



**Exploring the Uptake and Integration of Emerging Technology into
Pedagogical Practices in Health Sciences Education using an Activity
Systems Approach**

Gregory Doyle

Supervisor: Professor Dick Ng'ambi

This thesis is submitted for the award of the Doctor of Philosophy in
Education at the University of Cape Town, School of Education, Faculty of
Humanities.

February 2025

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

Abstract

This study investigates integrating educational technology into pedagogy and the role of professional development within a Health Sciences Faculty. It is framed within the interpretivist paradigm and informed by Cultural-Historical Activity Theory (CHAT) and Technological Pedagogical Content Knowledge (TPACK). A systematic literature review followed PRISMA 2020 guidelines to ensure study selection and reporting transparency. The overarching question of why particular lecturers, referred to as BrightSparks, excel in educational technology integration and how they might influence professional development is investigated. Integrating educational technologies in health sciences, with a focus on innovation, remains a challenge for most lecturers. This study defines innovation as the transformative and pedagogically grounded integration of technology to enhance teaching and learning. Hence, this research explores the strategies, challenges, and contextual factors that shape successful educational technology adoption and integration.

A sequential mixed methods approach was adopted, with the quantitative component using a Likert-scale online survey and the qualitative component using semi-structured online interviews. Participants were selected based on specific characteristics, particularly their proficiency in using educational technology and identification as potential BrightSparks. Among the 29 participants, 814 professional development activities were attended during the 12 months preceding filling in the survey, with individual attendance ranging from 0 to 60 and an average of about 28 activities per participant. Spearman's rank correlation and the Mann-Whitney U Test examined relationships between scores, demographic characteristics, and formal qualifications. Correlations emerged between academic qualification, teaching experience, and autonomy. The qualitative interviews revealed nuanced social and cultural dynamics influencing educational technology integration. Deductive thematic analysis using CHAT and TPACK, emphasising CHAT as the central framework for analysing BrightSparks' practices, illuminated the complexities of integrating educational technology, pedagogy, and content knowledge and identified contradictions affecting professional development.

The combined quantitative and qualitative data derived from BrightSparks emphasised adaptability, agency, student-centredness, transformative pedagogical approaches, and institutional support, corroborated by literature in the field. These findings informed the development of a 'bottom-up' Knowledge Framework for Technology Transformation (KF4TT), integrating the strengths of CHAT

and TPACK to support educational technology integration through professional development in higher education. Essential components of the KF4TT include targeted professional development to enhance individual lecturers' TPACK competencies, institutional support, collaborative learning communities, strategies to address systemic barriers, and encouragement of lecturer agency to foster ownership and flexibility in using professional development. In contrast to traditional professional development models, flexibility, adaptability, and sustainability are key features of the KF4TT, enabling individual lecturers and institutional leaders to continuously review and adapt to rapidly changing educational technology in higher education.

Declaration

I declare that the work submitted has not been formally submitted in its entirety or part and is my own work. Each contribution to, quotation in, and reference in this thesis from the work(s) of other people has been attributed, cited and referenced.

Signature

Signed by candidate

Date 16 February 2025**Acknowledgements**

I want to express my gratitude to all the people who helped me in this journey of preparation for this project. My thesis supervisor, Prof Dick Ng'ambi, for his support and encouragement throughout the writing of this thesis and to the invaluable support received from certain colleagues. In addition to the lecturers who participated in this study. A huge thank you to Charmaine, Jonathan and Jessica for their excitement, unwavering belief and love. Lastly, a big thank you to everyone in EDUTech for their support and encouragement.

Abbreviations and Acronyms

AODM - Activity Oriented Design Method
AR - Augmented Reality
CHAT - Cultural-Historical Activity Theory
CILT - Centre for Innovation in Learning and Teaching
CK - Content Knowledge
CoP - Community of Practice
CPD – Continuing Professional Development
CVI - Content Validity Index
DBIR - Design-Based Implementation Research
ERT - Emergency Remote Teaching
ET - Educational technology
F2F - Face-to-Face
HE - Higher Education
HEI - Higher Educational Institutions
ICTs - Information and Communication Technologies
KF4TT - Knowledge Framework for Technology Transformation
LMS - Learning Management Systems
NLF - Networked Learning Framework
NQF - National Qualifications Framework
OHP - Overhead Projector
PCK - Pedagogical Content Knowledge
PD - Professional Development
PK - Pedagogical Knowledge
SAMR - Substitution, Augmentation, Modification, and Redefinition
SAQA - South African Qualifications Authority
SPSS - Statistical Package for the Social Sciences
TCK - Technological Content Knowledge
TK - Technological Knowledge
TPACK - Technological Pedagogical Content Knowledge
TPK - Technological Pedagogical Information
UCT - University of Cape Town
UKPSF - UK Professional Standards Framework
VR - Virtual Reality

List of Tables

Table 2.1: Sub-themes identified under major themes of PD and ET	34
Table 2.2: Recent Model of Professional Development	57
Table 2.3: Comparative Overview of Terms Related to Lecturers Integrating ETs	66
Table 3.1: The Eight-Step Model Adapted from Mwanza, 2002, to Develop Activity Systems	83
Table 4.1: Overview of the Research Process	98
Table 4.2: Lecturers Interviewed	103
Table 4.3: Demographic comparison – Interviewees vs FHS Academics	103
Table 4.4: Items Comprising Categories for Student-, Self- and Departmental-Related Scores	115
Table 5.1: Summary of Created Scores from Questionnaire Items with Ranges	118
Table 5.2: Survey Participants' Demographic Data	119
Table 5.3: Items Comprising Categories for Student-, Self- And Departmental-Related Scores	122
Table 5.4: The Associations between Reasons for Attending PD and Using ET	123
Table 5.5: Association Characteristics and PD Activity Importance or Agency Scores	129
Table 6.1: Contradictions in ET	144
Table 6.2: Contradictions in PD	153
Table 6.3: Levels of TPACK of Lecturers	164
Table 6.4: High-level Summary of the Qualitative Data Responding to BrightSparks' Use of ET	170
Table 6.5 Lecturers' Experiences with and Perceptions of PD	173
Table 6.6: Two Activity Systems Analysed Using CHAT	174
Table 7.1: PD Contradictions and Strategies for Resolution	183
Table 7.2: ET Contradictions and Strategies for Resolution	184

List of Figures

Figure 1.1: Continuing Professional Development Cycle (Cooley et al., 2023; King et al., 2021)	23
Figure 1.2: Overall Research	25
Figure 2.1: Literature Search Strategy	34
Figure 2.2: Intersection of Significant Themes that Emerged from the Literature Review	36
Figure 2.3 PD Continuum	68
Figure 2.4: Fad-Like Technology Adoption Lifecycle	70
Figure 3.1: First-Generation Activity System (Vygotsky, 1978)	78
Figure 3.2: Second-Generation Activity System (Engeström, 1987)	79
Figure 3.3: TPACK Framework, Intersections of Knowledge Types (Wu et al., 2016)	88
Figure 3.4: Integrated Conceptual Framework	94
Figure 5.1: PD Activities Attended in the Last 12 Months	120
Figure 5.2: Question 3b - Rate the Importance of Attending Various Activities	121
Figure 5.3: Question 4 - Importance of PD	122
Figure 5.4: Question 5 - Influencing the use of Education Technologies in Practice	124
Figure 5.5: Question 7 - Barriers Experienced when Implementing or Using ET	125
Figure 5.6: Question 8 - Overall Perceptions of Control and Responsibility in Teaching	125
Figure 5.7: Question 8(i) - Perceptions of Control by Qualification (Master vs. Doctorate)	126
Figure 5.8: Question 8(ii) - BrightSparks' Perception of Control Compared to Teaching Experience	127
Figure 5.9: Associations Between Scores Created From Questionnaire Items	129
Figure 6.1: Third Generation Activity Systems	177
Figure 8.1: The Five Components of KF4TT	217
Figure 8.2: Simplified version of the KF4TT	218

Table of Contents

Chapter 1 – Introduction	12
1.1 Overview	12
1.2 Background and Context.....	13
1.2.1 Higher Education Disruptions	14
1.2.2 Institutional Context.....	14
1.2.3 Professional Development in Teaching in Health Sciences	15
1.2.4 Educational Technologies in Teaching and Learning	16
1.2.5 <i>BrightSparks</i>	18
1.2.6 Local Context.....	19
1.3 Educational Problem	21
1.4 Theoretical Frameworks: Integrating CHAT and TPACK	22
1.5 Positionality	25
1.6 Rationale	26
1.7 Aim	26
1.8 Research Question.....	27
1.9 Summary of Chapter	27
1.10 Thesis Structure.....	27
CHAPTER 2 – Literature Review	30
2.1 Overview	30
2.2 Context.....	30
2.3 Professional Development	35
2.3.1 Different Professional Development Constructs	38
2.3.2 Purpose of Professional Development	39
2.3.3 Factors Driving Professional Development	40
2.3.4 Regulatory Driven Professional Development.....	42
2.3.5 Trends in Professional Development	44
2.3.6 Professional Development for Developing Technological and Pedagogical Skills	45
2.3.7 Challenges Facing Professional Development	46
2.3.8 Designing a Professional Development Activity that Includes Educational Technologies	48
2.3.9 Planning and Implementing Professional Development.....	49
2.4 PD Frameworks and Models	50
2.5 Research on Effectiveness of Professional Development.....	53
2.6 Educational Technologies.....	59
2.6.1 How Technology Enhances Pedagogical Practice.....	61
2.6.2 Educational Technology Integration and Professional Development	62
2.6.3 Previous Applications of CHAT in Technology-Enhanced Learning.....	63
2.6.4 Implications for the Current Study	63
2.7 Lecturers Who Integrate Technology Exceptionally	64
2.7.1 The Role of <i>BrightSparks</i> in Blended PD Systems	68
2.7.2 <i>BrightSparks</i> Across the Technology Adoption Spectrum	69
2.7.3 <i>BrightSparks</i> and Transformative Practice	70
2.7.4 Implications for PD Frameworks	71
2.8 Agency in Higher Education	72
2.8.1 Theoretical Foundations of Agency	72
2.8.2 Agency in the Educational Context	72
2.8.3 Agency and PD.....	73
2.8.4 <i>BrightSparks</i> and Agency	73
2.8.5 Challenges in Implementing Agency-Driven Changes.....	74
2.8.6 Effective Change through Sustainability.....	74
2.9 Summary of Chapter	75
CHAPTER 3 - Theoretical Framework.....	76

3.1 Overview	76
3.2 CHAT	77
3.2.1 Activity Systems	81
3.2.2 Activity System 1 - <i>BrightSparks</i>	83
3.2.3 Activity System 2: Professional Development Activities	84
3.2.4 Contradictions in CHAT	85
3.3 TPACK	86
3.4 CHAT and TPACK	89
3.4.1 CHAT and TPACK as Integrative Frameworks	90
3.5 Critique of CHAT and TPACK	94
3.6 Summary of Chapter	95
Chapter 4 Methodology	97
4.1 Overview	97
4.2 Research Question	97
4.3 The Theoretical Framing of the Study	98
4.4 Research Design and Data Collection	99
4.4.1 Lecturers	101
4.4.2 Survey	103
4.4.3 Semi-Structured Interviews	105
4.4.4 Quality Framework	106
4.4.4.1 Quantitative Component Quality	106
4.4.4.2 Qualitative Component Quality	107
4.4.5 Ethics	107
4.4.6 Limitations of the Study	108
4.5 Data Analysis	108
4.5.1 Qualitative Data - Semi-Structured Interviews	109
4.5.2 Quantitative Data Analysis Methods	111
4.5.3 Correlations between the reasons for Attending PD and Using ET	113
4.6 Summary of Chapter	115
Chapter 5 – Findings: Quantitative Analysis	116
5.1 Overview and Context	116
5.2 Questionnaire Results	117
5.2.1 Demographic Results	118
5.2.2 Participation in PD Activities	119
5.2.3 Priority Areas for PD	120
5.2.4 Motivation for Attending Professional Development Activities	121
5.2.5 Use of Educational Technologies in Teaching	123
5.2.6 Barriers to Implementing ET	124
5.2.7 Agency	124
5.2.7.1 Agency vs Qualification	125
5.2.7.2 Agency vs Teaching Experience	126
5.3 Correlations Between Questionnaire Scores	127
5.3.1 Demographic Characteristics vs PD Activity Importance or Agency	128
5.4 Summary of Chapter	129
Chapter 6 - Findings: Qualitative Analysis	131
6.1 Overview	131
6.2 Key Findings from Qualitative Data	132
6.3 Findings Through an Analytical Framework	133
6.3.1 Contradictions and Mediation	137
6.3.2 Educational Technology	138
6.3.2.1 ET Contradictions	140
6.3.2.2 ET Mediating Artefacts	146
6.3.3 Professional Development	149

6.3.3.1 PD - Contradictions	150
6.3.3.2 Professional Development - Mediation	154
6.4 Technological Pedagogical Content Knowledge Analysis	156
6.4.1 Technological Knowledge	157
6.4.2 Pedagogical Knowledge	159
6.4.3 Content Knowledge	161
6.4.4 TPACK	162
6.4.5 CHAT – Professional Development	165
6.4.6 CHAT – Educational Technologies.....	167
6.5 Summary of Qualitative Data	169
6.6 Themes from the Quantitative Data Compared with Qualitative Data	177
6.7 Summary of Chapter	179
Chapter 7 – Discussion	181
7.1 Overview	181
7.2 Contradictions	182
7.2.1 Contradictions in PD	182
7.2.2 Contradictions in using ET.	183
7.3 Main Themes	185
7.3.1 Theme A - Developing TPACK Competencies	185
7.3.1.1 Correlations between the reasons for attending PD and using ET	187
7.3.1.2 PD Importance and ET Influence.....	187
7.3.1.3 Role of PD in Supporting TPACK Development and Overcoming Challenges	188
7.3.1.4 Theme A - Summary.....	189
7.3.2 Theme B - Role of CHAT in Integrating ET in Teaching.....	189
7.3.2.1 Barriers of Time and Institutional Support to Integrating ET	190
7.3.2.2 Navigating Sociocultural and Institutional Factors in ET Integration	191
7.3.2.3 Theme B - Summary.....	191
7.3.3 Theme C - Role of PD in <i>BrightSparks'</i> Ability to Integrate ET in Teaching	192
7.3.3.1 Correlations between reasons for attending PD and using ET.	193
7.3.3.2 Professional-Related Reasons	194
7.3.3.3 Student-Centred Motivations.....	195
7.3.3.4 PD and Agency	195
7.3.3.5 Agency and Years of Teaching	195
7.3.3.6 Fostering a Supportive PD Environment	196
7.3.3.7 Mitigating Challenges and Resistance through PD	196
7.3.3.8 Digital Literacy and Tailored Professional Development.....	197
7.3.3.9 Theme C- Summary.....	197
7.3.4 Theme D - What Can Be Learned from <i>BrightSparks</i> to Inform PD?	198
7.3.4.1 PD Importance and ET Influence.....	199
7.3.4.2 Barriers to ET	200
7.3.4.4 Collaborative Approaches and Peer Mentoring	200
7.3.4.5 ET Impact on Workload and Resistance from Students	201
7.3.4.6 Theme D - Summary.....	201
7.3.5 Themes A – D: Combined Findings	202
7.4 Institutional Implications for Technology Adoption	205
7.5 Summary of Chapter	206
Chapter 8 – Developing a Framework for PD.....	208
8.1 Overview	208
8.2 Context.....	208
8.3 Interpreting Findings with Literature and CHAT/TPACK.....	210
8.3.1 Theme A: Implications for Developing a PD KF4TT from Findings (TPACK).....	210
8.3.2 Theme B: Institutional Contradictions and Sociocultural Influences (CHAT)	211
8.3.3 Theme C: Personalising PD and Promoting Self-Directed Learning	212
8.3.4 Theme D: Contextualising PD and Institutional Support.....	212

8.4 Knowledge Framework for Technology Transformation	213
8.4.1 Development Based on Key Themes.....	213
8.4.2 Key Features of the Knowledge Framework for Technology Transformation.....	214
8.4.2.1 Theoretical Foundations of KF4TT.....	215
8.4.2.2 Developing Equilibrium across TPACK Domains.....	218
8.4.2.3 KF4TT as a Sustainable PD Framework	218
8.4.2.4 Structural and Conceptual Pillars of KF4TT.....	219
8.5 Framework Development Based on Findings.....	220
8.5.1 Mini-Case Study: Dr M's Journey.....	220
8.5.1.1 Assessment of Current Competencies and Context.....	221
8.5.1.2 Design of PD Programmes and Institutional Support	221
8.5.1.3 Implementation and Monitoring	222
8.5.1.4 Continuous Evaluation and Adaptation	222
8.5.1.5 Holistic Approach to PD and ET Integration	222
8.6 Summary of Chapter	223
Chapter 9 – Conclusion.....	225
9.1 Overview	225
9.2 Review of Research Question	225
9.3 Practical Implications	226
9.3.1 Implications for Professional Development.....	226
9.3.2 Implications for Lecturers (Educators)	226
9.3.3 Implications for Policymakers (Institutional Leaders)	227
9.4 Limitations and Future Directions in Practical Implications.....	228
9.5 Theoretical Implications and Contributions.....	228
9.5.1 Advancing the Body of Knowledge	228
9.5.2 Theoretical Limitations and Future Scholarly Directions.....	229
9.5.3 Overall Contribution of the Thesis	229
References	231
Appendix A – Survey	261
Appendix B – Consent	267
Appendix C – Quantitative Data Extract.....	269
Appendix D1 – Qualitative Data Extract – PD	272
Appendix D2 – Qualitative Data Extract – ET.....	275
Appendix E – Literature Review Sources per Theme*	284

Chapter 1 – Introduction

This introductory chapter provides an overview, followed by background and context. Key topics such as higher education (HE) and institutional context are discussed, and the forms of professional development (PD) and the role of educational technologies (ETs) in teaching and learning are elaborated. In addition, it outlines the phenomenon being studied, particularly the emergence of the term *BrightSparks*, which classifies the type of lecturer that is the focus of this research. Thereafter, the educational problem is identified, the theoretical framework underpinning the study is presented, and my positionality is elaborated. It concludes with the rationale for the study, the aim and the research question that guides the study. These sections establish the need for the study and highlight the empirical gap in understanding how lecturers integrated ETs into their teaching and the role PD plays in that process.

1.1 Overview

Continuing education and PD for academics in the workplace is essential to universities and is generally understood as staff development. The fast pace of development in ETs has contributed to the need to adapt to our changing teaching, learning, and research environments. Observations within a faculty of health sciences reveal that while some lecturers skilfully integrate ETs into their teaching practices, others show no significant changes in their teaching methods despite participating in formal PD. This disparity underscores a critical gap in empirical research, the limited understanding of how lecturers, particularly those who engage in self-directed or informal PD (experiential, self-initiated learning), integrate ET, given their minimal participation in formal PD programmes (structured, institutional training). These constructs (informal/formal) are discussed fully in Section 2.3.1. Their natural inclination towards technology and its use in education raises the question of what factors contribute to their proficiency. This group of lecturers, whom I have termed *BrightSparks*, represent a unique cohort within the faculty. They embrace ET in their pedagogy and navigate through HE changes more swiftly than their peers, as seen during the adoption of online teaching and increased use of ET. Their ability to adapt and innovate with minimal or no PD support is particularly striking and underscores the need for this research.

For my research, I use the following definition for *BrightSparks*:

Lecturers who encapsulate the qualities of innovation, leadership, responsiveness, student-centeredness, and adaptability are rooted in a deep commitment to enhancing educational outcomes through the strategic integration of technology. (For further information on how this definition was determined, see Section 1.2.5.)

ETs are technologies used in teaching and are variously referred to as e-learning, technology-led, and, depending on the context, can also be referred to as emerging technologies. These ETs encompass digital tools and innovations strategically aligned with pedagogy and content to address diverse learning needs and enhance teaching and learning processes (Ng'ambi et al., 2012; Islami et al., 2022; Bond et al., 2020a). In order to avoid a focus on merely teaching 'how-to-skills', this research aims to draw on relevant theoretical frameworks to put forward new insights that can assist lecturers in implementing and integrating technologies. A further benefit could be helping lecturers to prepare for future technology changes. One of the premises explored in this research is that some lecturers adapt more quickly and navigate online independently or with minimal assistance from others.

The significance of this research lies in its potential to fill a gap in the literature by developing a conceptual framework that delineates the specific knowledge, skills, and behaviours enabling lecturers to overcome barriers and effectively integrate ET into their teaching. (Mercader, 2020; Bhat, 2023; Chugh et al., 2023a). Given the wide range of ways in which technology is used among lecturers in health sciences, from the *BrightSparks* to those who are hesitant or resistant to change, this research offers important insights for future PD programmes and educational strategies within the faculty in which my research has taken place and could be transferable to other contexts. In this thesis, I examine the different facets of the integration of ET in HE teaching, the role of PD in this process, and the distinctive characteristics of '*BrightSparks*' that set them apart from their colleagues.

1.2 Background and Context

The South African Department of Education's 2004 policy document stipulates that Information and Communication Technologies (ICTs) are central to the training of lecturers and the continual PD of practising lecturers (South African Department of Education, 2004). It envisages that lecturers should be able to use technologies in their pedagogical practice to create an effective and efficient

learning experience (South African Department of Education, 2004). Salmon (2005) comments that the policy does acknowledge the constraints and difficulties in integrating technology into teaching and learning and that it cannot be done in isolation. Based on my observation, very few details in the White Paper illustrate how to integrate technologies into teaching and learning. Furthermore, consideration needs to be given to lecturers from different contexts and with diverse skills, necessitating a programme or plan that develops the competencies they need to integrate technologies into their teaching (Moolman & Essop, 2008). The SADE Whitepaper and UCT Strategic Goals, additionally, strongly advocate blended learning, which indirectly implies the inclusion of technologies in combination with face-to-face instruction (University of Cape Town, 2021), stipulating it as the primary teaching mode foregrounds issues of lecturers' and students' digital literacies as well as the ability to use ETs.

1.2.1 Higher Education Disruptions

Over the past ten years, challenges in HE, including student protests, have highlighted the necessity of adapting quickly and making optimal use of ETs. This was particularly evident at the onset of the global COVID-19 pandemic when lockdown was imposed in many countries, including South Africa. The closure of non-essential businesses, schools, and universities forced a rapid shift to Emergency Remote Teaching (ERT) (Czerniewicz et al., 2019; Baboolal-Frank, 2021). With ERT, the cancellation of in-person classes required lecturers to move to online platforms, which resonated with previous academic disruptions such as the 2015 #FeesMustFall and #RhodesMustFall protests in South Africa (Langa et al., 2017). During these protests, many South African universities closed, leading to calls to move teaching online to enable a continuation of the academic year (Czerniewicz et al., 2019). Amidst the challenges posed by the COVID-19 pandemic, the lecturers who adapted successfully and more quickly than their colleagues to the available digital platforms demonstrated how their pedagogical practices ensured that teaching and learning continued effectively. These lecturers underscore the significance of adaptability and innovation in today's dynamic educational landscape. They were in an advantageous position when these challenges occurred (Czerniewicz et al., 2020).

1.2.2 Institutional Context

This research is situated within the University of Cape Town (UCT). It is considered one of the top-ranked universities in Africa and a well-resourced, mid-sized residential institution (University of

Cape Town, 2024). It prides itself on its position in international HE rankings due to its teaching and research output quality (Sadiq et al., 2019). Traditionally, research has been more prominent than teaching at this institution; however, the latter has started to gain more prominence, leading to a greater emphasis on the PD of lecturers (University of Cape Town, 2018), an area that this research explores in greater depth. In 2018, Professor Mamokgethi Phakeng, UCT's then Vice-Chancellor, launched the five-year "Online Education Project" initiative (CILT, 2020). The focus of this project was the development of online and blended undergraduate programmes. The goal was to grow UCT's online education capacity. It explicitly addressed challenges related to improving student success and student experiences through curriculum change, thus acting as a catalyst for innovation in teaching and learning.

The "Online Education Project" was complemented by the 2018 Teaching and Learning Report, which emphasised that online learning environments should complement face-to-face teaching (University of Cape Town, 2018). It recognised the interconnectedness between pedagogy and ET. As teaching evolved, pedagogies such as streaming, flipped classrooms and facilitated online discussion necessitated the inclusion of ET. While ET validation is evident at UCT, it is not necessarily mandated. Several policy frameworks, exemplified by the "Teaching and Learning Framework", commend the infusion of technology into pedagogical designs, with its "Intentional use of digital tools and artefacts for enhancing the student experience" (UCT T&L Framework, 2022, p.3).

Most undergraduate curricula in the faculty embody a blended learning archetype, an intentional mix of face-to-face instruction and purposeful online activities in which technology extends, supports, or personalises learning without replacing scheduled contact time.. Through local learning management systems (LMS) such as Vula (up to 2024) and Amathuba (from 2022), students can delve into academic content, engage in peer interactions, and liaise with lecturers. This platform is a repository for diverse learning materials while facilitating virtual discussions and academic submissions. Notably, lecturers retain the autonomy to cherry-pick their preferred technological tools.

1.2.3 Professional Development in Teaching in Health Sciences

PD encompasses a wide range of activities to enhance the knowledge, skills, and abilities of lecturers in HE. While the term is used interchangeably with concepts like faculty development, in-service

training, and lifelong learning, it broadly refers to intentional activities designed to support lecturers in their teaching, research, administration, and clinical responsibilities (Steinert, 2013; Lotti, 2020). The goals of PD include preparing lecturers to adopt innovative pedagogical practices, adapt to evolving ETs and meet institutional and regulatory requirements (McMahon et al., 2015; Höfrová et al., 2021).

PD is pivotal in mediating change within HE institutions, particularly in integrating ET into teaching and learning. PD acts as a critical link between technological advancements and improved student learning outcomes by equipping lecturers with the skills needed to navigate complex implementation pathways. Without structured interventions, lecturers may struggle to integrate ET effectively, making PD an essential mechanism for fostering innovation and supporting institutional goals (Biondi, 2024).

PD holds additional importance in health sciences due to regulatory requirements set by the Health Professions Council of South Africa (HPCSA). Lecturers must comply with Continuous Professional Development (CPD) requirements to maintain their professional registration, while institutions must meet accreditation standards to ensure quality teaching and learning. PD opportunities in the health sciences range from workshops and ad hoc consultations to formal programmes that address curriculum design, instructional strategies, and the integration of ETs. These initiatives are essential for equipping lecturers to meet the high professional standards expected in training future health professionals (HPCSA, 2021).

1.2.4 Educational Technologies in Teaching and Learning

E-Learning includes all forms of electronically supported learning and teaching. Technology makes learning more effective or efficient, allowing students to extract information, share their knowledge, learn at their own pace, and engage in critical thinking (Goodyear & Retalis, 2010). Bond et al. (2020a) concur and observe that numerous technologies are available to support and enhance teaching and learning for the benefit of students. While many lecturers use technologies to design content or deliver lectures, the integration into content and pedagogy knowledge is sometimes lacking (Gorder, 2008). Their use of technology is influenced by context, perceived usefulness, available support, their attitudes and beliefs towards technology (Chen, 2008; Park & Son, 2009; Gachago et al., 2021), as well as their educational qualifications, age, teaching experiences,

technology capability, and learning preferences (Carvin, 1999; Schiller, 2003; Neyland, 2011). Surprisingly, their attitude and beliefs have a greater impact on whether they use technology than the availability of infrastructure. Gil-Flores et al. (2017) categorise these influencing factors into minor and major elements. Minor elements include networking opportunities, recognition and rewards, flexibility and customisation, technology integration, and community engagement. Major elements encompass needs assessment, goal setting, PD opportunities, mentoring and coaching, evaluation and feedback. These factors highlight the relationship between the use of technology in teaching and learning, the attendance of technology-related PD activities, collaboration, and perceived self-efficacy (Gil-Flores et al., 2017).

Integrating technologies into teaching is a complex process made more difficult due to the quickly evolving nature of technologies. These changes or updates require lectures to adapt, upskill or learn how to use the innovative technologies. It has been shown that technical competencies influence pedagogical competencies, which implies that lecturers must know how to use the tool before integrating it into their teaching (Suarez-Rodriguez et al., 2018). Thus, lecturers' technological competencies are essential for integrating technology into their pedagogy and teaching practice. According to Ng'ambi et al. (2012), ETs are tools and innovations designed for education-related purposes, encompassing both novel technologies and those newly introduced within particular contexts. In this study, innovation is defined as the strategic and transformative integration of ETs to enhance pedagogical practices and learning outcomes. It is not merely about technological novelty; rather, innovation reflects a more profound pedagogical commitment to improving student learning through adaptable and contextually responsive practices. Islami et al. (2022) further elaborate by describing ETs as diverse digital tools that support and enrich teaching and learning processes. However, integrating these tools into pedagogical practice introduces additional complexities, such as ensuring equitable access and addressing the varying levels of lecturers' preparedness (Islami et al., 2022; Atabek, 2019). Effectively managing these challenges is essential to fully realise the potential of ETs in advancing innovation in education.

E-learning, a broad term aiming to facilitate the construction of knowledge through digital means, encompasses a range of practices from online courses to blended learning environments (Tavangarian et al., 2004; Bond et al., 2020b; Gachago et al., 2021). Specifically, technology-enhanced learning, a subset of e-learning, refers to the strategic use of technology to support

learning objectives, often facilitated through platforms like the LMS (Islami et al., 2022). ETs include tools like Virtual Reality (VR) for immersive learning experiences and Artificial Intelligence (AI) for personalised learning paths, which are increasingly being adopted in HE to address diverse pedagogical needs (Bond et al., 2020a; Ng'ambi et al., 2020). For this research, I refer to ETs as digital tools and innovations to enhance teaching and learning. Their effective integration to enrich educational practices and outcomes requires addressing the challenges of access and lecturer preparedness, which underscore the importance of PD.

1.2.5 *BrightSparks*

There is an excellent variety of ways lecturers across HE use ETs to support teaching and learning. Some stand out for their exceptional ability to adopt and integrate ETs in innovative and transformative ways. From my professional experience and the literature review, I have identified a group of technologically adept lecturers who integrate ETs into their pedagogy to fundamentally enhance teaching and learning practices. I refer to these lecturers as *BrightSparks*.

While the literature uses terms such as "trailblazers," "early adopters," or "exceptional lecturers" to describe individuals with advanced teaching or technological capabilities, the concept of *BrightSparks* is distinct and specific to this study. For example, early adopters in Rogers's (1962) Technology Adoption Bell Curve embrace innovations quickly and enthusiastically. However, *BrightSparks* go beyond early adoption to focus on pedagogy-driven integration of ETs rather than technology for its own sake. Similarly, while "exceptional lecturers" are often recognised for their teaching excellence, *BrightSparks* stand out in their ability to independently navigate the CPD Cycle and blend formal and informal professional learning activities to develop their technological and pedagogical skills.

BrightSparks are self-directed learners with a high degree of agency, seeking opportunities to enhance their teaching without relying solely on structured PD. They act as champions of technology, inspiring and mentoring their colleagues while modelling innovative practices. This study is motivated by the insufficient literature to identify and understand such lecturers. By focusing on *BrightSparks*, this research aims to explore their practices and examine how their technological competencies and agency can inform the design of PD strategies to support broader ET adoption in HE. In Summary, *BrightSparks* are lecturers who integrate ETs into their teaching

practices in transformative and pedagogically meaningful ways. They exemplify innovation, leadership, adaptability, and student-centeredness, driven by a deep commitment to enhancing educational outcomes. These lecturers achieve their impact primarily through self-directed learning and intrinsic motivation rather than reliance on structured PD activities. *BrightSparks* models the characteristics of lifelong learners, early adopters, and change agents, navigating the CPD Cycle independently. Through their innovative practices, they inspire and influence their peers, fostering a culture of continuous improvement and pedagogical transformation.

1.2.6 Local Context

Yurtseven et al. (2020) suggest that in order for a curriculum to keep pace with technological advancements, lecturers need to focus on PD and the integration of ET in teaching and be committed to continuously updating and enhancing their teaching methods to meet the dynamic demands of education. Several lecturers have successfully integrated technologies into their teaching in the Health Sciences Faculty, in which this research is undertaken. These lecturers have adapted to the evolving nature of ETs while maintaining their fundamental roles in the faculty. By foregrounding the practices and experiences of these lecturers, we can gain valuable insights to enhance future PD approaches in health sciences. I aim to highlight the practices of these *BrightSparks*, demonstrating how their experiences can inform and improve PD strategies. The focus will be on understanding the networks of interacting activity systems of lecturers and PD, providing a holistic view of how technology is integrated into teaching practices.

The complexity of lecturers' conditions of service and teaching undergraduate students within health sciences is multifaceted, especially in my context, which consists of various programmes ranging from Medicine to Physiotherapy. Staff serve multiple roles, including lecturers, researchers, clinical supervisors, and administrators. Developing and maintaining a health sciences programme involves designing curricula, selecting suitable teaching methods, and aligning with accreditation standards. Managing coordination, scheduling classes, and coordinating resources like laboratory sessions and clinical placements further complicate programme delivery. Recruiting qualified lecturers with expertise in health sciences is complex, and retaining them requires addressing their PD needs, job satisfaction, and work-life balance. Collaborations with hospitals, clinics, and research institutions are vital for health sciences faculties. Navigating these partnerships, securing funding, and ensuring staff involvement in research projects are complex tasks. Furthermore, health sciences

programmes must meet stringent accreditation standards, with lecturers playing a key role in maintaining quality. Regular assessments, curriculum updates, and adherence to ethical guidelines are necessary to ensure programme integrity. Serving a diverse student population requires academic support, addressing individual needs, and promoting inclusivity. Balancing workload and ensuring fair treatment for all students poses additional challenges. Keeping pace with advances in medicine, technology, and healthcare delivery is crucial. Staff need ongoing training to keep abreast, adding another layer of complexity. This contextual complexity is an important consideration in this research and is the reason for focusing only on lecturers teaching undergraduate students.

PD, which concentrates on empowering lecturers to use ETs in their teaching, has the potential to integrate technological, content, and pedagogical knowledge that is both sustainable and adaptive within the social framework of universities (Belland, 2009). While traditional PD models have demonstrated efficacy in facilitating pedagogical transformation by providing logical rationales for adopting new pedagogies and skills (Hilty et al., 2019), it is crucial to avoid scenarios where lecturers view PD as the sole rationale for change. Rather, a knowledge framework for PD, constructed with insights into lecturers' inherent values and priorities, such as those emerging from *BrightSparks*, could serve as a more empowering approach.. Such a model encourages lecturers to actively navigate the evolving landscape of ET and pedagogical challenges. The continuous cycle of CPD represented in Figure 1.1 underscores the importance of systematic reflection, planning, action, and evaluation (Cooley et al., 2023; King et al., 2021). However, the unidirectional arrows may also inadvertently suggest a linear and fixed sequence, whereas, in contrast, research points to the complex, adaptive, and iterative nature of CPD. For example, Al-Omary et al. (2024) found that implementing CPD into practice is not automatic and requires contextual adaptation, underscoring the need for feedback loops and ongoing engagement. Similarly, Mlambo et al. (2021) describe CPD as shaped by dynamic factors such as organisational culture, motivation, and environmental support, which do not always align sequentially. Poitras et al. (2025) further illustrate that adapting CPD learning into real-world settings involves nonlinear decision-making and reflective adjustments based on evolving care needs. Thus, embedding feedback mechanisms within the CPD model more accurately reflects its inherently iterative and flexible character. In this way, PD supports sequential development and a responsive and evolving cycle of professional learning and adaptation (Figure 1.1).



Figure 1.1: Continuing Professional Development Cycle (Cooley et al., 2023; King et al., 2021)

1.3 Educational Problem

My role as an e-learning Manager has enabled me to observe how some lecturers engaged ETs, integrating them effectively into their pedagogy, while others struggled. Throughout the disruptions in South African HE since 2015, I have keenly noted a divergence in responses: some lecturers incorporated ETs into their pedagogical practices with less effort and more success than others. Additionally, they moved beyond the general trend of uploading their traditional PowerPoint teaching slides with recorded narratives to replace their usual live classroom lectures.

The dynamic allure of technology and its multifaceted opportunities have propelled many lecturers within the health sciences towards PD engagements. In terms of lecturers' personal development, my observations revealed that while some lecturers are genuinely invested in pedagogical enhancement, others approach PD with a mindset to acquire novel competencies or to satiate their curiosity regarding innovative offerings in the faculty. The shift towards online education, catalysed by the 2020 COVID-19 pandemic, underscored the impetus for rapid acclimatisation to nascent technological paradigms.

It must be stressed that PD is not compulsory. Therefore, not all lecturers attend the activities the institution offers. They may rely on a range of other ways to develop their expertise in teaching. Regarding PD's content, the focus is often geared to the needs of the lecturers who attend, though

assumptions are frequently made concerning what they ought to acquire. Despite the existence of structured PD programmes, many lecturers prefer self-directed learning activities that suit their specific needs. The lack of PD frameworks accommodating this continuum limits lecturers' ability to blend formal and informal PD practices. I aim to explicitly seek out those individuals who have used a range of alternative means of self-development to delve into their motivations, strategies, and the intrinsic and extrinsic factors that influenced their adoption and integration of ETs in teaching. This knowledge can inform a new way of conceptualising and offering PD activities by constructing a PD Knowledge Framework for Technology Transformation (KF4TT) in health sciences grounded in the study's empirical evidence.

1.4 Theoretical Frameworks: Integrating CHAT and TPACK

The theoretical framework for this study conceptualises PD as a continuum, encompassing formal, structured activities and informal, self-directed learning (Jacob et al., 2015; Behari-Leak et al., 2018). Lecturers identified as *BrightSparks* exemplify varied pathways along this continuum: some begin with formal PD before transitioning to more self-directed practices, while others engage in entirely self-initiated learning from the outset. This diversity highlights the need for a theoretical framework that supports multiple learning approaches, offering opportunities for lecturers to evolve into innovative practitioners as the *BrightSparks* have done.

This study adopts Cultural-Historical Activity Theory (CHAT) as an analytical lens to understand these developmental trajectories better. Grounded in works on mediated action and further developed by Engeström (1987), human activity is situated within broader cultural, historical, and institutional contexts (Cole & Engeström, 1993; Engeström, 1987). CHAT, therefore, serves as an overarching lens to examine the complex human activity systems involved in lecturers' integration of ETs. It provides a robust framework for understanding the dynamic and context-specific factors influencing how lecturers adopt and use ETs in their teaching practices. By emphasising the interconnectedness of actors, tools, rules, and outcomes within an activity system, CHAT enables a holistic analysis of lecturers' motivations, challenges, and practices, particularly those identified as *BrightSparks*.

CHAT is applied to analyse the activity systems that shape lecturers' PD and their use of ETs. For example, lecturers' integration of ETs can be influenced by institutional rules, PD frameworks, peer collaboration, and broader cultural-historical factors (Cole & Engeström, 1993). The theory also

highlights how contradictions and tensions within activity systems, such as conflicting institutional goals or a lack of alignment between formal and informal PD opportunities, can create opportunities for innovation and transformative change (Engeström, 1993). These tensions are particularly relevant when examining how *BrightSparks* navigates their professional growth and can contribute to redesigning PD frameworks.

While CHAT is the primary lens, this study also incorporates Technological Pedagogical Content Knowledge (TPACK) as a complementary framework to understand the competencies required for effective technology integration. TPACK, developed by Koehler & Mishra (2009), advocates that integrating ETs into teaching requires a combination of technological, pedagogical, and content knowledge. This framework is beneficial for identifying the unique technological and pedagogical expertise demonstrated by *BrightSparks*, who often excel in leveraging ETs to transform their teaching practices.

The integration of CHAT and TPACK allows this study to address two key dimensions, the contextual and systemic factors and the pedagogical and technological competencies. CHAT provides a broader understanding of the cultural, historical, and institutional contexts in which lecturers operate and the contradictions and dynamics that shape their actions. TPACK offers a focused lens to explore how *BrightSparks* blends content, pedagogy, and technology to create innovative and effective teaching practices.

Informed by an interpretivist paradigm, which views reality as socially constructed and context-dependent (Pervin & Mokhtar, 2022), this study focuses on understanding, rather than measuring, how lecturers make sense of ET and how PD experiences shape that meaning within their local settings. From this worldview, this study leverages CHAT and TPACK to holistically examine *BrightSparks'* practices and their implications for PD design. By combining these frameworks, this research analyses how and why lecturers integrate ETs within their specific contexts and identifies the competencies and strategies that can inform the development of more flexible and inclusive PD frameworks.

Within ETs, CHAT is often used as a theoretical framework to understand how technologies are adopted, adapted, configured, and used in complex social situations (DeVane & Squire, 2012). The

combination of CHAT and TPACK provides powerful theoretical tools to evaluate how ET is used and integrated within teaching models at the micro level while considering its adoption within PD at a macro level. Figure 1.2 illustrates the conceptual framework used to study *BrightSparks*, lecturers who integrate ETs in transformative and pedagogically meaningful ways. The three circles represent the key dimensions of the study:

- *BrightSparks* (TPACK): *BrightSparks* are selected based on their technological, pedagogical, and content knowledge integration. It is relevant for selecting *BrightSparks* based on their technological-pedagogical integration.
- Culture, Context, and History (CHAT): CHAT analyses how institutional, cultural, and historical contexts shape *BrightSparks*' practices. It is relevant for exploring the cultural, contextual and historical influences on *BrightSparks*' development.
- PD Redesign: Insights from TPACK and CHAT are used to inform the design of PD to support *BrightSparks*' practices and influence them better.

The intersections represent the relationships and synergy between these dimensions. "Agency" is likely the underlying attribute that enables the *BrightSparks* phenomenon to be what it is, reflecting their intrinsic motivation and self-directed learning practices.

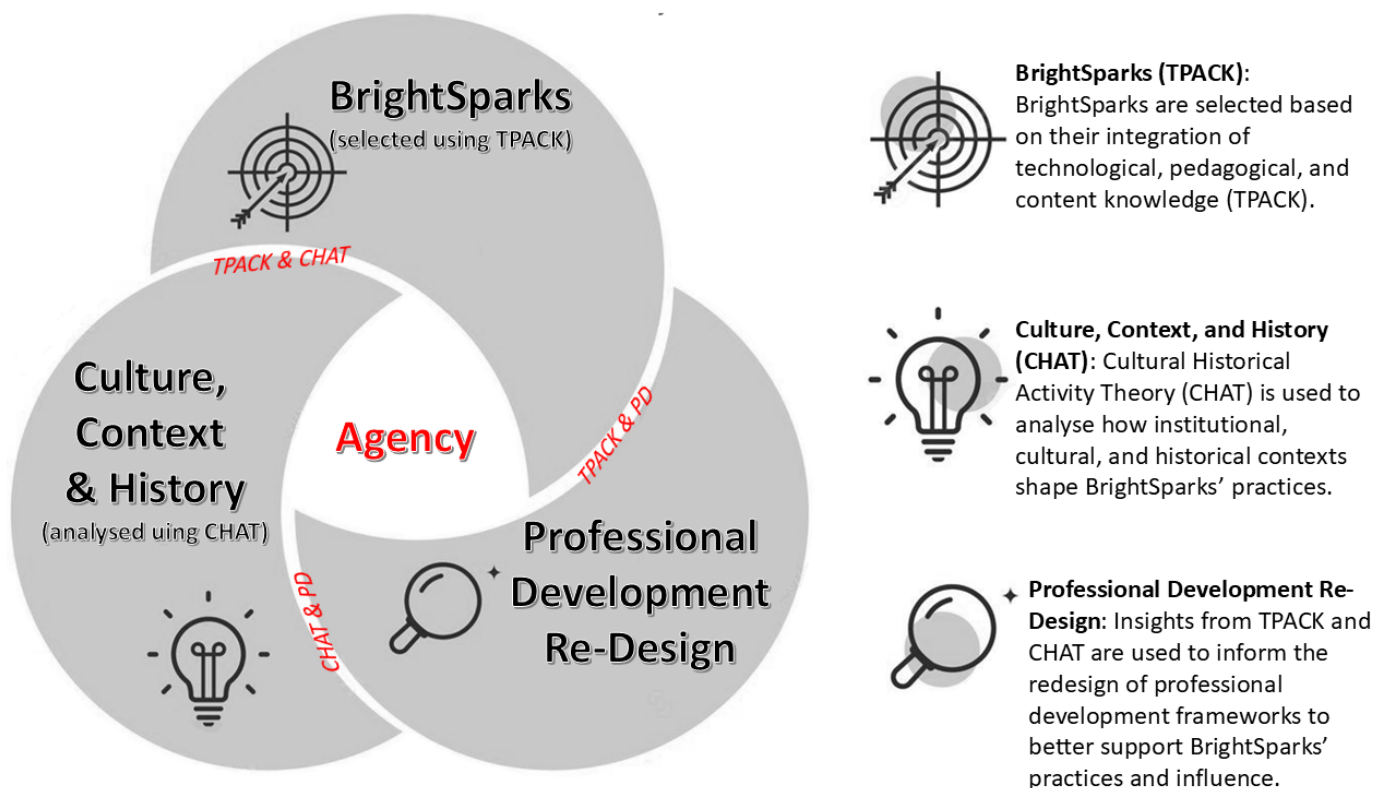


Figure 1.2: Overall Research

1.5 Positionality

As an E-Learning Manager and a PhD student, I am placed in the unique position of being both a participant in and observer of the use of ET at the institution. As the E-Learning Manager, leading a team responsible for supporting and training staff in using technologies at the institution, I have engaged extensively with many lecturers who use ET in their teaching over the last decade. I am often called upon to answer questions regarding using ET within teaching. As mentioned above, the description of my work alludes to how lecturers in the faculty may perceive me. The insider-outsider role tension is a common experience among practitioner-researchers and is well-recognised in literature (Aiello & Nero, 2019; Hill & Dao, 2021; Punch & Rogers, 2022).

Guided by an interpretivist paradigm, I assume that reality is socially constructed, multiple and context-bound, and that knowledge is generated through lecturers' shared meanings and interactions. My aim, therefore, is not to uncover a single objective truth but to understand how lecturers themselves make sense of ET within their specific cultural and institutional milieu. An interpretivist stance is particularly appropriate for three reasons. First, the study seeks to reveal the subjective meanings BrightSparks attach to technology-enhanced teaching rather than to test predetermined variables. Second, the data strategy, purposive sampling of knowledgeable lecturers and in-depth, semi-structured interviews, privileges thick, contextualised descriptions over statistical representativeness, aligning with interpretivist epistemology (Schwandt et al., 2007; Pervin & Mokhtar, 2022). Third, both CHAT and TPACK are rooted in sociocultural and constructivist thought, assuming that knowledge emerges through mediated activity and negotiated understanding; an interpretivist paradigm therefore provides the ontological and epistemological foundation that coherently underpins these frameworks. My insider role gives me a deep understanding of the context within which ET is being integrated, which can enrich the research with detailed insights. I know our lecturers' challenges and goals with ET integration. However, as a researcher, I need to take a step back and critically assess these practices and experiences from an impartial standpoint. This outsider role necessitates a level of detachment, allowing for critical analysis and assessment of the educational practices related to ET.

The balance between these perspectives is indeed challenging, but it is also a strength. Recognising this tension and addressing it within the research can enhance the validity and credibility of my

findings. It allows me to reflect on my position and its influence on this study, a critical aspect of qualitative research (Cohen & Crabtree, 2006; Mercer, 2007; Cleland, 2017).

1.6 Rationale

Over the many years of being in my position supporting the use of ET and conducting PD activities, I have interacted extensively with lecturers who employ ET in their teaching, some striving for improvement, with or without some form of PD. After facilitating numerous PD activities focused on integrating technology into teaching, I have noted that attendance often does not enable the lecturers to modify their teaching practices through ETs. Reasons could include the design of the PD activities, available support, and the individual circumstances of the lecturers. This prompted me to reflect on the design and implementation of PD activities centred around ET and how they can effectively influence teaching practices.

The evolution from conventional to transformative educational approaches, particularly with the incorporation of ET, presents a multifaceted and complex process. Lecturers who demonstrate proficiency in integrating ET into their pedagogy display characteristics distinguishable from those of their colleagues. Hence, this research seeks to engage with these innovative lecturers, termed *BrightSparks*, to develop a PD framework from the bottom up, avoiding top-down conceptualisation and design. Therefore, my research delves into understanding the context of *BrightSparks* lecturers, their specific practices, strategies, challenges, and the contextual factors that enable their ability to integrate ET.

1.7 Aim

This research aims to explore the practices and experiences of health sciences lecturers proficient in integrating technologies within their cultural and historical contexts, drawing on the theoretical perspective of CHAT. By investigating the driving factors behind their technology usage, particularly their ability to swiftly adapt to the evolving demands in HE, and by focusing on *BrightSparks*, this study seeks to inform the advancement of a PD KF4TT in health sciences that emerges directly from the data. This framework aims to facilitate a transformative shift in lecturers' pedagogical practices within health sciences, enabling the effective incorporation of ET.

1.8 Research Question

Drawing on the theoretical perspective of CHAT, how does *BrightSparks*' application of technological pedagogical content knowledge inform the advancement of a PD framework for technology transformation using ET?

My sub-questions are:

1. How do lecturers develop TPACK competencies to integrate technologies to facilitate learning?
2. How is the integrative use of ET by *BrightSparks* developed and influenced by CHAT?
3. If so, how have the blended structured and self-directed learning PD activities influenced *BrightSparks*' ability to integrate ET into their teaching?
4. What can be learned from *BrightSparks* to inform the design and implementation of a PD framework for technology transformation that allows for the integration of ET by health sciences lecturers?

1.9 Summary of Chapter

There has been a clear shift in teaching strategies from face-to-face (f2f) teaching to a blended model - combining f2f and online teaching. Technology is used more frequently and more widely. Particular events have catalysed new ways of teaching, such as the #FeesMustFall movement at the institution and the COVID-19 pandemic. Furthermore, lecturers are impacted differently depending on how much technology they used before the disruptive events described above (Czerniewicz et al., 2020). Many lecturers consider ET an acutely complicated teaching tool (Tarling & Ng'ambi, 2016). The complexity of effectively integrating ET and the role of innovation as a driver of that integration in teaching calls for a more comprehensive approach that intertwines pedagogical, content, and technological knowledge, as Koehler & Mishra (2009) suggested. This research is therefore framed within the interpretivist paradigm, drawing on CHAT and TPACK to deepen the understanding of how particular lecturers excel in using ET and the impact PD has had on their teaching styles.

1.10 Thesis Structure

Chapter 1 introduces the thesis, setting out the background, rationale, aims, and research questions. It establishes the context for the study, highlighting the empirical gap identified in how lecturers

integrate ET in their teaching, sometimes independently of PD programmes. Chapter 2 reviews the literature and theoretical frameworks that inform the study. It provides an in-depth discussion on the issues of PD and ET, examining them through CHAT and TPACK to understand how they intersect to potentially transform pedagogies. Chapter 3 describes the theoretical framework of the research, explaining why CHAT and TPACK were selected to examine lecturers' use of ET and the factors influencing this usage, as well as their perceptions of PD.

Chapter 4 details the sequential mixed-methods research approach and data collection process, focusing on the practices and pedagogies of *BrightSparks*, lecturers adept at using ET. This chapter outlines the CHAT-informed methods for gathering data, administering surveys, and conducting interviews. This approach provides a comprehensive understanding of the mediated actions and interactions within the educational setting.

Chapters 5 and 6 are dedicated to data analysis, presenting initial findings from the study of how health sciences lecturers use ET and the role of PD in their practice. Chapter 5 explores the quantitative data from surveys, and the following chapter explores the qualitative data from interviews. I employed a deductive thematic analysis strategy by identifying themes informed by CHAT and TPACK. This approach allowed for a thematic analysis aligned with the research objectives, highlighting potential contradictions and allowing space for inductive insights to surface organically from the data. These emergent themes were not always easily categorised within the predefined theoretical constructs, but nonetheless provided meaningful contributions to understanding the complexity of PD and ET integration. This reflexive stance acknowledges the inherently dynamic, non-linear, and iterative nature of qualitative analysis (Al-Omary et al., 2024; Mlambo et al., 2021; Poitras et al., 2025), where the interplay between researcher interpretation and participant narratives may yield insights that exceed the boundaries of the initial framework. Recognising this complexity enhances the trustworthiness of the analysis but also aligns with the interpretivist orientation underpinning the study. In the context of using CHAT and TPACK as analytical frameworks, contradictions might arise when different elements interact unexpectedly, revealing more profound insights into the dynamics of educational technology (ET) integration. Examples include situations where educational practices or beliefs clash with systemic constraints or expectations and instances where lecturers' technological, pedagogical, and content knowledge do not align seamlessly in practice.

Chapter 7 discusses the results from the data analysis, summarising the significant outcomes and insights gleaned from the study, which leads to Chapter 8, which sets forth a framework for transforming PD. The concluding chapter of the thesis discusses the research's contributions. It outlines the empirically derived PD knowledge framework that allows lecturers to enhance their teaching practices and effectively integrate ET significantly.

CHAPTER 2 – Literature Review

2.1 Overview

This chapter reviews the literature on PD and ETs, focusing on their integration into HE and teaching practices, particularly in the health sciences. It explores the purpose of PD, its driving factors, and challenges such as limited resources, time constraints, and resistance to change. The characteristics of *BrightSparks* are highlighted by a group of innovative and technologically adept lecturers who demonstrate advanced competence with ETs, exhibit a strong capacity for innovation, and navigate challenges effectively. Their practices provide key insights for designing a responsive PD knowledge framework. The chapter emphasises the importance of developing lecturers' TPACK as a foundation for effectively integrating ETs to enhance teaching and learning outcomes. The chapter also examines the role of agency in supporting lecturers' professional growth and its interplay with PD. Agency, defined as the capacity to make intentional decisions that shape one's professional identity and practices, strengthens lecturers' ability to integrate ETs effectively. By understanding the contextual factors influencing *BrightSparks'* adaptability, particularly during disruptions like COVID-19, this chapter identifies strategies for sustainable and impactful PD practices. The discussion critiques reductionist views of PD as merely corrective, instead advocating for approaches that scaffold agency, foster reflection, and encourage responsive professional learning. By synthesising key insights and identifying gaps in the literature, this chapter sets the stage for exploring how *BrightSparks'* innovative practices can inform the development of a KF4TT.

2.2 Context

This research specifically targets the development of PD knowledge designed to support lecturers in enhancing their teaching practices through ET (Section 1.2.4). Specifically, a PD KF4TT aims to facilitate a transformative shift in pedagogical practices within the health sciences. This envisaged knowledge framework is not designed to outline specific PD activities but to provide a structured model that enhances existing competencies and inspires the integration of technologically integrated pedagogies within health sciences. As a knowledge framework, it explicitly emphasises and organises the domain of knowledge, the skills, behaviours, and competencies that lecturers require. The goal, therefore, is to explore how *BrightSparks*, a group of innovative and technologically adept lecturers, have engaged with ET to benefit their students, thereby offering valuable insights for PD. *BrightSparks* represents a unique cohort within the academic community,

distinguished by their novel approaches to integrating technology into their teaching practices. These lecturers often go beyond the formal PD opportunities provided by institutions, engaging in self-directed learning, peer collaborations, and experiential learning to enhance their pedagogical skills (Geertsema, 2021).

The literature on lecturers who exhibit TPACK characteristics with negligible impact from PD is sparse, with few studies explicitly focusing on this group. Existing research highlights their proactive nature and significant contributions to the educational landscape. *BrightSparks'* experimentation with new technologies enables them to create engaging and effective learning environments. Their ability to seamlessly blend formal and informal PD activities allows them to stay ahead of technological trends and adapt their teaching methods accordingly (Brown & Duguid, 1991; Geertsema, 2021; Vallera & Sadat, 2021).

The neglect of this group in the literature may stem from the traditional focus on structured PD programmes versus the challenges associated with self-directed learning, for example, lack of time, isolation, as well as lecturers feeling overwhelmed by the lack of structure and clear direction, which has given rise to the assumption that informal, self-directed learning is less impactful (Minott, 2012; Abou Said & Abdallah, 2024). In addition, it is difficult to justify the achievements of informal development and the lower status compared to formal learning (Minott, 2012; Johnson & Majewska, 2022). However, *BrightSparks* challenge this notion by demonstrating that informal learning and peer mentorship can be powerful drivers of professional growth and teaching innovation (Nowell, 2022). By studying *BrightSparks*, my research aims to fill this gap in the literature, highlighting the importance of supporting and nurturing these lecturers to foster a culture of continuous improvement and technological integration in HE. In this thesis, I argue that understanding the different facets of *BrightSparks* and their engagement with ET can provide valuable insights for designing an effective PD programme. I suggest that by recognising and leveraging the strengths of these innovative lecturers, institutions can develop more flexible and responsive PD strategies that cater to the diverse needs of their staff members.

Consequently, the choice of technologies that lecturers incorporate into their teaching and the methods used for integration into their pedagogical practices are critical. This aspect raises pertinent questions about the role of PD in this process. It has been suggested some time ago that

understanding how lecturers make these technology integration decisions is crucial for gaining insights into PD's influence in fostering effective technology adoption as well as offering valuable lessons for the educational community (Brown & Duguid, 1991; Koehler et al., 2013). Such insights from existing research could inform and inspire lecturers to make similarly effective choices in their teaching contexts.

This literature review adopts a narrative approach, synthesising and interpreting findings to provide a comprehensive overview of current knowledge while identifying emerging themes and gaps. Following PRISMA 2020 guidelines (Page et al., 2021), a systematic approach was used to document the identification, screening, and selection of relevant literature, ensuring transparency and reproducibility. The significant themes from the literature search concentrate on PD and ET, particularly their integration with pedagogy and content knowledge. This review seeks to understand how these elements contribute to effective technology-enhanced teaching practices within health sciences. The focus on lecturers who excel in integrating ET within their cultural and historical contexts aligns with the study's aim to explore the practices and experiences of health sciences lecturers by examining the driving factors behind their technology usage and their ability to adapt to evolving demands in HE to facilitate a transformative shift in lecturers' pedagogical practices, enabling the effective incorporation of ET.

The literature search used search terms such as 'professional development,' 'staff development,' 'educational technology,' 'emerging technologies,' 'agency,' 'professional change,' and 'transformation,' combined with Boolean operators (AND and OR). These keywords were initially selected based on their frequent occurrence in previous articles covering similar topics and their relevance to the research aim. As the review and write-up progressed, the search focus was refined to align with the themes that emerged from the literature, including professional development (general discussions, purpose, trends, skills development, regulatory and context-driven influences, frameworks, forms, challenges, and effectiveness), educational technologies (general use, improving pedagogy, and the role of *BrightSparks* lecturers), and agency (theory, professional development, education, and challenges).

By identifying and incorporating these themes into the search strategy, I ensured the literature review captured a comprehensive and relevant set of studies on integrating ETs and PD in HE (Figure

2.1). Searches were performed independently and with assistance from a UCT librarian, utilising electronic databases and platforms such as PubMed, Scopus, CINAHL, and Google Scholar. Initially, 480 articles underwent full-text review, after a refined set of 394 studies was identified as relevant. Further refinement through the write-up process, including removing duplicates, focusing explicitly on PD, ETs, and agency, and excluding tangential topics, resulted in 220 unique studies included in the final literature review.

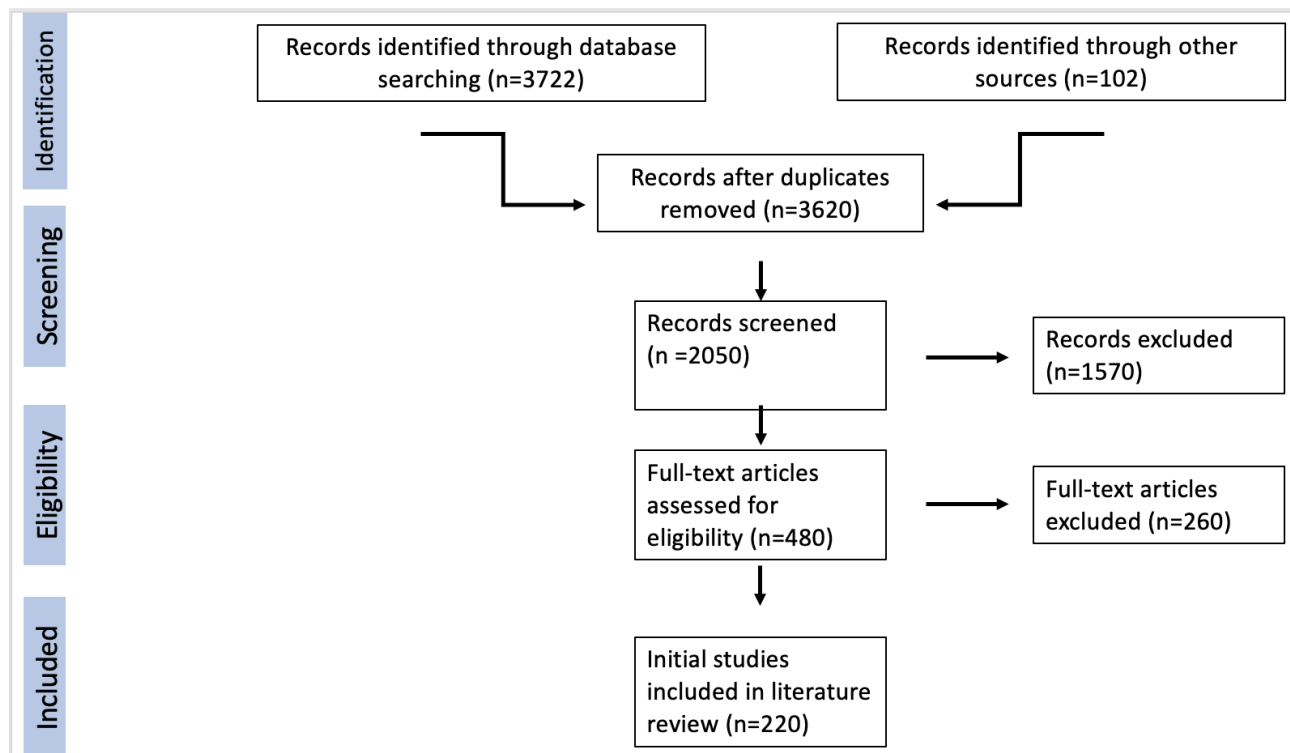


Figure 2.1: Literature Search Strategy

Table 2.1 below shows the themes and sub-themes from these 220 studies, noting that numbers reflect occurrences of themes/sub-themes, and studies frequently addressed multiple themes. The final literature review in this chapter is based on 220 unique studies. See Appendix E for the sources per theme.

Table 2.1: Sub-themes identified under the major themes of PD and ET.

Theme	Sub-Theme
Professional Development / Staff Development	General - 20
	Rationale - 32
	Trends - 34
	Skills Development - 5
	Regulatory and Context Driven - 8

	Purpose - 8
	Frameworks and Models - 20
	Forms - 9
	Effectiveness - 39
	Effective Change - 3
	Planning and Implementing - 11
	Designing - 10
	Challenges - 19
	General - 20
Educational Technology / Emerging Technology	Improving Pedagogy - 21
	<i>BrightSparks</i> - 24
	General - 14
Agency	Education - 4
	Theory - 4
	Professional Development - 5
	Education - 3
	Challenges - 1

The focus is on the relationship between PD and the lecturer, particularly the integration of ETs and their role in transforming teaching and learning. Figure 2.2 depicts the intersection of the significant themes from the literature review that were presented in Figure 2.1. This research addresses a gap in the literature: the underexplored potential contributions of technologically adept lecturers, referred to as *BrightSparks* in this study, to PD strategies. By exploring the development of their TPACK competencies and understanding their use of ET through the lens of CHAT, I aim to illuminate how innovative and technologically adept lecturers can shape PD strategies within health sciences. This research additionally considers lecturers' and PD activity systems' historical and cultural contexts, particularly integrating ETs with pedagogy and content to transform teaching and learning.

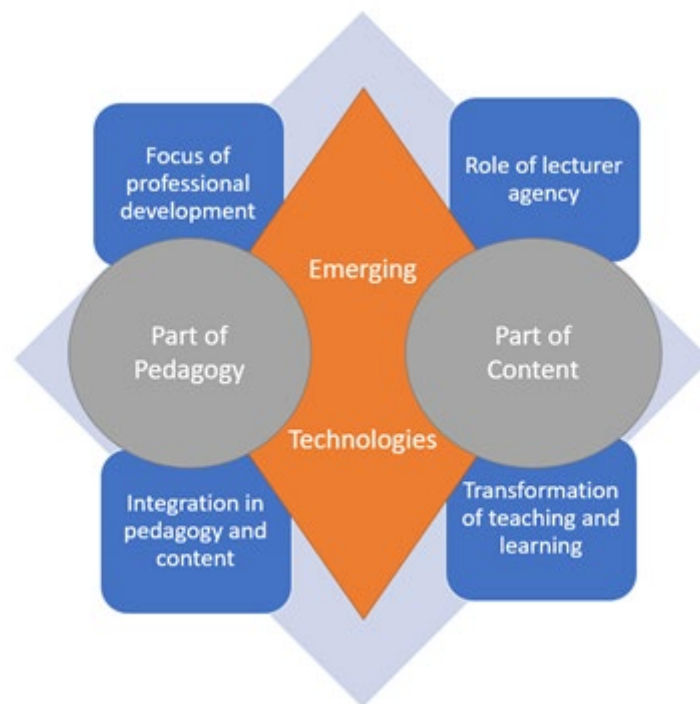


Figure 2.2: Intersection of Significant Themes that Emerged from the Literature Review

Section 2.3 explores the various aspects of PD, including its forms (formal and informal), purposes, driving factors, challenges, and trends. It also addresses strategies for incorporating ETs and effective planning and implementation of PD activities to enhance teaching and learning outcomes. It further reviews existing research on the outcomes and impacts of PD programmes, highlighting best practices and areas for improvement. Section 2.4 discusses the benefits of integrating technology into pedagogical practices, including increased student engagement, personalised learning, and improved instructional methods. Section 2.5 highlights case studies or examples of lecturers who have successfully integrated ETs into their teaching practices, displaying innovative approaches and successful outcomes. Finally, the key points discussed in the chapter are summarised.

2.3 Professional Development

PD has long been an established practice in HE, traditionally featuring structured or institution-led initiatives aimed at enhancing lecturers' pedagogical skills, curriculum design capabilities, and communication techniques (Jacob et al., 2015; Behari-Leak et al., 2018; Day, 1999; Guskey, 2000; Guskey, 2003; Kelchtermans, 2004; Steinert, 2005). At the same time, formal PD programmes can elevate teaching quality and improve student learning outcomes (Prebble et al., 2004); there is

growing recognition, building on the continuum concept introduced in Chapter 1, of self-led, self-driven PD. This research focuses on how lecturers independently pursue professional growth through self-initiated activities, thereby shedding light on how they adapt to and integrate ET beyond traditionally offered structured opportunities.

During the 1980s, PD focused on assessing and integrating technology into teaching and enhancing non-teaching skills like communication and collaboration. These programmes aimed to improve lecturers' ability to use technology in the classroom effectively. However, while efforts were made to enhance teaching effectiveness, the primary focus remained on training lecturers to deliver content rather than emphasising research development. Despite this, PD began to evolve beyond merely training lecturers to include developing research ability at all levels, from individual lecturers to departments and the institution (Dill, 1980).

In the 1990s, PD expanded to encompass other aspects of the lecturer's roles – ethics, clinical skills, and leadership development. Different PD models emerged, influenced by the learning theories of the time, such as cognitive and constructivist approaches. Lecturers explored various teaching methods and strategies, leading to a more holistic approach focused on teaching skills and non-teaching aspects like ethics and leadership. This period marked significant growth in PD, where the influence of learning theories shaped the models and strategies used (Wilkerson & Irby, 1998; Guskey, 2002).

In the early 2000s, PD activities continued to be characterised by diverse learning methods and theories. Lecturers experimented with active learning, flipped classrooms, and other novel approaches. The importance of collaborative development activities also surfaced, with lecturers and departments engaging in interdisciplinary collaborations, sharing best practices, and co-designing courses. This period highlighted the value of cooperative efforts and innovative teaching strategies, which, in turn, enhanced PD (O'Sullivan & Irby, 2011; Vallera & Sadat, 2021).

During the 2010s, PD in education underwent transformative changes due to technological advancements and shifts in educational philosophy. The decade was marked by the widespread adoption of online and blended learning models, which required lecturers to effectively adapt their teaching strategies to integrate technology into their curricula. Simultaneously, there was a strong

emphasis on student-centred teaching approaches, promoting active learning and inclusive practices that catered to the diverse needs of students. Trinidad (2020) describes student-centeredness as an educational approach that emphasises fostering student responsibility for learning while also critically examining the roles of the lecturer to create a learning environment where students are actively involved in both the process and content of their education. This period also saw an increased focus on utilising data and learning analytics to personalise instruction and enhance student outcomes. Additionally, the expansion of Massive Open Online Courses and global online conferences facilitated unprecedented levels of global collaboration, allowing lecturers to share resources and best practices across international boundaries, further enriching the PD landscape (Cox, 2004; Richlin & Cox, 2004; Philipsen et al., 2019).

In the 2020s, PD in education has increasingly emphasised digital literacy, inclusivity, and preparing lecturers for future challenges in HE. This era underscores the importance of understanding digital tools, data privacy, and effective online communication. PD has also prioritised inclusivity, equity, and diversity as the world becomes more interconnected, encouraging lecturers to embrace teaching practices that cater to changing demographics and global connectivity. Additionally, rapid technological advancements necessitate lecturers to stay ahead of the curve in integrating ET into their pedagogical strategies. Expanding online and blended learning has broadened PD opportunities, emphasising flexible, self-directed, and collaborative learning platforms. Despite these general trends, specific practices and priorities vary based on the institution, discipline, and regional educational context (Hartshorne et al., 2020).

Context-specific factors influencing PD include participants' identities, prior learning and past experiences, the learning context, whether the activity is mandatory, how outcomes are measured, and which theoretical strategies were used in the design and implementation (Gachago et al., 2017). Furthermore, the design varies according to context, resulting in significant variability in PD (Tejada Fernández, 2013; Hilty et al., 2019; Vallera & Sadat, 2021). Another set of literature focuses on developing a theory that forms the basis for designing and implementing professional (/staff /faculty) development programmes. Prebber et al. (2004) note that there is no conformity regarding which theory to use, and theories range from adult education, active learning, and interactive teaching to sociocultural theory, experiential learning theory, and situated or social learning theories.

CHAT has been applied in educational contexts to explore the complex interactions between individual agency, cultural norms, and institutional structures (Cole & Engeström, 1993; Engeström, 1987). CHAT provides a holistic lens for analysing PD by situating individual learning within broader sociocultural and historical contexts. While not widely used in PD design in health sciences, CHAT offers a valuable perspective for understanding how systemic factors influence the development and transformation of lecturers' teaching practices. This study draws on CHAT to investigate how technologically adept, innovative lecturers, *BrightSparks*, navigate and reshape PD practices by engaging with ETs.

2.3.1 Different Professional Development Constructs

In recent years, PD in HE has increasingly embraced hybrid models that integrate various constructs, including *formal* and *informal*, *lecturer-* or *self-led*, *institution-* or *self-initiated* activities, or combinations thereof. This shift has been accelerated by the impact of COVID-19, which prompted more flexible and creative approaches to teaching and learning. By blurring traditional boundaries between structured, externally driven PD and more autonomous, participant-driven forms (Jacob et al., 2015; Behari-Leak et al., 2018; Geertsema, 2021), HE institutions now offer a continuum of opportunities to meet diverse professional learning needs (McMahon et al., 2015).

Formal PD typically includes highly structured programmes such as CPD workshops, in-service training, and certification courses (Avidov-Ungar & Herscu, 2020). These institutional offerings aim to enhance specific curriculum design, pedagogy, and communication skills. In contrast, informal PD is characterised by experiential learning, peer collaboration, and self-directed exploration (Mansvelt et al., 2008). Examples include experimenting with digital tools independently, attending webinars on one's own initiative, or joining informal networks to share knowledge. Increasingly, lecturers proactively blend formal and informal methods with self-led and institution-led components. For instance, *BrightSparks* often illustrate how individual motivation, experiential learning, and peer collaboration can foster innovative uses of ETs (Jones & Dexter, 2018; Barton & Dexter, 2020; Xianhan et al., 2022). Although these lecturers might benefit from institution-driven initiatives, they frequently engage in self-initiated experimentation with ET tools and peer networking to refine their pedagogical strategies. This proactive mixing of different PD constructs underscores the importance

of recognising PD as a synergistic process where structured activities and creative, exploratory learning intersect (Geertsema, 2021; Mansvelt et al., 2008).

In today's rapidly evolving educational landscape, viewing PD through multiple constructs (formal/informal, self-led/lecturer-led, institution-initiated/self-initiated) is crucial for designing comprehensive strategies that address lecturers' varying needs and preferences. By integrating these approaches, institutions can develop flexible and holistic PD frameworks, enabling lecturers to adapt, innovate, and effectively respond to the demands of contemporary education (Barton & Dexter, 2020). This is especially pertinent when promoting ET adoption, where institutional support works with individual exploration to transform teaching and learning practices.

2.3.2 Purpose of Professional Development

Ideally, PD activities should happen at various levels – individual, departmental, institutional, and broader (Skeff et al., 1997). It should promote the development of lecturers, both personally and professionally. The outcomes of activities identified by the term 'PD' often vary, focusing on one or more of the following: developing skills, lifelong learning, or professional competence (Steinert, 2005; Richter et al., 2011; Tejada Fernández, 2013; Hilty et al., 2019; Vallera & Sadat, 2021).

Benor's (2000) vision for PD includes the following reasons:

- Orientation of staff new to teaching, either due to a role change or because they are new to the institution.
- Conducting regular workshops which teach generic skills related to specific aspects of education.
- Instructing lecturers on how to use certain ETs.
- Catering to the identified needs of lecturers for teaching in a specific context, whether related to research, administration, or teaching.
- Providing an ongoing scaffolded programme that assists those who have chosen teaching as a career can lead to certification and activities that additionally cater to those in administration and leadership, primarily concerned with leadership skills and management.

Much has been written about the design and development of such activities, which take many forms (Tejada Fernández, 2013; Hilty et al., 2019; Vallera & Sadat, 2021). Factors framing PD, such as

attributes and elements that contribute to effective teaching, play a pivotal role in shaping the pedagogical effectiveness of lecturers. By engaging in PD activities, lecturers can refine their teaching practices and enhance students' learning experiences, creating conditions that may lead to improved learning outcomes (Prebble et al., 2004). However, the impact of these factors on teaching quality varies depending on how PD is designed, delivered, and contextualised within the educational environment.

2.3.3 Factors Driving Professional Development

According to Gruppen et al. (2006), the drivers of PD activities can be public accountability, the changing nature of teaching and improving lecturer vitality. Another factor is helping lecturers teach, given that lecturers generally receive little training on how to teach (Gruppen et al., 2006; Van Heerden et al., 2020; Gumede et al., 2023), which is compounded by the absence of a teaching or educational qualification requirement when advertising for lecturer vacancies in health sciences (MHET, 2018). The need for PD activities has become more transparent in a changing HE environment, characterised by teaching to a more diverse student body, the rise of integrated curricula, and innovative technologies (Irby & O'Sullivan, 2018; Mclean et al., 2008). Institutions need to support those lecturers who want to become better teachers, be more efficient, and be willing to embark on a developmental process (Higgs & McAllister, 2007; Cameron et al., 2023). Institutions should be proactive and facilitate PD opportunities for the professionalisation of their lecturers (Benor, 2000; Prebble et al., 2004; Higgs & McAllister, 2007; Mclean et al., 2008; Wills & Rudolph, 2010; De Villiers et al., 2018; Irby & O'Sullivan, 2018).

One effective strategy is identifying and nurturing lecturers who can serve as champions and role models for their peers. These champions typically exhibit strong pedagogical skills, innovative teaching practices, and a commitment to continuous improvement. Institutions can cultivate more of these champions by providing targeted PD programmes focusing on leadership development, instructional innovation, and peer mentorship. Additionally, recognising and rewarding exemplary teaching practices can motivate other lecturers to aspire to similar standards. Support for other lecturers to improve their teaching could be facilitated through a professional service model and individual support via PD or a peer mentorship model (Weimer & Lenze, 1997; Körkkö et al., 2022; Zhou et al., 2023). By creating a continuous improvement and collaboration culture, institutions can

foster an environment where lecturers are encouraged to share best practices and support each other's professional growth.

It has been observed that mentoring in PD creates a non-threatening environment, assisting lecturers in developing career paths and guiding junior colleagues (Pololi et al., 2002; Ramani, 2006; Körkkö et al., 2022). Campbell et al. (2019b) further suggest that mentoring can be offered within a professional service model to improve teaching or provide guidance and support to junior colleagues. An important advantage of mentoring in PD is that it provides valuable emotional support during stressful phases of academic careers, which can have long-lasting effects (Rinfret et al., 2023). Understanding self-organised mentorships is crucial, particularly in the context of *BrightSparks*. Self-organised mentorships often emerge organically, driven by the proactive engagement of lecturers seeking peer support and guidance. Mutual respect, shared goals, and collaborative learning characterise these mentorships. *BrightSparks* could mentor each other or colleagues through informal networks, peer collaborations, and experiential learning opportunities (Geertsema, 2021).

Innovative mentorship models, such as peer mentorship, have proven effective in fostering diverse leadership and achieving equity in HE (Bluvas, 2021). Peer mentorship creates a supportive environment where colleagues at similar career stages can share experiences and strategies, thus enhancing their PD (Pololi et al., 2002; Zhou et al., 2023). Institutions can provide platforms and opportunities for lecturers to connect and collaborate to cultivate self-organised mentorships, including informal networking events, collaborative projects, and peer-led workshops (Rinfret et al., 2023; Nowell, 2022). By fostering a culture of mentorship, institutions can support the continuous development of their staff members and promote the exchange of best practices. Other forms that positively impacted motivation and resulted in behavioural change were sharing success stories and ideas, increased levels of collaboration, and developing e-learning champions (Ng'ambi et al., 2012; Bozalek et al., 2013b; Mässing, 2017). Learning champions have participated in ET-focused PD and championed the benefits to peers (Gachago et al., 2021). PD is recognised as a necessary aspect of HE, and universities increasingly consider it an essential pathway towards staff capacity-building (Gruppen et al., 2006; Gulbahar, 2008). The responsibility for PD often falls within a specific unit's mandate (Gumede et al., 2023). For example, in South Africa, the Universities of Cape Town and Free State have centres dedicated to PD.

The potential of ETs to enhance teaching and learning motivates lecturers to participate in PD activities. Some lecturers aim to improve their teaching methods through technology integration (Brown & Duguid, 1991). Others seek to acquire new skills or explore technological innovations out of curiosity (O'Doherty et al., 2018). Therefore, motivation for attending PD activities can vary significantly among lecturers, with some driven by a desire to enhance their teaching practice, while others are motivated by an interest in keeping abreast with ET developments (Guskey, 2003; Steinert, 2005).

2.3.4 Regulatory Driven Professional Development.

In health sciences, lecturers are practising health professionals who must comply with CPD requirements to maintain their registration with the HPCSA. However, they may not be mandated by the institution to attend PD activities in areas other than their specialisation. In my position, I am involved with others in facilitating PD activities, focusing on the practicalities of using certain technologies and integrating these tools into lecturers' teaching. Online learning in the health sciences is an expanding concept, and PD plays a vital role in promoting its use among staff (O'Doherty et al., 2018).

In line with international health professional standards and practices, South Africa has stringent accreditation processes mandated by the HPCSA, which shape the framework of health sciences education (Dowelani & Dowelani, 2020). This regulatory environment affects curriculum development and underscores the active involvement of professional bodies in defining educational standards (Maphosa et al., 2014; Dowelani & Dowelani, 2020). These developments necessitate a dynamic approach to continuing PD, ensuring that lecturers are equipped to meet evolving standards and effectively incorporate the latest educational practices. Furthermore, the curriculum design, teaching, and learning processes must meet the requirements for Higher Educational Institutions (HEI) in South Africa and adhere to the outcomes-based requirements for graduates compiled by the HPCSA and the South African Qualifications Authority (SAQA) (HPCSA, 2021).

The HPCSA specify graduate attributes, which include the ability to deliver quality health services to a diverse population and, therefore, dictates what is taught by stipulating the criteria for curricular design. One of the definitions of curriculum is that which “sets out the course of study (the Latin

“currere” means “to run”) and enables learning and teaching to take place. It should be underpinned by a clear educational philosophy. The curriculum is also a dynamic, complex process continually being constructed and mediated through the interaction between teachers, students, the external world, and knowledge...” (McKimm & Jones, 2018, p.520). Lecturers play a critical role in shaping the knowledge and professional abilities of future health professionals. This influence extends to their pedagogical methods, significantly affecting the health services these professionals provide (Frenk et al., 2010). Research emphasises the need for curricula to be systematically designed to address specific educational outcomes, ensuring that students are adequately equipped for their future roles (Khanna et al., 2021). It is incumbent upon academic leaders and policymakers to foster an environment that encourages lecturers to integrate advanced ETs. Doing so enhances the acquisition of complex knowledge, skills, and attitudes essential for student success (Arruzza & Chau, 2021). This strategic support optimises teaching effectiveness and is crucial in advancing overall student learning outcomes.

Therefore, lecturers in the health sciences bear the critical responsibility of educating and training future health professionals, necessitating high professional standards in their teaching (Arruzza & Chau, 2021). This foundational role underscores the need for ongoing PD, ensuring that lecturers are equipped with innovative educational techniques and continuously advancing their ability to meet these standards. Thus, PD is an essential mechanism to support lecturers in effectively fulfilling their educational mandates. The HPCSA conducts regular quality assurance visits to educational facilities to review what and how teaching and learning occur to ensure compliance with their standards. Every institution that teaches health professionals must be re-accredited every five years. The HPCSA institutional quality assessment reports submitted in 2014 and 2019 for the MBChB Curriculum at my institution were based on their site visit plus a faculty self-assessment questionnaire, underscoring the importance of PD.

They subsequently made the following points in said report:

- The staff attend training in programme and curriculum design, which includes curriculum development, instructional strategies and methods geared towards assessment and student support.
- The faculty offers these development opportunities as voluntary options. There is no related faculty-based teaching and learning policy. The compilation of a formal Teaching and

Learning policy was one of the recommendations to ensure that all lecturers receive relevant training.

- The nature of these opportunities is informal and unstructured, for example, during one-to-one consultations and ad-hoc workshops for those lecturers educating undergraduate students.
- The HPCSA report claimed that online courses would be practical because of their flexibility (HPCSA, 2021).

Most lecturers, clinicians and clinical lecturers who teach in the health sciences are registered with the HPCSA and, therefore, are familiar with the HPCSA's requirement to continually update their professional knowledge and skills for personal development. PD is thus an accepted and valued activity in the health sciences.

2.3.5 Trends in Professional Development

PD is a decades-long, well-established activity that has been implemented to extend competencies, deepen knowledge, and develop skills (Day, 1999; Guskey, 2000; Guskey, 2003; Kelchtermans, 2004; Steinert, 2005; Cilliers & Herman, 2010; Nasser & Karraker, 2018; Vallera & Sadat, 2021; Haas et al., 2023). While numerous motivations drive PD, such as improving competencies and the changing nature of teaching (De Villiers et al., 2018), the focus on what PD encompasses has shifted. It has transitioned from training and skills development to lifelong learning, professional competence, and being student-centred (Steinert, 2005; Richter et al., 2011; Tejada Fernández, 2013; Hilty et al., 2019; Vallera & Sadat, 2021). Several types of PD have arisen in response, including workshops, seminars, peer mentorship, and self-directed learning, all aimed at enhancing teaching efficacy and supporting educational innovation.

In addition, the topics and skills covered within PD activities vary and depend on who offers the activity. Building on the definition in Section 1.2.3, the PD of lecturers refers to activities that lecturers undertake to update their knowledge, skills, and competencies to transform their teaching and learning. This 'push' approach, where structured opportunities are provided (by the faculty or the institution) for PD, is complemented by a 'pull' approach, where lecturers actively seek out and engage in PD activities based on their interests and perceived needs. This dual approach ensures that PD is institutionally guided and personally driven, fostering a comprehensive and responsive

development environment. In the context of CHAT, the goal to transform teaching serves as the object that drives the activity system, with the outcome being the actual improvements in teaching practices and student learning.

Improvements in teaching and student learning are necessitated by the fact that technology has changed all aspects of life over the past decades, including teaching and learning (Buabeng-Andoh, 2012). Online learning is becoming the norm as the HE landscape changes. Students in the 21st century use technology in their learning differently from those 20 years ago due to rapidly changing technologies (Bond et al., 2020b). In response, universities are expected to adapt and respond by transforming and updating curricula, adopting new pedagogical strategies, implementing the latest technological advances, and building capacity (Tomei, 2005; Buabeng-Andoh, 2012; Anorue et al., 2023).

In South Africa, further challenges involve teaching a diverse student body, calling for an integrated, decolonised curriculum, and new ETs (McClean et al., 2008). Traditionally, most South African HE PD activities are informed by studies conducted in the Northern Hemisphere (Van Wyk & Van Zyl, 2023). Our context often differs from theirs; we are less well-resourced, face financial constraints, have diverse learning-enabled students, and have increased student numbers (Singh, 2015; DHET, 2017; Pramjeeth et al., 2023). Their assumptions are based on circumstances and operational needs, frequently quite different from those in the South. This lack of inclusivity of Southern Hemisphere perspectives and practices is problematic (Niemczyk, 2018; De Villiers et al., 2018). However, there are also similarities, such as lecturers often lacking formal education qualifications and obstacles like lack of motivation, time constraints, and budget constraints, which align with the findings from Northern Hemisphere studies (Inamorato dos Santos et al., 2019).

2.3.6 Professional Development for Developing Technological and Pedagogical Skills

The method and practice of teaching about ETs are multifaceted, requiring a strong link between technological competence and the complexity of integrating these technologies into teaching (Suarez-Rodriguez et al., 2018; Gachago et al., 2021). This complexity is captured by the TPACK framework, which emphasises that effective technology integration in education necessitates understanding the interplay between technology, pedagogy, and content (Koehler et al., 2013; Rosenberg & Koehler, 2015). Technological competencies influence pedagogical competencies,

which require understanding the technology and knowing how to use it effectively before integrating it into teaching (Almerich et al., 2016). Thus, technical competencies are foundational for integrating technology into pedagogy (Suarez-Rodriquez et al., 2018).

The competencies of how to use technologies precede the competencies of integrating those technologies into pedagogy. Effective PD allows lecturers to develop technological and pedagogical competencies, effectively integrating technologies into their teaching and learning methods (Suarez-Rodriquez et al., 2018). This approach aligns with the TPACK framework, which guides lecturers in combining these competencies to enhance their teaching practices and improve student learning outcomes.

2.3.7 Challenges Facing Professional Development

There are many challenges related to PD in South Africa and internationally. Factors which could impede lecturers from attending PD activities include the absence of institutional support, inadequate time, and a lack of motivation (Skeff et al., 1997; Steinert, 2005; Mafunda et al., 2007; Adeoye et al., 2013; Dintoe, 2019). Often, teaching is seen as secondary to the importance of doing research, and good teaching is not rewarded (Irby & O'Sullivan, 2018). Insufficient institutional endorsement is evident when limited resources are allocated to deliver PD or lecturers are not given time off to attend these activities (Skeff et al., 1997). This lack of support can manifest as inadequate funding, minimal administrative backing, and insufficient recognition of the importance of PD for teaching improvement.

Participation in PD will require incentivisation, according to Mclean et al. (2008) and can be facilitated by an institutional culture which encourages reflection and self-evaluation (Irby & O'Sullivan, 2018; Mclean et al., 2008). Herman (2013) suggests that incentives do not always pertain to motivating lecturers to attend PD. Motivation can be positively influenced if lecturers realise the benefits of PD's impact on the teaching of their courses (White & Myers, 2001). Additionally, lecturers' usage of ET could be improved if more time is available for training on using the technology or incorporating it systematically into teaching and learning (Dintoe, 2019).

Barriers to PD have been identified as ranging from a lack of supportive leaders and resistance to change to unmotivated lecturers and their unwillingness to identify areas of need or possible new

opportunities for potential improvements in teaching (Steinert, 2005). The former can be associated with a lack of support from leadership, excellent teaching not being rewarded, a lack of resource allocation for development, or not encouraging participation at such events. If lecturers do not perceive the benefits of training or the link between training and enhancing their teaching, they might not attend training programmes (Skeff et al., 1997).

While all the above may be accurate, some measure of curiosity and motivation to improve oneself continually and educationally may also be needed, which could help with the navigation of contextual constraints. Accordingly, the willingness to adapt and change does not happen outside of having to negate the limitations and draw on present affordances (Zhang, 2022).

Awareness of the geographic location is essential to understanding the obstacles that individuals or institutions may face. African challenges are related to the institutional infrastructure needed to implement ETs and others; for example, low computer literacy, bandwidth access, connectivity, availability of devices and reliance on mobile data indirectly affect PD (Mässing, 2017; Kaliisa & Picard, 2017). However, these factors often drive the adoption of technologies and the flexibility to deliver education to students anywhere and anytime (Mässing, 2017). Furthermore, research shows that the direct benefit of PD on improved student learning is lacking because it is difficult to measure (Knight et al., 2007).

Another challenge to delivering PD is selecting relevant and appropriate topics because the health sciences are practice-based. Topics for development activities, therefore, range from those related to teaching, learning, and assessment to technical, digital literacy-related skills a lecturer requires to integrate ET in their pedagogy. Literacies are a form of social practice leading to mastery of a discourse (Street, 1984; Gee, 2008). Thus, digital literacy is more than just a matter of acquiring technical skills that can be applied in a specific context; instead, it involves learning a set of literacies, not only skills central to their learning and thinking. A further differentiation of digital literacy from computer literacy is how these literacies and abilities are embedded and integrated into the curriculum (Gunn et al., 2011). It should be noted that these two literacies may hold different emphases at various stages in the curriculum. This essential factor noticeably impacts student learning (Lea & Street, 1998). Recent scholarship frames this embeddedness through a post-digital lens, arguing that digital and non-digital practices are now so intertwined that the distinction often

escapes notice (Jandrić et al., 2018; Fawns, 2019). A post-digital sensibility, therefore, views digital literacy not as an add-on but as the routine navigation of interconnected social and technological learning environments.

PD is seen as a vehicle to prepare lecturers for teaching in the digital age, explicitly showcasing and teaching concepts related to ETs and the skills they would need. However, an obstacle to realising this vision is that PD activities are often inflexible, or too much emphasis is placed on face-to-face activities, making it difficult for lecturers to attend (Perlman et al., 2014). In contrast, my institution's infrastructure and institutional support are available to promote the importance of using technology in teaching and learning. Moreover, there is a culture of celebrating innovative teaching through Teaching Awards, thus providing an added benefit that can potentially neutralise negative attitudes as barriers to progress and change (O'Doherty et al., 2018). Additionally, motivation to integrate ET might be enhanced by factors beyond pedagogical improvement, including increased efficiency, better time management, and the perception of lecturers as technologically proficient experts (Gunn et al., 2011; Ertmer et al., 2012).

2.3.8 Designing a Professional Development Activity that Includes Educational Technologies

My research investigates the design of PD programmes at HE institutions, focusing on health sciences. This will be framed within a PD KF4TT, drawing on lessons learnt from *BrightSparks*, which aims to support lecturers in enhancing their teaching practices through ET. Several potential approaches from the literature could include using champions and role models (Vansteenkiste et al., 2020; Sancar et al., 2021; Shea, 2021; Nachtigall et al., 2022).

It is important to remember that any approach needs to cater to diverse lecturers' needs, acknowledge time constraints and consider appropriate content that can appeal to different disciplinary teaching needs, as well as selecting the most appropriate delivery methods to prepare lecturers for effective integration of ET in their teaching (Duran, 2022). Considering these considerations, Tondeur et al. (2017) recommend that technology planning and leadership, staff training, access to resources, cooperation within and between institutions, micro-level strategies and scaffolding authentic technology experiences be addressed in combination.

PD activities must also consider lecturers' prior knowledge and context when planning and implementing to maximise learning. Using lecturers' prior knowledge and context as the starting point draws on Vygotsky's Zone of Proximal Development (Vygotsky, 1978), a valuable lens considering individual experience. The goal is to acknowledge that diversity occurs as much among lecturers as students. Rogers (1962) and Biondi (2024) refer to the 'laggards', the lecturers who missed the wave of adoption. Diversity amongst lecturers further manifests in different knowledge and skill sets, and at each level of expertise. The goal is, therefore, to understand how they could develop ET integration competencies through PD and how that is related to the perceived quality and usefulness of the training activity. Traditionally, PD aims to convince lecturers to change their pedagogy or provide alternative methods or skills. However, PD activities do not necessarily bring about change but provide the tools required for change (Guskey, 2002). Hence, this research aims to understand how lecturers learn and develop ET competencies. While the traditional PD approach has been to 'teach them,' this approach often falls short (Tejada Fernández, 2013; Hilty et al., 2019). In contrast, this study aims to learn from those who teach themselves, the *BrightSparks*, to develop a 'ground up' understanding of an alternative, practical approach to PD.

2.3.9 Planning and Implementing Professional Development

Designing sustainable and effective PD programmes necessitates understanding lecturers' diverse backgrounds and needs. Kern (1998) and McLean et al. (2008) proposed a model emphasising the importance of engaging with the specific purpose of PD and whether PD should respond to identified needs or cater to generic needs lecturers might have as teachers (Al-Eaky & Mclean, 2012; Alwadei, 2023). Additionally, it is essential to assess the support from leadership structures and resources available when developing a PD programme. A needs assessment would be crucial to tailor PD effectively to its target audience, ensuring that the programme addresses specific requirements. Deciding whether PD is mandatory also impacts its effectiveness. Identifying barriers and opportunities is critical to facilitating the process (Becker et al., 2019).

Defining the aims and outcomes of PD and ensuring their alignment with needs assessment is essential. For example, is the aim to improve student learning, lecturer teaching, or both? Planning how to measure these outcomes and related objectives is imperative at this stage. Furthermore, theoretical strategies underpinning training must be considered, as well as who the participants are and their teaching contexts (Becker et al., 2019; Patfield et al., 2023). According to Prebble et al.

(2004), numerous relevant learning theories, for example, the Zone of Proximal Development theory, Experiential Learning theory and various adult, situated and social learning theories, have been used to inform PD programmes. This study will focus specifically on CHAT and TPACK.

Following the planning phase, implementation issues need to be addressed, such as module design, timing, and venue selection, which significantly influence lecturer participation, sustainability, and completion rates (Patfield et al., 2023). Thereafter, evaluation and feedback mechanisms integral to PD planning must be considered (Cioca & Gifford, 2022). The Kirkpatrick (1994) Model provides a comprehensive framework for evaluating PD programmes by examining participation, changes in behaviour, attitude and knowledge as measurable results (Desimone, 2009; Sims & Fletcher-Wood, 2021; Duran, 2021). According to Alsalamah and Callinan (2022), regular annual publications relating to using the Kirkpatrick Model indicate that it continues to remain widely used. The evaluation process is crucial for determining the PD program's success and identifying areas for improvement.

2.4 PD Frameworks and Models

In the evolving landscape of HE, PD frameworks and models have become crucial for structuring and enhancing teaching practices (Tejada Fernández, 2013). They provide structured approaches that align PD initiatives with pedagogical goals, institutional needs, and the dynamic contexts of education (Brown et al., 2010; Tack et al., 2018). In the context of PD in HE, frameworks are broader, more flexible constructs that provide overarching guiding principles for practice (Guskey, 2003). They are designed to be adaptable to diverse institutional contexts and evolving educational challenges, offering a dynamic conceptual foundation for professional growth. In contrast, models tend to be more static or descriptive representations; they delineate specific components, processes, or sequential steps within a PD initiative, often presenting a linear and prescriptive approach to implementation (Guskey, 2003). Traditionally, PD focused on improving lecturers' pedagogical skills, curriculum design capabilities, and communication techniques (Klein & Riordan, 2009; Sancar et al., 2021; Uzorka et al., 2023). However, as the scope of PD expands to include technology integration and holistic skill development, there is an increasing need for well-defined frameworks that guide professional growth effectively (Jacob et al., 2015; Guskey, 2003; Steinert, 2005).

Key themes and trends derived from the literature review reveal a variety of PD frameworks and models employed in HE. They often integrate elements such as reflective practice, teacher agency, and the incorporation of technology into teaching. For example, TPACK emphasises the interplay between technology, pedagogy, and content knowledge, aiming to develop lecturers' abilities to integrate digital tools effectively into their teaching practices (Leslie, 2020; Uzorka et al., 2023). Similarly, models like the UK Professional Standards Framework (UKPSF) focus on setting clear standards for teaching quality, aligning PD with institutional goals, and fostering continuous improvement through reflective practice and collaboration (Brown et al., 2010; Advance HE, 2023). Other frameworks, such as the Networked Learning Framework (NLF) and the cMOOC model, highlight the importance of community-driven, peer-supported learning environments that leverage digital technologies for scalable and flexible PD (Cochrane & Narayan, 2017; Ostashewski & Reid, 2017).

One significant trend from the literature is the emphasis on integrating technology with pedagogy, as seen in the TPACK framework and the design-based approach to PD that focuses on creating, implementing, and evaluating educational artefacts (Curwood, 2013). This reflects a broader shift towards fostering digital literacy and encouraging innovative teaching practices. Another trend is the focus on reflective practice and collaborative learning environments, as outlined in models like the UK PSF and the framework for fostering reflective practice through regular sessions and collaborative workshops (Klein & Riordan, 2009; Sancar et al., 2021). These frameworks emphasise the importance of ongoing reflection and peer collaboration in enhancing teaching effectiveness and adaptability.

The effectiveness and applicability of these frameworks vary based on their focus and design. The UKPSF, for instance, provides a comprehensive structure adaptable to various disciplines and teaching roles, making it a versatile model for HE (Advance HE, 2023). In contrast, the TPACK framework is particularly effective in contexts where integrating ETs is a primary focus, providing a clear pathway for developing digital literacy alongside pedagogical skills (Uzorka et al., 2023). The cMOOC model, emphasising peer-supported learning and scalability, offers a flexible approach well-suited for large-scale PD initiatives. However, significant digital literacy and self-motivation may be required among participants (Cochrane & Narayan, 2017). Future PD frameworks should be inclusive, adaptable, and aligned with institutional goals and lecturers' evolving needs. Further

research is needed to explore the long-term impacts of these frameworks on teaching practices and student outcomes, particularly in the context of rapid technological advancements and changing educational philosophies. There are commonalities among the PD frameworks discussed, and these common themes allow for a better understanding of how various PD frameworks align with or differ from each other.

Several frameworks emphasise the importance of developing specific competencies among lecturers to enhance teaching effectiveness. For example, the Harden teacher's role framework categorises lecturer roles into information provider, facilitator, assessor, and role model. These help structure PD programmes to cover various teaching skills and professional attributes (Kohan et al., 2023). Similarly, the UKPSF outlines areas of activity, core knowledge, and professional values to foster comprehensive professional growth across career stages (Advance HE, 2023).

Reflective practice is common across various PD frameworks, encouraging lecturers to continuously assess and refine their teaching methods. The National Professional Development Framework promotes reflective practice through its Personal Development Portfolio, which supports ongoing professional growth (National Forum for the Enhancement of Teaching and Learning in Higher Education, n.d.). The Professional Learning and Development Framework also highlights reflective practice as a core element, aligning it with collaborative learning to promote a culture of continuous improvement (Advance HE, 2023).

Many frameworks underscore the value of collaborative learning and the development of professional learning communities. The NLF fosters collaborative, community-driven professional learning through social networking tools and peer interactions (Ostashewski & Reid, 2017). Similarly, the CMALT cMOOC framework leverages online communities and peer feedback to build digital literacy and pedagogical skills among lecturers, demonstrating the importance of social and collaborative learning environments in PD (Gupta, 1992).

Adaptability to various educational contexts and flexibility in learning modalities are highlighted across several PD frameworks. The Framework for Online Professional Development emphasises flexible participation and the ability to accommodate diverse learning needs and contexts, particularly in online environments (Bragg et al., 2021). The Professional Development Framework

for Lecturers in Educational Technologies also stresses the importance of adaptable PD strategies that align with the dynamic nature of ETs and changing pedagogical approaches (Yadav et al., 2014).

A significant focus on integrating technology and developing digital competencies is evident in many PD frameworks, reflecting the growing importance of ETs in teaching. The TPACK framework is foundational for many models, emphasising the integration of technological, pedagogical, and content knowledge to enhance teaching practices (Curwood, 2013). The PD framework for computer science teachers also specifically targets the development of TPACK, showcasing the need to blend content expertise with technology integration skills (Yadav et al., 2014).

Several frameworks provide structured pathways for lecturers to progress in their careers, highlighting the importance of formal recognition and career development in PD. The UKPSF delineates four descriptors representing different career stages, from new practitioners to senior academic leaders, and offers a clear pathway for career advancement and recognition of teaching excellence (Advance HE, 2023). The Framework for Faculty Development in Health Sciences similarly uses a staged approach to guide lecturers through various levels of competency and expertise (Kohan et al., 2023).

These themes offer insights into the evolution of PD frameworks in HE. It is important for me to extract insights that will guide my proposed framework's design, ensuring it is grounded in evidence-based practices while being flexible and responsive to my specific research context.

2.5 Research on Effectiveness of Professional Development

What is effectiveness, what does it refer to, and how would one measure it? In PD, effectiveness could be related to lecturer participation and satisfaction with the activity or the resulting impact on learning. Alternatively, it can consider the effect on learning from lecturers who have attended these programmes to evaluate whether practice changed and student learning improved (Kirkpatrick, 1994; Prebble et al., 2004; Knight et al., 2007). Studies in measuring the effectiveness of PD programmes often use Kirkpatrick's model to evaluate various outcomes, including changes in lecturers' knowledge, skills, and behaviours, as well as the impact on student learning (Kirkpatrick, 1994; Prebble et al., 2004; Knight et al., 2007; De Villiers et al., 2018).

Behavioural changes are challenging to measure, even when using Kirkpatrick's model. Mclean et al. (2008) defined effectiveness as the ability of the PD activities to accomplish their primary aim. Therefore, this implies that effectiveness is context-specific and varies depending on the activity or the programme. It also means that PD activities should be tailored to meet the specific needs of lecturers. From the outset, it is essential to decide how effectiveness will be measured and what resources will be allocated, acknowledging that some aspects, such as students' attitudes, would be extremely challenging to measure.

Sustainability is also important, as is the need to incorporate PD into an ongoing programme contextualised to the identified needs within the department or faculty. They should have facilitators who are familiar with and empathetic towards lecturers' needs and available to give ongoing support (Davis et al., 2005). Ideally, these facilitators should have credibility, be relied on for support and be able to listen and engage with the lecturers (Steinert, 2005).

Effectiveness can be fostered by working with and through others. Collaborating with other units and centres involved in PD could reduce the resources needed to conduct PD programmes (Rienties et al., 2023). A considerable volume of material is readily available under Creative Commons licences, so it makes sense to use what is already developed (Rienties et al., 2023). Cooperation and collaboration to share sound principles, practices, and expertise should be standard practice (Kent & Gibbs, 2004). In the discourse on the effectiveness of PD, particularly regarding integrating ET into teaching practice, it is critical to acknowledge the presence of multiple evaluative models beyond the well-established Kirkpatrick model. Kirkpatrick's model looks at the effectiveness of activity at four distinct levels: participation satisfaction, what they learn in terms of knowledge, skills, and attitudes, behavioural changes and measurable results, for example, changes in the organisational practice or improved student learning (Campbell et al., 2019a). However, it is difficult to measure outcomes (Carnell et al., 2022).

Drawing on the theoretical perspective of CHAT, we can better understand how the interaction within the activity systems of PD programmes, such as those developed by *BrightSparks*, influences the application of TPACK. CHAT provides a framework for examining the complex interplay between individuals, tools (in this case, ET), and the community within PD settings. This approach emphasises the importance of context and collaborative learning, highlighting how PD programmes must be

adaptable to the evolving needs of lecturers and institutions. By incorporating CHAT principles, PD programmes can more effectively support lecturers in integrating technology into their teaching practices, ensuring that PD imparts knowledge and fosters meaningful changes in practice (Erich et al., 2020).

Moreover, the application of TPACK in PD frameworks underscores the importance of integrating technology in pedagogically sound and content-specific ways. *BrightSparks'* application of TPACK demonstrates how PD programmes can be designed to address lecturers' unique technological, pedagogical, and content knowledge needs. This targeted approach helps create more relevant and practical PD experiences that align with the specific teaching contexts of lecturers (Rienties et al., 2023).

By aligning PD with CHAT and TPACK, we can create a more holistic and dynamic approach to PD. This alignment ensures that the PD programme is theoretically sound and relevant, leading to sustainable changes in teaching practices and improved student outcomes. Integrating these theoretical frameworks into PD evaluation models, such as Kirkpatrick's, can provide a more comprehensive understanding of the impact of PD, considering not just immediate outcomes but also long-term changes in practice and learning (Carnell et al., 2022).

In a South African context, Mclean et al. (2008) support the idea of effectiveness, which relates to outcomes, did the activity accomplish its primary aim? This could be taken one step further: considering effectiveness as to whether participants' goals were met. Lecturers who attend also do so with a goal that might not align directly with the goal of the activity. The lecturer's reason for attending, their purpose for using ETs in their pedagogy, must be measured against how that technology transforms their teaching aims (Ng'ambi et al., 2012; Ng'ambi, 2013). The implication is that effectiveness is context, activity, and participant-specific. PD activities should, therefore, be tailored to meet the specific needs of lecturers and measure whether those needs were met. These alternative frameworks offer nuanced perspectives on PD outcomes and are particularly pertinent to contemporary educational contexts where technology plays a pivotal role.

Various early models (Table 2.2) of PD were developed to enhance lecturers' teaching practices, including: Guskey's Model of Teacher Change (Guskey, 2002); Desimone's Core Features of PD

(Desimone, 2009); the CIPP Model (Context, Input, Process, Product) (Stufflebeam, 2003); the Logic Model (W.K. Kellogg Foundation, 2004), Reflective Practice Model (Schön, 1983), the original Communities of Practice (CoP) Model (Wenger, 1998) and the Professional Learning Communities Model (DuFour et al., 2010).

Table 2.2: Recent Model of Professional Development

Model	Description	Key Characteristics	Context in Study
Action Research and Lesson Study	Teachers systematically investigate their practices to improve instruction and student learning. These collaborative and iterative methods promote continuous professional growth (Patton & Parker, 2017; Coenders & Verhoef, 2019).	Collaborative, iterative methods, continuous professional growth	Enhances reflective teaching and collaborative improvement
Updated Community of Practice (CoP)	Groups of lecturers who share a common interest or goal collaborate, learn from each other, and develop expertise. In PD, CoPs can foster sustained learning and support (Wenger-Trayner & Wenger-Trayner, 2015).	Sustained learning, support, and expertise development	Encourages community-building and shared expertise
Design-Based Implementation Research (DBIR)	Focuses on designing, implementing, and refining educational innovations in real-world contexts. It emphasises collaboration between researchers, practitioners, and stakeholders to address complex problems. In the context of PD, DBIR encourages iterative cycles of development, testing, and refinement (Penuel & Gallagher, 2017).	Collaboration between researchers and practitioners, iterative cycles of development	Addresses complex educational problems through practical innovation
Job-embedded PD	Integrates PD directly into teachers' daily work. It emphasises learning while doing, coaching, and collaborative problem-solving (Darling-Hammond et al., 2017).	Direct application, ongoing support, and practical relevance	Promotes hands-on learning and immediate application
Learning Analytics for PD	Leverages data and analytics to help lecturers make informed decisions about their professional growth. By analysing learning behaviours and outcomes, PD	Data-driven decision-making, personalised, adaptive PD	Enables tailored PD based on data insights

	programmes can be personalised and adaptive (Siemens & Long, 2011).		
Adaptive Learning Model	Focuses on the adaptability of PD programmes to meet the changing needs of teachers and students through continuous cycles of inquiry, reflection, and adjustment (Timperley, 2011).	Continuous improvement, responsiveness	Ensures PD remains relevant and practical over time
Blended Learning Model for PD	Combines face-to-face and online learning to provide flexible, scalable, and personalised PD (Horn & Staker, 2015).	Flexibility, scalability, and personalisation	Balances convenience and interaction in professional learning
Communities of Practice (CoP) Model	Focuses on groups of lecturers who share a concern or passion and learn through regular interaction and collaboration (Wenger, 1998).	Shared goals, regular interaction, and collective learning	Fosters a supportive learning community among lecturers
Comprehensive Assessment of Leadership for Learning	A model that evaluates PD's impact on leadership practices across an educational institution. This distributed leadership approach can effectively gauge the systemic influence of PD on technology integration beyond individual classrooms (Hallinger, 2011).	Distributed leadership, systemic influence	Measures the broader impact of PD on institutional practices
Learning Forward Standards for Professional Learning	Provides a comprehensive framework for PD, emphasising seven critical areas for effective learning (Learning Forward, 2011).	Standards-based, comprehensive, effective learning	Guides the development of high-quality PD programmes
Micro-Credentialing Model	Involves issuing digital badges or micro-credentials to teachers upon completion of specific PD activities or mastery of skills (Berry & Airhart, 2016).	Recognition, specific skill mastery, and digital badges	Motivates teachers through targeted recognition and achievements
SAMR Model	Categorises the use of technology into four levels: Substitution, Augmentation, Modification, and Redefinition (SAMR), and	Technology integration, transformation,	Encourages the transformative use

	encourages a move from enhancing to transforming tasks (Puentedura, 2012).	and task enhancement	of technology in teaching
Transformative Learning Theory in PD	Focuses on changing teachers' perspectives and practices through critical reflection and discourse (Mezirow, 2009).	Critical reflection, perspective change, discourse	Promotes profound, transformative changes in teaching practices

These models include PD-specific frameworks and broader educational and social science research models, adapted effectively to analyse PD practices in HE contexts. They are not mutually exclusive, and lecturers often combine elements from multiple approaches. As the field of PD evolves, researchers and practitioners continue to explore innovative ways to enhance teaching and learning. In addition, modern adaptations of the Kirkpatrick model offer more nuanced approaches to evaluating PD. One such model is the Kirkpatrick Partners' New World Kirkpatrick Model, which updates the original framework (Kirkpatrick, 2015; Liao & Hsu, 2019). This model retains the original four levels but adds significant detail on effectively applying and measuring each level, emphasising the importance of the relevance and transfer of training to the job and the results it produces.

Another successor to Kirkpatrick's model is Kaufman's Five Levels of Evaluation (Roberts & Bregazzi, 2023). Roger Kaufman expanded upon Kirkpatrick's four levels by adding a fifth level that assesses how the training impacts society. Kaufman's model is especially relevant in the context of ET, as it evaluates how PD translates into long-term value not just for the individual and the organisation but also for the broader community or society (Kaufman et al., 2003).

When considering PD's role in fostering ET integration, selecting an evaluation model that reflects the multifaceted nature of such initiatives is paramount. The chosen model should accommodate the complexity of teaching practices, technological tools, and institutional contexts, ensuring a holistic and robust assessment of PD effectiveness. Findings from Ahmad Zaky El Islami et al. (2022) suggest that future PD programmes should emphasise collaborative learning environments and leverage digital tools for broader access. Additionally, PD should be context-specific, addressing the unique needs of teachers and their teaching environments. By focusing on these areas, PD programmes can more effectively support teacher development and improve student outcomes (Ahmad Zaky El Islami et al., 2022).

2.6 Educational Technologies

The increasing use of technology in education today is an irrefutable trend (Chen et al., 2020). Technology is helping to generate and disseminate knowledge in numerous ways. In addition, using ETs can "promote qualitative learning outcomes such as collaborative knowledge sharing, authentic learning, student-centeredness and student empowerment" (Gachago et al., 2013, p.101). Various forms of technology help to generate and disseminate knowledge, improve our ability to share knowledge more effortlessly than ever (Afshari et al., 2009), and help us to access, gather, analyse, present, and transmit knowledge and information (Cidral et al., 2018; Gachago et al., 2021). Technology has long been seen as a vehicle to solve pedagogical problems and improve the effectiveness and efficiency of learning in education (Gentry, 1995).

Particularly for those involved in education, it is a part of our daily lives, providing and creating a learning environment for students to play an active role in constructing knowledge. Students in HE can acquire a variety of valuable skills using technology. They must learn digital literacy and computer skills to navigate digital platforms, use software applications, and understand basic computer operations. (Thornhill-Miller et al., 2023). In addition, collaboration and communication through online platforms, discussion forums, and virtual teamwork (Brasca et al., 2022), critical thinking and problem-solving through solving complex problems using digital resources are crucial skills (Brasca et al., 2022), as well as creativity, innovativeness and adaptability as students explore tools such as graphic design software (Thornhill-Miller et al., 2023). As technology evolves rapidly, students must adapt to new tools and platforms (Brasca et al., 2022). In addition, there is the ethical use of technology as students learn about digital ethics, privacy, and responsible online behaviour (Thornhill-Miller et al., 2023). Information Literacy and Research Skills are required for using technology to enhance access to information, databases, and scholarly resources (Brasca et al., 2022). Against this background, an important question arises: What is the role of educational institutions in preparing students to use technology effectively in their learning and eventually as graduates? This, in turn, raises the question of what role technology plays in their learning and their lecturers' role in modelling the usage of technologies in their teaching.

ETs are a broad range of current and new digital tools and innovations designed to enhance teaching and learning processes. These technologies include e-learning platforms, technology-led instructional tools, and emerging technologies, as discussed in Chapter 1 (Ng'ambi et al., 2012;

Islami et al., 2022; Bond et al., 2020a). ETs encompass various applications such as video conferencing technologies, lecture recordings, YouTube and other social networks, interactive whiteboards, learning analytics, augmented and virtual reality, gamification, simulations, and artificial intelligence. Richey (2008: p.24) defines ET as the "study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources".

The context in which these technologies are used defines their educational value. For instance, VR and AI offer immersive and personalised learning experiences, which are increasingly adopted in HE to address diverse pedagogical needs (Bond et al., 2020b). While these technologies are familiar in other sectors, their application in education is specifically tailored to facilitate learning through creating, using, and managing processes and resources in teaching and learning environments (Ng'ambi et al., 2012). An important consideration is that differentially resourced universities may experience the same technology differently (Gachago et al., 2021). For instance, the basic use of LMS at some universities in South Africa is seen as ET integration due to insufficient, unreliable infrastructure and inadequate ICT skills for effective participation in e-learning (Mashau & Nyawo, 2021). At other institutions, ET may be used to solve problems involving pedagogy to improve the effectiveness and efficiency of learning in education (Gentry, 1995).

Multiple factors influence lecturers' decisions to integrate ET, including their comfort with technology, perceived relevance to teaching goals, available PD opportunities, and the anticipated impact on student engagement and learning outcomes. Gil-Flores et al. (2017) categorise these into major and minor factors (Section 1.2.4). Minor factors, such as networking opportunities, recognition and rewards, and flexibility, shape lecturers' everyday decisions to adopt technology. In contrast, major factors, including needs assessment, goal setting, PD opportunities, mentoring, and evaluation, serve as structural influences that either facilitate or hinder sustained ET adoption. This distinction reinforces the interplay between individual competencies and systemic enablers. It highlights that while PD enhances lecturers' technological, pedagogical, and content knowledge (TPACK), its effectiveness depends on institutional conditions that support reflective practice, collaborative learning and sustainable ET integration.

The TPACK framework (Koehler & Mishra, 2009) provides a valuable lens for understanding these decision-making processes, as it highlights the interplay between lecturers' knowledge of technology, pedagogy, and content. Effective PD programmes support TPACK development by equipping lecturers with the integrated knowledge needed to align technology use with pedagogical goals and subject matter, enabling informed and impactful choices about ET integration. However, from a CHAT perspective, contradictions between institutional policies and actual support structures may act as barriers, underscoring the importance of aligning faculty development initiatives with lecturers' real-world teaching contexts.

Furthermore, by examining successful cases where lecturers have made impactful technology integration choices, other lecturers can learn and perhaps begin to replicate these successful practices in their contexts. TPACK can illustrate the pedagogical strategies and decision-making processes that led to successful technology adoption, offering a practical framework for others to follow. This approach enriches the understanding of how PD facilitates technology adoption and highlights the importance of aligning technology with pedagogy and content to foster a culture of continuous improvement and innovation in teaching practices.

2.6.1 How Technology Enhances Pedagogical Practice

Different teaching tools have been considered technological advancements at various stages of history. For example, introducing overhead projectors (OHPs) was initially considered a significant innovation (Zimmerman et al., 2019). Over time, technologies like the OHP have become integrated into standard teaching tools and are no longer viewed as novel technologies (Bruce & Hogan, 2019). Despite this, such technologies have significantly altered teaching practices and the methods required to implement them effectively.

When thoughtfully aligned, ETs can help lecturers transform their pedagogy, but poorly chosen or implemented tools may fragment attention, create cognitive overload or widen digital divides (Selwyn, 2016; Kirschner & van Merriënboer, 2013). Thus, the affordances listed below are potentials, not guarantees. In order to achieve their responsibility (Section 2.3 and 2.3.4), lecturers need to employ pedagogical strategies that combine various mechanisms, styles, tools, and resources (Alon & McIntyre, 2005; Bozalek et al., 2013b; Aronin, 2019; Cui et al., 2023). ETs offer affordances that go further in enhancing learning experiences, for example:

- Interactivity: Allowing students to participate in their learning actively (Bozalek et al., 2013a).
- Cooperative learning: Facilitating online collaborations and group work (Dlamini & Nkambule, 2019).
- Flexibility: Enabling students to learn at their own pace and from anywhere (Aronin, 2019).
- Feedback: Providing individual and group feedback efficiently (Cui et al., 2023).
- Skill development: Helping students develop critical skills, for example, analysing, synthesising, and evaluating information (Timothy, A., 2016).

As previously outlined, it is widely recognised that several factors have historically influenced the use of technology by lecturers, for example, context, perceived usefulness, available resources, attitude, and beliefs (Chen, 2008; Park & Son, 2009; Gachago et al., 2021). However, with the advent of smartphones and the proliferation of mobile technology relating to digitalisation, new variations have become significant, for example, mobile accessibility, digital literacy, and integrating mobile apps into educational practices (Ng'ambi et al., 2012; Bond et al., 2020a). These in turn, have brought to the fore, more so than ever, influencing factors relating to educational level, age, experience, capability to use technology, teaching style, willingness to learn innovative technologies, self-efficacy, enjoyment, anxiety, and technological complexity as lecturers are confronted with modern digital tools and platforms, which reflect more ubiquitous and mobile forms of learning and teaching (Schiller, 2003; Neyland, 2011; Fernández-Batanero et al., 2021; Granić, 2022). Given the broad range of these factors, a combination of theories would be needed to fully unpack and explore them in a mixed-methods study, particularly considering the transformative impact of recent technological advancements. Contextual embeddedness will be a key variable for the study as it is essential if ETs are to transform teaching and learning effectively. The complementary connection between pedagogy and technology affordance is crucial for achieving transformation, which, according to Tarling (2018a & 2018b), is evident in the changes and processes developed by lecturers to improve learning outcomes.

2.6.2 Educational Technology Integration and Professional Development

PD in HE increasingly emphasises the purposeful integration of ET to enhance pedagogy (Hardman, 2008; Hardman, 2005). However, technology does not inherently improve teaching; its impact depends on alignment with sound pedagogy, contextual constraints and lecturer competence (Selwyn, 2016; Yehya, 2021). Various studies have applied CHAT to understand how lecturers adapt

to systemic pressures and leverage technology to transform teaching. For instance, Van Der Merwe's (2015) review of Bozalek et al. (2015) suggests that contradictions, such as those arising from institutional goals versus personal teaching philosophies, can serve as catalysts for innovative practices (Bozalek et al., 2015; Van Der Merwe, 2015). These findings parallel research in TPACK, showing that technology use is most effective when seamlessly embedded in pedagogical and content knowledge (Koh, 2013). There are case studies of contradictions and transformative learning in the literature. For example, Rambe (2012) illustrates how questions posted in a Facebook group generate cognitive scaffolding, promoting dialogue-driven innovation. This case reveals how informal digital tools can serve as powerful mediators, reshaping traditional norms and roles in HE. In another example, Rambe and Bere (2014) highlight that adopting ETs within authentic learning tasks requires negotiating institutional constraints, such as curriculum design and faculty support structures, a process that fosters more profound, transformative learning experiences.

2.6.3 Previous Applications of CHAT in Technology-Enhanced Learning

Hardman's (2005, 2008) research provides strong examples of how to apply CHAT to university classrooms. By mapping activity systems to identify contradictions and mediating tools, she demonstrates how technology adoption can create tension and opportunities for lecturers seeking meaningful PD. Building on Engeström's (1987) activity triangle, Mwanza (2002) outlines an approach that combines systematic analysis with practical design interventions. Her work underscores the value of iterative feedback loops, which can inform how *BrightSparks* refine their teaching strategies as they integrate new technologies. Rambe's (2012) and Van Der Merwe's (2015) discussions point to digital platforms, such as social media and collaborative online tools, as mediators that can reshape power relations, encourage peer feedback, and expand learning communities. These insights are crucial for understanding *BrightSparks*' agility in adopting new technologies in health sciences.

2.6.4 Implications for the Current Study

These works underscore the importance of analysing the systemic and cognitive aspects of ET usage. For health sciences lecturers identified as *BrightSparks*, contradictions within institutional structures (Hardman, 2005, 2008) and the practical demands of technology integration (Koh, 2013; Rambe, 2012) can catalyse professional growth. Adopting an integrated CHAT-TPACK lens (Bozalek et al., 2015; Van Der Merwe, 2015) provides a robust framework to identify, analyse, and potentially

resolve these tensions. The lessons from previous CHAT applications ultimately inform how the KF4TT might facilitate transformative learning and teaching practices in health sciences.

2.7 Lecturers Who Integrate Technology Exceptionally

In my faculty, I have observed how some lecturers influence their peers through their impactful use of ETs, a trend that Campbell et al. (2019b) connect to PD activities. An empirical gap exists in understanding lecturers who can integrate ETs into their teaching. As briefly noted in Chapter 1, these lecturers, *BrightSparks*, often achieve transformative integration of ETs, not through strictly structured PD, but via self-motivation, creativity, and peer collaboration (Ng'ambi et al., 2012; Witt et al., 2021).

Although similar terms appear in the literature, such as “trailblazers,” “early adopters,” “innovators,” or “champions”, the *BrightSparks* construct is unique to this study. “Trailblazers” lead in adopting new practices (Ng'ambi et al., 2012; Mässing, 2017), while early adopters (Rogers, 1962) embrace innovations due to their openness to change (Tomasino & Fedorowicz, 2014). However, these existing terms (Table 2.3 below) focus broadly on adopter behaviours or leadership roles rather than the nuanced practices of lecturers who independently drive both their technological and pedagogical growth.

The term “exceptional lecturers” is used in the literature to convey those who excel in teaching and student engagement (Uzorka et al., 2023; Tarling & Ng'ambi, 2016). While the designation *BrightSparks* aligns with this notion, it has the added dimension of the capacity to independently navigate the CPD Cycle (Cooley et al., 2023), blending formal and informal PD activities. Unlike other exceptional lecturers who may rely heavily on institutional support, *BrightSparks* exhibit strong agency, shaping their PD and leveraging ETs for pedagogical innovation.

Although *BrightSparks* predominantly favours self-initiated and informal learning approaches, they do not all arrive by the same route. Some begin with formal, institution-led PD and gradually transition toward self-directed exploration, while others immerse themselves in self-driven development from the outset. This variation situates *BrightSparks* at different points along a PD continuum, encompassing not only formal vs. informal but also institution-initiated vs. self-initiated

and lecturer-led vs. self-led modes. Their flexibility in traversing these constructs illustrates professional growth's fluid nature and the many pathways to transformative teaching practices.

BrightSparks' commitment to continual improvement aligns with concepts of lifelong and life-wide learning (King et al., 2021). However, their focus on using technology to create transformative educational experiences is shaped by institutional pressures (e.g., COVID-19 disruptions) and personal motivation to innovate. In literature, these lecturers might also be termed "champions" or "change agents" (Barton & Dexter, 2020), given their ability to advocate for, model, and inspire ET adoption among peers. However, *BrightSparks* go beyond mere advocacy; they exemplify substantive pedagogical transformation rooted in a vision for technology-enhanced teaching and learning.

For this study, the concept of *BrightSparks* is informed by multiple theoretical and empirical ideas, including the CPD Cycle and agency and technology adoption models. *BrightSparks* illustrate a unique capacity to navigate the CPD Cycle autonomously: they reflect on their own learning needs, set appropriate goals, seek out resources, and apply new skills to enhance their teaching (Cooley et al., 2023; King et al., 2021). This independent engagement demonstrates their commitment to professional learning and positions them as professional learners within the broader PD framework.

Table 2.3: Comparative Overview of Terms Related to Lecturers Integrating ETs

Term	Definition	Key Characteristics	Relation to BrightSparks
BrightSparks	Lecturers who achieve transformative integration of ETs through self-motivation, creativity, and peer collaboration often do so outside formal PD structures.	- Blend formal and informal PD activities	The central focus of this study represents a unique construct combining aspects of other roles but distinguished by their autonomous navigation of PD and transformative use of ETs.
		- Exhibit strong agency and self-directed learning	
		- Navigate the CPD Cycle autonomously	
		- Drive pedagogical innovation	
		- Influence peers through practice	
Early Adopters	Individuals who adopt innovations shortly after innovators are characterised by a higher	- Embrace change and new ideas	BrightSparks often fall within this category but are distinguished by their focus on pedagogical transformation

	degree of opinion leadership and openness to change. They are more discreet in adoption choices and are respected by their peers.	- Serve as opinion leaders - More socially forward - Provide feedback to refine innovations	and self-directed PD beyond mere adoption.
Trailblazers	Pioneers or innovators who lead the way in adopting new practices or technologies, often leaving a path for others to follow.	- Innovate and experiment with new ideas - Influence others through their actions - Often self-motivated and proactive	BrightSparks share the pioneering spirit but focuses explicitly on integrating ETs to transform teaching practices within higher education.
Champions	Individuals who actively promote and support adopting new technologies or practices within an organisation often help others achieve their goals.	- Advocate for technology adoption - Assist peers in learning and using new tools - Invest time in skill development - Often bridge the gap between technology and users	BrightSparks act as champions by modelling effective ET integration and inspiring peers, but their role extends further into self-directed PD and pedagogical innovation.
Change Agents	Individuals who promote and enable change within an organisation, facilitating the adoption of new practices and helping others to adapt.	- Facilitate organisational change - Support others in adopting new practices - Act as catalysts for improvement - Often hold formal or informal leadership roles	BrightSparks function as change agents by influencing teaching practices and PD approaches, primarily through innovative practices and peer collaboration, rather than formal leadership positions.

Hence, *BrightSparks* are lecturers who use ETs, integrated with content and pedagogy, to transform their teaching practices, achieved mainly through self-development rather than formal PD. In line with Rogers's (1962) Technology Adoption Bell Curve (Biondi, 2024), they typically fall within the early adopter or early majority groups, responding swiftly to changes such as the shift to online instruction and increased reliance on ET. Their proactive innovation further cements their role as champions of technology adoption within their institutions (Tomasino & Fedorowicz, 2014), offering exemplars for colleagues who may follow different paths along the PD continuum (Figure 2.3) to achieve similar transformative outcomes.

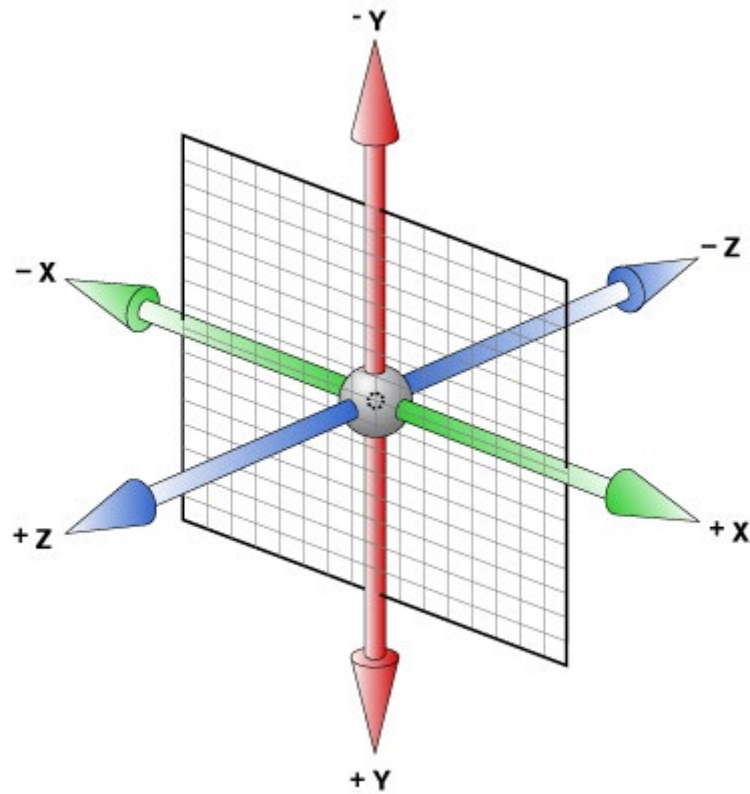


Figure 2.3 PD Continuum

- X-axis: Initiation: Self-Initiated (-X) $\leftrightarrow$ Institution-Initiated (+X)
- Y-axis: Delivery: Self-Led (-Y) $\leftrightarrow$ Lecturer-Led (+Y)
- Z-axis: Formality: Informal (-Z) $\leftrightarrow$ Formal (+Z).

PD Continuum / Constructs:

- Formal vs. Informal: Concerns the structure of the PD (e.g., accredited courses, conference workshops, institution-sanctioned events = formal; unstructured or peer-led learning, reading blogs, social media communities, trial-and-error practice = informal).
- Lecturer-led vs. Self-led: Addresses who facilitate the PD (e.g., a workshop or webinar led by a trainer vs. a lecturer independently acquiring resources and teaching themselves).
- Institution-initiated vs. Self-initiated: Describes who drives or mandates the PD (e.g., department or university requires a training session vs. a lecturer deciding to learn something new independently).

BrightSparks typically cluster toward the back left bottom corner near the centre of the cube, i.e., near the negative ends of all three axes, rather than at the centre (0, 0, 0):

- Self-Initiated (centre, negative on the x-axis)

- Self-Led (negative on the y-axis)
- Informal (negative on the z-axis)

Although they may occasionally move along one or more axes (for example, when they attend a formal, institutionally sponsored course or pursue certification), their centre of gravity remains firmly in the cube's self-initiated, self-led, and informal region.

2.7.1 The Role of *BrightSparks* in Blended PD Systems

BrightSparks bridges the gap between formal and informal PD by blending structured opportunities with self-initiated learning activities. Their approach is characterised by experiential learning, peer collaboration, and knowledge-sharing, often outside formal PD structures (Avsec & Jerman, 2020; Avancena et al., 2023). Examples include experimenting with new digital tools, attending online seminars independently, or creating informal networks for sharing ideas and success stories with colleagues (Geertsema, 2021). By leveraging formal and informal PD activities, these lecturers demonstrate the potential of hybrid PD systems to support professional growth and foster innovative teaching practices (Barton & Dexter, 2020).

In my context, I have observed how some *BrightSparks* influence their peers through peer-to-peer mentoring and collaboration, which creates a non-threatening environment for knowledge-sharing and skill development. Research shows that such mentoring, where senior lecturers guide and support junior colleagues, fosters a culture of collaboration and helps junior lecturers develop their teaching practices (Pololi et al., 2002; Ramani, 2006). *BrightSparks* not only model the effective use of ETs but also inspire other lecturers to explore new technologies and teaching strategies, even without formal institutional mandates (Ng'ambi et al., 2012; Bozalek et al., 2013).

What sets *BrightSparks* apart is its ability to move beyond simply applying ETs as add-ons to existing practices. Instead, they integrate ETs in ways that scaffold learning, encourage collaboration, and open new spaces for student development. For instance, Tarling and Ng'ambi's (2016) study on lecturers' use of ETs draws on the Teacher Change Framework, highlighting lecturers who shift from teacher-centric approaches to transformative, student-centred practices. Tarling (2018) further describes these lecturers as "Reproducers of Change" who deliberately exploit the principles of transformative ET integration to create less regulated and more open learning environments for

students. *BrightSparks* exemplifies this approach, using ETs to fundamentally reshape how they teach and how students learn.

2.7.2 *BrightSparks* Across the Technology Adoption Spectrum

The practices of *BrightSparks* stand in stark contrast to other lecturers along the technology adoption spectrum (Figure 2.4). While *BrightSparks* lead in adopting and integrating ETs, other lecturers demonstrate varying degrees of engagement. Some lecturers express interest in ETs but require substantial scaffolding and structured support for pedagogical integration. Others, characterised as ‘laggards’ or ‘conservatives’ in the technology adoption lifecycle, resist integrating ETs altogether, opting to continue teaching as they always have (Shelton, 2017). These lecturers may acknowledge the potential of ETs but are content with traditional practices, such as distributing printed or digital copies of their teaching materials, without exploring more innovative applications.

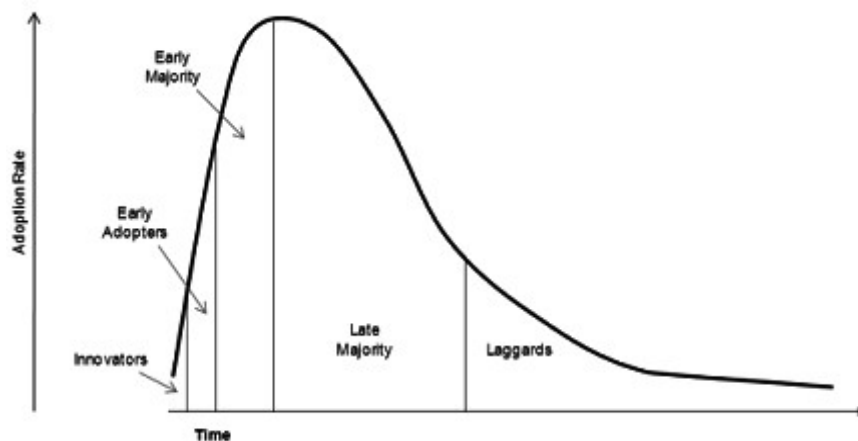


Figure 2.4: Fad-Like Technology Adoption Lifecycle

BrightSparks stands out as a driver of innovation within this spectrum. Their ability to combine formal and informal PD activities with their intrinsic motivation and agency enables them to model best practices and positively influence their peers. By sharing their experiences through informal networks and institutional events, *BrightSparks* contributes to the professional growth of their colleagues and helps bridge the gap for those less confident in integrating ETs (Jones & Dexter, 2018; Xianhan et al., 2022).

2.7.3 *BrightSparks* and Transformative Practice

Despite the extensive literature on PD, innovation in teaching, and ET integration, few frameworks identify lecturers who independently integrate ETs in transformative, pedagogically meaningful ways. Existing labels, "trailblazer", "champion", and "early adopters", focus on broad adopter behaviour or leadership roles, not on lecturers who drive their own technological and pedagogical growth. Similarly, frameworks such as the CPD Cycle (Cooley et al., 2023; King et al., 2021) assume structured institutional support and overlook how self-directed lecturers navigate PD autonomously. This leaves a conceptual void for understanding *BrightSparks*' unique characteristics, motivations, and practices.

The characteristic features of *BrightSparks* mean they are often overlooked in PD research because their development depends less on formal structures and more on proactive engagement with both formal and informal opportunities. Current literature rarely explores the intersection of pedagogy and self-directed ET integration, central to the *BrightSparks* construct. For example, lifelong learners are portrayed as adaptable and committed to self-improvement (King et al., 2021). However, they are not necessarily linked to the context-specific challenges of integrating ETs in HE or the transformative potential for teaching and learning. *BrightSparks* fills this gap by showing how technological innovation anchored within pedagogical goals shapes the learning experience for students rather than simply adding digital tools as afterthoughts.

Critically evaluating the construct shows that it synthesises trailblazers, early adopters, and lifelong learners' notions into a lens that foregrounds transformative teaching with ET. In health sciences education, transformation, following CHAT, is a qualitatively new configuration of the activity system, achieved by resolving contradictions between existing pedagogies and emergent technological possibilities (Beatty & Feldman, 2012). This duality is rarely acknowledged in the literature, as most frameworks treat formal and informal PD as distinct or separate domains (Barton & Dexter, 2020). Furthermore, *it* challenges the traditional notion of PD by demonstrating that effective professional growth can occur outside institutional structures, driven by individual motivation and peer collaboration. This study, therefore, positions *BrightSparks* as a valuable construct for understanding and supporting lecturers who operate at the intersection of technology integration, self-directed learning, and pedagogical transformation, offering a lens to address the empirical gap in PD literature and practices.

Since transformation is historically and culturally situated, its expression varies across disciplines and institutions. In South African higher education, Hardman (2005, 2008) shows how lecturers negotiate tensions between institutional expectations and pedagogical values; *BrightSparks* in this study do likewise, navigating massification, digitalisation and resource constraints by combining formal PD with self-initiated communities of practice (Van der Merwe, 2015). Their actions illustrate Engeström's expansive learning, where contradictions, such as rigid curricula versus flexible ET affordances, become catalysts for redesigning tasks, redistributing agency and re-imagining professional identities (Beatty & Feldman, 2012).

However, transformation is not universally embraced. Some lecturers resist fundamental change when technologies clash with disciplinary norms or perceived instructional efficacy. Recognising this resistance frames transformation as a negotiated, iterative process, balancing innovation with contextual fit and personal agency with institutional structures. *BrightSparks*, therefore, serve as empirical probes, revealing both the promise and the limits of technology-mediated pedagogical change and guiding PD designs that respect local histories, power relations and resource realities.

2.7.4 Implications for PD Frameworks

Understanding the dynamic interplay between various PD constructs (e.g., formal vs. informal, self-led vs. lecturer-led) and the agency demonstrated by *BrightSparks* is critical for designing a more comprehensive PD framework in HE. *BrightSparks'* innovative practices suggest the potential for leveraging self-motivated lecturers as *champions* or informal mentors, thereby encouraging others to adopt ETs and explore more flexible, blended PD models. This approach underscores the value of tapping into intrinsic motivation and peer collaboration, particularly for institutions aiming to foster a culture of technological innovation.

By examining how *BrightSparks* develops technological competencies and analysing their ET use through the lens of CHAT, this research explores ways technologically adept lecturers can help shape PD strategies within health sciences. Ultimately, *BrightSparks* offers insight into addressing the gap in understanding how *exceptional* lecturers build and maintain their technology expertise, highlighting the need to integrate formal, informal, and agency-driven approaches into holistic PD strategies that support all types of lecturers in effectively integrating ET into their practice.

2.8 Agency in Higher Education

Agency is a broad term that generally refers to a quality of engagement by individuals over time, usually influenced by the context in which they work (Edwards, 2015). Agency, therefore, is defined as an intentional action, exercising control and making decisions that influence one's work, professional identity, and work environment (Etelapelto et al., 2013). Agency is a strategy a lecturer uses to bring about deliberate change unrelated to personal capacity or competency (Ali & Hamid, 2018). It consists of several components - a temporally embedded process of social engagement informed by the past, future, and present. Agentic dimensions can be interpenetrated with forms of institutionalised PD (Emirbayer & Mische, 1998).

2.8.1 Theoretical Foundations of Agency

Archer (2000, 2003) comments that there is considerable disagreement amongst social theorists regarding the concepts of agency (person) and structure (society). Social structure is understood as "the aggregate consequences of prior [person-person/person-world] interactions" (Archer, 1988, p. 468), which are relational; therefore, in my context, affecting lecturers as primary agents, who act within the context of the teaching environment (Archer, 2000).

It is not easy to separate the individual agent from the environment they are situated in. According to Harvey (2002), the individual creates society, and society creates the individual. Williams (2005) argues that structure and agency do not have to be merged and that Margaret Archer's sociological perspective presents the relationship between structure and agency as an inter-relationship. Structure conditions agency, and agency elaborates upon the structure, which it confirms. In society, the context enables or constrains agency (human action) but does not determine it (Archer, 1995). Williams (2005) further observes that there are often costs involved in our choices, but that agency implies that the agent, the lecturer, decides whether that cost is worth it. Society cannot determine someone's decisions; it can only enable or constrain them.

2.8.2 Agency in the Educational Context

The context in which lecturers work is essential for understanding their agency (Kauppinen et al., 2020). The learning environment is never static as it goes through periods of flux, influenced by indeterminate forces such as the COVID-19 pandemic and #FeesMustFall protests. Amid such changing working conditions, lecturers are positioned as agents of change with the assumption and

requirement to engage in ongoing professional learning (Kauppinen et al., 2020). Agency is considered a necessary component for shifting professional identity and transformation of practices in responding to changes in culture and context (Jones & Charteris, 2017).

Agency influences work practice, teaching content, and working methods. These could be enhanced by strengthening the lecturer's philosophy, transforming professional commitments, developing confidence in pedagogical skills, and using new pedagogies (Hokka et al., 2017). According to Kauppinen et al. (2020), agency can produce expansive and transformative change through action with specific aims and guidance.

2.8.3 Agency and PD

PD can play an essential role in lecturer self-development, integrating ETs with their pedagogical practices and content, and developing agency. PD activities have features which could support agency development, for example, motivation, a comprehensive programme incorporating evidence-based practices, hands-on activities, long-term PD, reflection opportunities and a supportive learning community (Kauppinen et al., 2020). This directly opposes an individual lecturer attempting these on his or her own.

Lecturers undertaking self-development assume a dual role of being lecturers and the 'critics' watching them teach (Nguyen, 2020; Mermelstein, 2018). The burden is primarily on themselves to identify areas of adjustment and improvement, and employ and adopt them. They are embedded in their practice, making them the most knowledgeable and appropriate people to improve their practice (Mills, 2000; Stringer, 2007). Agency is developed through awareness of practices and beliefs and through constructing knowledge (Nguyen, 2020).

2.8.4 *BrightSparks* and Agency

These lecturers exhibit a remarkably strong sense of agency, defined as the capacity to act independently and make intentional choices in their teaching practice. While many educators rely on institutional scaffolding to integrate ETs, *BrightSparks* demonstrates greater autonomy in adopting new tools and shaping personal PD frameworks, proactively responding to the demands of contemporary HE (Mässing, 2017). Their self-driven approach, combined with the ability to champion innovations among peers, aligns with literature describing technologically adept lecturers

as self-motivated, self-taught innovators who blend formal and informal PD to achieve transformative pedagogical change (Tondeur et al., 2017; Tarling, 2018). Moreover, their visible success in effectively integrating technology often motivates colleagues to seek PD opportunities, underscoring the value of peer influence and informal learning in driving ET adoption.

2.8.5 Challenges in Implementing Agency-Driven Changes

While agency can be a powerful force for change in educational settings, there are several challenges in implementing agency-driven changes:

- Institutionally: There is a recognised need for institutional-level leadership support and policies to facilitate individual agency (Ali & Hamid, 2018). Without this support, lecturers may find it challenging to enact the changes they envision.
- Resources: Implementing new technologies or pedagogical approaches often requires resources that may not be readily available. This can limit the scope of agency-driven changes.
- Resistance: Not all lecturers may be equally receptive to changes their more agentic colleagues propose. Overcoming this resistance can be a significant challenge.
- Sustainability: Ensuring that agency-driven changes are sustainable over time is crucial. This requires ongoing support, resources, and a culture that values continuous improvement.
- Balance: Finding the right balance between institutional structures and individual agency can be challenging. Too much structure can stifle agency, while too little can lead to chaos.

2.8.6 Effective Change through Sustainability

Focusing on the result of PD activities and what has been effective due to the intervention is crucial for moving forward with further PD activities; the other essential aspect is sustainability. If PD is deemed successful and achieves results, it is more likely to receive institutional support. These activities need to be context-specific and relevant to the situation. Additionally, they ought to be flexible and adaptable to the needs of the lecturers and institution, run by those who know the needs of lecturers and are available to give ongoing support (Davis et al., 2005). These trainers need credibility with lecturers (Steinert, 2005) and to be economical in resource use, for example, reusing material available under Creative Commons licences instead of spending resources redeveloping new material. Similarly, learning and collaborating with units from other PD programmes can reduce the resources needed to run PD activities. Cooperation and collaboration to share principles,

practices, and expertise should be standard practice if PD is to be seen to initiate and sustain change (DeLuca et al., 2017).

2.9 Summary of Chapter

This chapter explored various aspects of PD, including its purpose, driving factors, and challenges, as presented in the literature. There is widespread agreement that PD is pivotal in enhancing teaching skills and student outcomes. Yet, barriers such as limited resources, time constraints, and resistance to change must be addressed for effective implementation. The literature further suggests that ET can be strategically integrated into PD programmes to improve their sustainability and impact. However, the evolution of PD in ET integration has been slow, particularly in South Africa, where resource disparities persist.

The concept of *BrightSparks* emerged from gaps in the literature discussing leaders in educational change and their relationship to PD. Unlike traditional early adopters, *BrightSparks* are characterised by their strong sense of agency, adaptability, and technological expertise, using ET in transformative and pedagogically meaningful ways. Understanding their practices offers valuable insights into designing a KF4TT. Literature suggests that developing lecturers' TPACK is essential for successful ET integration, reinforcing the need for PD programmes that align technological and pedagogical competencies with real-world teaching contexts.

Agency is central to *BrightSparks*' identity, and research suggests that agency-driven PD supports professional knowledge construction, identity formation, and evolving teaching practices. Effective PD should, therefore, scaffold agency and provide opportunities for reflection, ensuring that lecturers move toward autonomous and sustained ET adoption. The adaptability of *BrightSparks*, particularly in response to challenges like COVID-19, underscores the contextual nature of ET integration and the need for flexible, responsive PD models.

This literature aligns with the study's research question on developing lecturer competencies in technology integration. By drawing on *BrightSparks*' continuum of expertise, institutions can design PD programmes that foster ET adoption in ways that transform teaching and learning. The next chapter will outline the theoretical and conceptual frameworks guiding this research, linking insights from the literature review to the study's methodological approach.

CHAPTER 3 - Theoretical Framework

3.1 Overview

This chapter expands on Cultural-Historical Activity Theory and Technological Pedagogical Content Knowledge as the underlying theories for this research. CHAT is the study's overarching theoretical perspective, while TPACK provides a complementary knowledge-based framework for examining *BrightSparks'* practices. The combination is used to inform the choice of methodology and to provide an analytical framework for data analysis. Building on the complexity of integrating ET, highlighted in Chapter 1 and based on the literature in Chapter 2, my study explores what can be learned from *BrightSparks* to inform the design and implementation of a PD KF4TT. This framework will support health sciences lecturers in integrating ET. The study is guided by the overall aim of understanding the driving factors behind *BrightSparks'* technological use to formulate this framework. By examining these factors using CHAT and TPACK, I aim to uncover the dynamics of ET integration in teaching practices and the broader context influencing these activities. In this process, I will extract the most essential characteristics of *BrightSparks*.

CHAT provides a robust theoretical lens to examine the collective, tool-mediated actions within the educational environment. It emphasises core principles, namely the collective nature of human action, learning through first-hand experiences, the role of tools in facilitating learning and communication, and the importance of community in constructing meaning (Foot, 2014). This perspective enables the analysis of activity systems represented by lecturers and their PD initiatives. It highlights how these systems evolve through collective learning actions and respond to contradictions, fostering expansive learning. Conversely, TPACK is a foundational element that outlines the essential knowledge lecturers require to integrate technology into their pedagogy effectively. It offers a comprehensive approach to understanding the interplay between technology, pedagogy, and content knowledge, guiding the evaluation of ET integrated into *BrightSparks'* teaching practices.

Therefore, by integrating CHAT and TPACK, I seek to uncover how *BrightSparks'* approach to PD and ET integration reshapes their teaching landscape. The analysis aims to identify effective strategies for PD in ET, informed by an understanding of the systemic interactions and the expansive learning opportunities of *BrightSparks*. This dual theoretical approach offers a comprehensive framework for

examining the complex dynamics of technology integration in education. It provides insights into developing a PD framework that empowers lecturers to enhance their pedagogical practices with ET.

3.2 CHAT

CHAT has been extensively used in educational research to understand complex learning environments. This theoretical framework, based on the research of Soviet psychologist Vygotsky, provides a method for understanding and examining the intricate nature of educational processes as they occur within broader social, cultural, and institutional frameworks. From a sociocultural perspective, learning is socially located and mediated by artefacts (Vygotsky, 1978). These artefacts are practical, cultural, or conceptual aids that facilitate education and growth, and mediation occurs between a person, the action's Subject, and its Object (Figure 3.1).

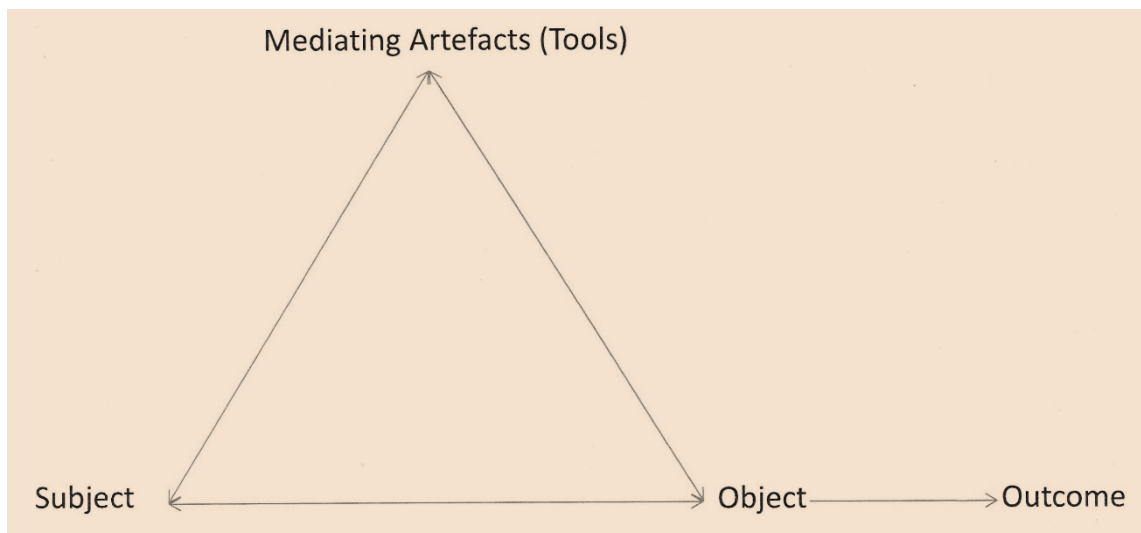


Figure 3.1: First-Generation Activity System (Vygotsky, 1978)

In this first generation of activity theory, the unit of analysis is the individual. It was primarily used to understand an individual's behaviour by examining their actions on culturally mediated objects. The development of the first-generation activity theory by Leontyev (1977) emphasised the integration of individual actions within a collective activity system, recognising the role of social influences and collective engagement. Leontyev introduced the concept of the activity system comprising the Subject, Object, and community, where roles were defined through a Division of Labour and mediated by rules. Engeström (1987) refined this framework by visually representing the elements and their interrelations in his well-known diagram (Figure 3.2).

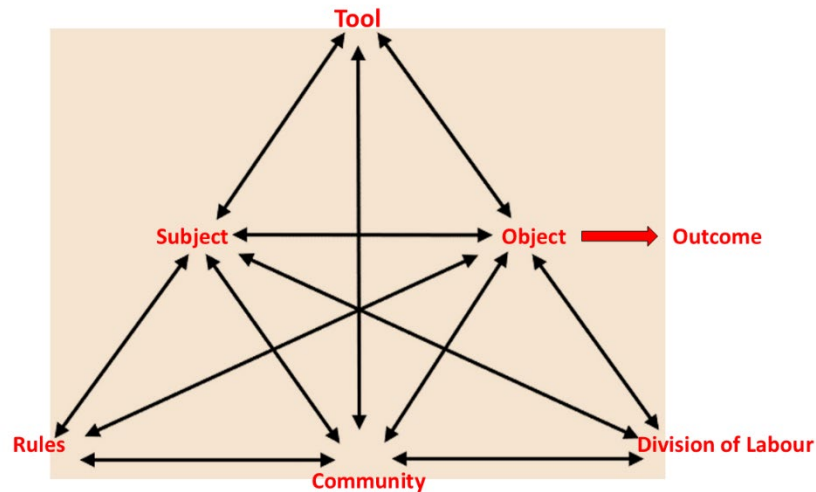


Figure 3.2: Second- Generation Activity System (Engeström, 1987)

These components comprise an activity system. It refers to the overall framework or structure that guides and shapes the interactions and behaviours of the individual. An activity system is a critical concept that helps understand human activities within a sociocultural context. An activity system represents an interconnected and dynamic network of elements that work together to accomplish a specific outcome. It is used to help analyse the interactions between individuals, artefacts, and the social environment in which they operate.

The main components of an activity system are as follows:

1. The **Subject** refers to the individual or group of individuals who are actively engaged in the activity. It includes their motives, intentions, and desires. The Subject is the driving force behind the activity and influences the decisions and actions taken within the system.
2. The **Object** represents the goal or purpose of the activity. It is what the Subject seeks to achieve through their actions. The Object can be a physical outcome or intangible, for example, skill development.
3. The **tools for mediating artefacts** are the physical and psychological instruments or artefacts the Subject uses to interact with the world and accomplish the activity. They can be physical objects or intangible resources (symbols or language). Tools mediate the relationship between the Subject and the Object, shaping the actions and outcomes of the activity.
4. The **rules** are the norms, conventions, and regulations governing the activity. They can be explicit or implicit, for example, laws and regulations, or informal, referring to customs and

social norms. The rules provide guidelines and constraints that influence the behaviour and actions of the Subject within the activity system.

5. The **community** represents the social context in which the activity occurs. It includes the people, groups, and social structures surrounding and influencing the Subject. The community can provide support and resources, and contribute to developing and transmitting norms and values.
6. **Division of Labour** refers to distributing tasks and responsibilities among individuals or groups within the activity system. It involves the coordination and collaboration of different participants to achieve the overall goal of the activity. The Division of Labour can be based on expertise, skills, roles, or social hierarchies.

Activity theory is compatible with my research because I adopt a sociocultural view in which technology integration functions as a mediating artefact that shapes and is shaped by social action, rather than merely serving as a conduit between a subject and an object. These artefacts, including instruments, signs, language, machines, and computers, are embedded in culturally and historically situated activity systems. The relation between the individual and their environment is considered through the community component. Rules mediate the relationship between Subject and Community, and the Division of Labour mediates the link between Object and Community (Hettinga, 1998). The components of an activity system are interconnected and influence one another. Changes in one element can lead to adaptations and transformations in other elements, creating a dynamic and evolving activity system.

Second-generation activity theory focuses on the individual's actions and how they interact with tools and artefacts to achieve their goals. In this study I follow Kaptelinin and Nardi (2006) in treating *artefact* as the broad category (physical or symbolic products of previous human activity) and *tool* as an artefact that is actively used to mediate present action; thus, every tool is an artefact, but not every artefact functions as a tool at a given moment. In addition, it analyses the interactions between individuals and their sociocultural environment with particular emphasis on how the environment influences the actions of individuals. This generation of activity theory highlights the processes of internalisation and externalisation, which are central to Vygotsky's theory, exploring how individuals internalise social practices and cultural tools and how these shape their external

actions. The criticism against it, however, is its inability to understand individual activity systems' dialogue, multiple perspectives, and networking with others (Engeström, 2001).

Responding to earlier critiques of Vygotsky's original model, Engeström (1987) expanded the framework into third-generation Activity Theory to address the complexity of modern learning environments. This model represents an activity system that comprises a Subject, Object, Tools, Rules, Community, and Division of Labour. Third-generation CHAT broadened the unit of analysis beyond the individual to include collective and systemic aspects of an activity. It emphasises understanding the interactions and contradictions between multiple activity systems, focusing on social practices and larger systems rather than isolated actions. This approach acknowledges the existence of multiple voices and perspectives within activity systems, recognising that participants often bring diverse and conflicting viewpoints and interests. These tensions and contradictions are key drivers of activity development.

Importantly, third-generation CHAT emphasises the mutually constitutive relationship between humans and their material world, underscoring the significance of interactions between people and artefacts in understanding activity systems. Furthermore, it highlights the dialogical nature of activity systems, where continuous negotiation and interaction between different perspectives and communities play a central role in shaping outcomes. The shift from the second to the third generation represents an evolution in understanding and application, with the primary analytical focus now being the activity system itself. This broader unit of analysis incorporates historical and sociocultural dimensions, emphasising that activity systems evolve and are influenced by their historical and institutional contexts.

Building on this foundation, several key works provide insight into how CHAT can be operationalised in HE contexts. For instance, Hardman (2008) offers a methodological perspective on researching pedagogy using CHAT, emphasising the historical and cultural mediation of teaching and learning. Her insights are instrumental in understanding the context-bound nature of *BrightSparks'* technology integration. Similarly, Hardman (2005) underscores how contradictions and tensions in university settings can drive transformative practices through technology, particularly in "unequal terrains." This aligns with this research's focus on examining how health sciences lecturers adapt to institutional constraints while pursuing innovation.

Van der Merwe's (2015) review of Bozalek et al. (2015) highlights the intersection of technologies and authentic learning principles within CHAT. A collection of authors in the review volume argues that transformative pedagogies in HE often emerge when lecturers critically engage with institutional contradictions. This perspective is central to studying *BrightSparks*, as it sheds light on how these technologically adept lecturers navigate systemic challenges. Rambe and Bere (2014) extend this perspective by discussing how lecturers leverage CHAT to foster transformative pedagogy through authentic learning tasks and emerging technologies. Their conclusion reinforces the importance of identifying systemic tensions, such as misalignments between institutional rules and lecturers' professional goals, as catalysts for innovation.

Based on these insights, CHAT serves as the theoretical foundation for interpreting the findings from the questionnaire and interviews within this study. It provides a conceptual instrument to clarify diverse viewpoints and the interplay among activity systems, offering a lens to analyse how *BrightSparks* navigates and reshapes their PD practices. By grounding the analysis in time, place, and sociocultural context, CHAT enables this research to make specific claims about the lecturers involved, illuminating how they engage in activities, the role of artefacts and social context, and the impact of systemic tensions on their pedagogical practices (Engeström, 2001).

3.2.1 Activity Systems

This research considers the following activity systems:

- PD is where the lecturer, as a participant, is the Subject, and the Object is their practice. The Outcome would be the skills and knowledge needed to successfully integrate and implement ET into their content (TCK) and pedagogy (TPK) to achieve TPACK. The Division of Labour specifies the roles and responsibilities of the facilitator and lecturers. The rules element of the system might be a source of tension if lecturers have signed up because they were asked to or chose to participate due to their lack of ET usage. The system's tools include the PD pedagogies and resources employed to assist lecturers in reflecting upon their practice and improving their skills. The Outcome is to improve teaching and learning and enhance lecturer competencies.
- *BrightSparks* lecturers - The Outcome is the practical and integrated use of ETs (TPACK) pedagogy. In this system, the lecturer is the Subject. The Object of the teaching is the

students. The community includes other lecturers, administrators, and support staff associated with that course. The Division of Labour in the classroom specifies the power structure, including the lecturer's authority to choose and design the learning objectives, activities, assessment criteria, and behaviour. Rules, which might be implicit, specify expected behaviour. The tools include teaching and learning resources from textbooks, the whiteboard, and pedagogies, to the laptops used in their teaching.

The ultimate objective of all activity systems is to improve student success through effective teaching and learning pedagogies (practices and strategies). These systems, influenced by Mwanza's Activity Oriented Design Method (AODM), see Table 3.1, were used to support data-gathering and analysis of design insights (Mwanza, 2001). The following sections illustrate the development of the activity system components and start considering how to uncover contradictions.

Table 3.1: The Eight-Step Model Adapted from Mwanza, 2002, to Develop Activity Systems.

	Identification of	The question that was asked	Lecturers who are <i>BrightSparks</i> Activity System	PD Activity System
1	Activity of interest	What sort of activity am I interested in?	Teaching Practices of <i>BrightSparks</i>	PD Activity
2	Objective (purpose)	Why is the activity taking place?	To impart knowledge and facilitate learning using TPACK	To deliver a meaningful and effective PD programme which allows lecturers to enhance their knowledge and teaching strategies using TPACK
3	Subjects	Who engages in conducting this activity?	Lecturers (<i>BrightSparks</i>)	Lecturers attending
4	Tools	By what means are the subjects performing this activity?	Lecture slides, textbooks, online learning platforms, assessment tools and technologies which are integrated	The event programme and schedule, presentation materials, speaker selection, and feedback mechanisms

5	Rules and regulations	Are there any cultural norms, rules or regulations governing the performance of the activity?	University policies and culture, ethical standards, academic protocols, teaching methodologies	Guidelines for organising the event, regulations related to speaker selection, and event marketing guidelines
6	Division of Labour	Who is responsible for what, when conducting the activity, and how are the roles organised?	Lecturing, marking assignments, meeting with students, creating course materials	Planning the event, selecting and coordinating with speakers, facilitating sessions, collecting, and processing feedback.
7	Community	What is the environment in which this activity is conducted?	Department, lecturers, Administrators, Support staff, students	Other organisers, the lecturers attending the event, Reference speakers, and the broader academic community
8	Outcome	What is the desired Outcome of conducting this activity?	Understanding the practices of <i>BrightSparks</i>	Lecturers showing TPACK

3.2.2 Activity System 1 - *BrightSparks*

1. Subject: Lecturers (*BrightSparks*). They are actively engaged in research, teaching, and learning. They possess motivation, knowledge, attitude, values and skills.
2. Object: To impart knowledge and facilitate learning. The Object includes various aspects of teaching, research, and PD. It involves lecturing, facilitating learning, conducting and publishing research and advancing their careers.
3. Tools/Mediating artefacts: These include textbooks, lecture slides, and other course materials; learning management systems and other ET; as well as pedagogy and assessment.
4. Rules: These would include institutional policies, teaching guidelines, regulations, and requirements in addition to ethical standards, assessment criteria, the broader societal expectations and cultural influences shaping their practices.
5. Community: Colleagues, staff, administrators, students, and leadership structures. Activities in this community would include collaboration and mentoring.

6. **Division of Labour:** Responsibilities are distributed between design teams, co-convenors, and support staff. Activities include year planning, administrative duties, teaching, running assessments, providing feedback, research, and committee work.

The interactions between components one to six above illustrate how *BrightSparks* engages with tools and artefacts, abides by rules and regulations, collaborates with colleagues, and contributes to the academic community. Their activities are shaped by their subjectivity, the goals they aim to achieve, and their interactions within their context. The Outcome is understanding *BrightSparks'* practices.

3.2.3 Activity System 2: Professional Development Activities

- **Subject:** The lecturers attending the PD activity.
- **Object:** To enhance their knowledge, skills, and teaching strategies to integrate ET (TPACK).
- **Tools:** The PD course, course material, ET, which could include interactive tools, forums, and evaluation.
- **Rules:** The rules of participation and interaction are set by the PD organisers, as well as a code of conduct.
- **Community:** Other attending lecturers, the organisers, administrators, and faculty leadership.
- **Division of Labour:** Participating in sessions, discussions, and workshops, providing feedback, and applying new knowledge and skills in their teaching contexts.

The interconnection and interactions at play are how the Subject and the lecturer interact:

- Tools and artefacts (for example, reading materials, technology) to acquire new knowledge or skills.
- The Community (for example, colleagues' professional networks) provides support, feedback, and collaborative opportunities.
- The Rules and regulations (institutional policies and professional standards) shape the lecturer's actions and guide the PD process.
- The Division of Labour involves allocating tasks and responsibilities within the activity system.

3.2.4 Contradictions in CHAT

CHAT emphasises that knowledge, learning, and context are deeply intertwined and mutually constitutive. Learning and knowledge are not isolated from their context but are continuously shaped by and contribute to the social and cultural activities in which they occur (DeVane & Squire, 2012). In CHAT, knowing is action, manifested through social activity and composed of tools, language, and social interactions. The tensions between and within activity systems emerge as contradictions that could lead to evolution. These contradictions identify sources of change, development, and conflicts within the activity systems, which help determine a framework for how PD should happen.

In CHAT, contradictions are the primary drivers of change. Engeström (2001) identified four categories of contradictions. In this research, the goal is to identify these contradictions and the category in which they fall. The fundamental contradictions can be within elements of a system (primary) or between elements of a system (secondary). More complex contradictions would be between the Object of an activity system and the same system but in its more advanced form (tertiary) or between objects of different activity systems (quaternary). In the context of this research, the emphasis is on how *BrightSparks* have learned to use ET and what is taught in PD activities at the institution. A contradiction might occur when there is group work – each student aims to learn and succeed, but the group's goal is to complete a collaborative assignment (Nel & Brink, 2019).

Contradictions between lecturers and students might arise if the Rules of the lecturer's activity system, such as a strict grading policy, conflict with the Rules of the students' activity system, such as the expectation of fair grades. Another contradiction might arise if the lecturer's teaching style or chosen tools (Subject) are ineffective for the student's learning preferences or available tools (Object, student learning). The lecturer might adapt their tools or teaching methods in response to student feedback, leading to changes in both activity systems (Nel & Brink, 2019).

Contradictions between lecturers attending PD and the organiser of the PD might arise if the organisers' concept of effective PD does not align with the lecturers' expectations or needs. Another contradiction could occur if the tools provided by the organisers, such as the learning platform or presentation format, are not perceived as user-friendly for the lecturers. This creates a tension

between the intended purpose, enhancing skills, and the practical usability of the tools. Organisers might change the PD activity based on feedback from the lecturer community, leading to changes in both activity systems (Uzorka & Olaniyan, 2023).

3.3 TPACK

TPACK, conceptualised by Mishra and Koehler (2006), posits that effective technological integration emerges from the dynamic interplay among various knowledge domains. This integration necessitates the concurrent and interdependent functioning of this knowledge to facilitate the incorporation of ET into teaching. Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK) are the three basic types of knowledge that make up the TPACK framework. Technological Pedagogical Information (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), and TPACK are the result of the intersections of these various categories of knowledge. For effective technology integration in education, lecturers can better understand integration using the three types of knowledge described above.

Koehler and Mishra's (2009) TPACK framework measures lecturers' usage and integration of ETs. The framework takes cognisance of the ideal use of ET in which there is a balanced synthesis of the content, pedagogical and technological knowledge:

- Content Knowledge, the knowledge, expertise, and understanding a lecturer has of the subject in which they are attempting to help students develop competent cognitive levels for the course or subject.
- Pedagogical knowledge, the knowledge and understanding of the learning theories, such as constructivism and connectivism, that lecturers have about assessment, reflective practice, effective teaching, and instructional strategies used in their teaching.
- Technological knowledge, lecturers' understanding of ETs and their ability to integrate the appropriate technologies into their teaching practices to enhance student learning.

The TPACK framework requires lecturers to uncover a flexible type of knowledge in which these three types intersect and to avoid engaging them in isolation. Figure 3.3 shows how and where framework components intersect (Koehler et al., 2011). It is a model for a lecturer designing a curriculum which uses technology effectively and can respond to new developments using ETs. This framework will measure lecturers' competence in integrating ET using seven indicators, which are

combinations of these three types of knowledge (Wu et al., 2016): TK, PK, CK, TPK, TCK, PCK, and TPACK.

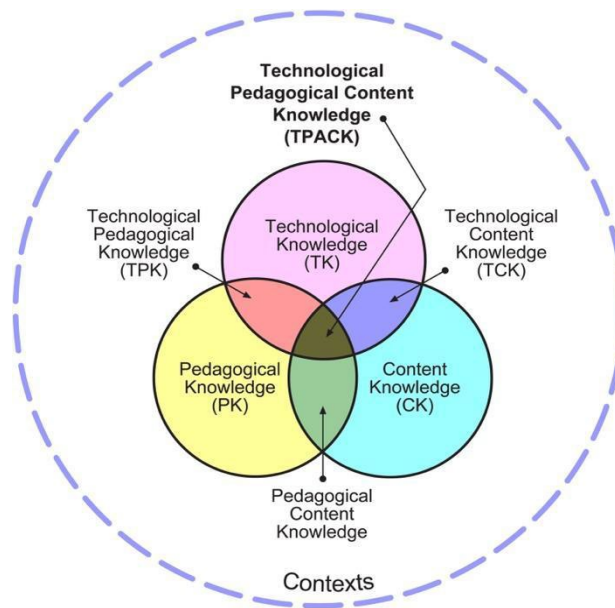


Figure 3.3: TPACK Framework, Intersections of Knowledge Types (Wu et al., 2016)

TPACK is used to analyse *BrightSparks'* practices and inform the development of a PD framework designed to cultivate key *BrightSparks* characteristics among lecturers. Specifically, the PD activity will need to model integrating technology, content, and pedagogy in a way that mirrors *BrightSparks'* effective practices. This approach, known as learning technology by design (Mishra & Koehler, 2006), enables lecturers to develop a contextualised understanding of ET integration. Through this process, lecturers will gain technical skills and the ability to make pedagogically sound decisions about technology use, fostering adaptability, innovation, and self-directed learning, core attributes of *BrightSparks*.

TPACK can reveal how ET is used in pedagogy and presenting content; it will thus help me determine if technology, pedagogy, and content are independent or co-dependent, integrated constructs. It will indicate if lecturers understand the complex relationship between content, pedagogy, and technology. TPACK empowers me to conceptualise and view a complex web of relationships in a methodological and grounded manner. Not only will this allow me to assess what effective teaching with technology is, but it will also enable me to gain an understanding and insight into the context in which good teaching happens, thereby facilitating PD professionals' capacity to help lecturers

develop a better learning environment. Given the centrality of 'context' in CHAT and the research literature, it would seem that it would be more beneficial to have learning environments that allow lecturers to explore technology about content and pedagogy in an authentic context. This approach goes beyond the traditional PD focus on content knowledge and pedagogy practices.

Technology integration in education has become increasingly prevalent in the digital age. However, introducing technology into classrooms without considering pedagogy and content can lead to ineffectiveness and not attaining learning outcomes. In order to overcome this challenge, TPACK is a framework that highlights the synergistic relationship between technology, pedagogy, and content knowledge (Mishra & Koehler, 2006). Effective teaching with technology requires more than just technological proficiency. It asserts that lecturers develop a unique knowledge base to allow the integration of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK) (Koehler & Mishra, 2009). This integration is crucial for aligning technology with learning outcomes, enhancing pedagogical approaches, and deepening students' understanding of the subject matter.

By considering TPACK, lecturers gain a deeper understanding of how technology can be purposefully used to support instructional goals and improve student learning outcomes. The framework guides lecturers in selecting appropriate ETs and resources that align with pedagogical strategies and content objectives (Angeli & Valanides, 2009). This alignment ensures that technology integration is meaningful and enhances the learning experience. Moreover, TPACK recognises the dynamic nature of teaching with technology. It acknowledges that the effective integration of technology evolves with advancements in pedagogy and the technology itself (Koehler & Mishra, 2009). Thus, TPACK provides a flexible framework that supports ongoing PD, encouraging lecturers to continuously update their knowledge and skills in response to changing educational contexts and technological advancements (Ertmer et al., 2012).

Therefore, the rationale for using TPACK lies in its ability to address the complexities of technology integration by considering the interplay between Technological Knowledge, Pedagogical Knowledge, and Content Knowledge. By considering TPACK, lecturers can purposefully integrate technology into their teaching practices, ensuring that it enhances pedagogy and supports content

objectives. It guides ongoing PD and encourages lecturers to adapt their practices in response to evolving pedagogical and technological landscapes.

3.4 CHAT and TPACK

In research, the application of CHAT and TPACK has been instrumental in advancing an understanding of educational practices and technology integration. CHAT, in particular, serves as a robust analytical tool and methodological framework for examining learning as a social and cultural phenomenon, especially in complex environments (Vygotsky, 1978; DeVane & Squire, 2012). For example, it has been applied to explore the ontological and epistemological underpinnings of research methodologies, enhancing practice-based learning and reflection during inclusive education fieldwork (Hancock & Miller, 2017; Qureshi, 2021; Grimalt-Álvaro & Ametller, 2021). Furthermore, CHAT has been leveraged to investigate equity-oriented organisational and systems change, enabling researchers to analyse systemic inequities within HE (Engeström & Sannino, 2010).

Operationalising CHAT has been advanced by scholars offering practical methodologies. Mwanza's (2002) Activity-Oriented Design Method provides an Eight-Step Model to systematically identify contradictions and mediating tools in activity systems. Initially developed for Human-Computer Interaction, this framework is highly adaptable to examining health sciences lecturers' technology integration. It offers a practical lens for understanding how *BrightSparks* navigates and reshapes their PD environments. Similarly, Rambe's (2012) application of CHAT to digital contexts, mentioned in section 2.5.2, such as cognitive scaffolding on Facebook, underscores how online platforms can challenge and transform traditional educational power dynamics. These findings resonate with *BrightSparks*' ability to adapt and innovate within diverse technological ecosystems. Together, these works demonstrate how CHAT can be applied to uncover the tensions, contradictions, and transformations that shape lecturers' practices in integrating ETs.

CHAT highlights how PD influences lecturers' practices through the evolving relationships between the Subject (lecturer), Object (ET), and other elements of an activity system. For instance, the activity system of PD may introduce ET as an Object, leading to quaternary contradictions between the PD system and institutional policies or lecturers' existing practices. These contradictions force lecturers to either reject technology or learn to integrate it into their teaching. As ET transitions from an Object to a Tool, secondary contradictions may emerge between ET and other elements,

such as Rules or Division of Labour, requiring lecturers to adapt, accommodate, or transform their practices. If transformation occurs, tertiary contradictions may arise between the transformed system and related systems, prompting further change and adaptation. This dynamic evolution of activity systems makes CHAT an essential framework for understanding the complex processes underlying lecturers' technology integration.

While CHAT provides a sociocultural lens to analyse the broader systemic and institutional dynamics, TPACK focuses on the interplay of pedagogy, technology, and content knowledge in the teaching process (Koh, 2013). Koh's (2013) rubric for assessing lesson activities offers a practical tool for evaluating meaningful ICT integration and informs the design of a PD KF4TT. Her emphasis on active, authentic, and cooperative learning aligns with CHAT's focus on mediated activity and collective transformation.

The growing popularity of TPACK is evidenced by its extensive application across diverse educational contexts. It has been pivotal in conceptualising the knowledge categories lecturers require for effective technology integration in disciplines ranging from health education to the humanities (Adipat, 2021; Lee et al., 2022; Ait Ali, El Meniari et al., 2023). Numerous studies have operationalised TPACK to explore and measure how in-service teachers develop and apply this integrated knowledge using qualitative methodologies (Luo & Zou, 2022). TPACK provides a micro-level lens to understand how lecturers combine technological, pedagogical, and content knowledge in meaningful and transformative ways.

3.4.1 CHAT and TPACK as Integrative Frameworks

CHAT and TPACK together provide complementary perspectives for analysing ET integration. While CHAT emphasises the macro-level focus on systemic contradictions and sociocultural influences, TPACK examines the micro-level interplay of knowledge domains required for effective ET integration. Importantly, CHAT uncovers the systemic and institutional factors that mediate TPACK's development, revealing how sociocultural elements, such as institutional rules, professional hierarchies, and collaborative practices, influence lecturers' ability to enact TPACK. For example, systemic tensions, such as conflicting institutional priorities or limited resources, shape how lecturers adapt and implement technology. By situating TPACK within the sociocultural lens of CHAT, this study emphasises that TPACK does not develop in isolation but is dynamically mediated by the

broader context in which lecturers operate. Hence, these frameworks will illuminate how *BrightSparks* navigate institutional constraints, leverage peer collaboration, and effectively integrate its technological, pedagogical, and content knowledge to transform teaching and learning. While integrating CHAT and TPACK offers a comprehensive analytical approach, it also presents methodological and conceptual challenges that must be acknowledged.

First, the two frameworks operate at different levels of analysis, CHAT examines systemic, collective activity while TPACK focuses on individual knowledge domains, creating potential tension in reconciling these perspectives. For example, when analysing a lecturer's technological knowledge (TK), TPACK might focus on their technical skills, while CHAT would consider how institutional rules and community norms shape the development and application of those skills. This difference in analytical focus requires researchers to carefully navigate between individual knowledge construction and sociocultural mediation. Second, the frameworks employ distinct vocabularies and conceptual structures. CHAT's emphasis on contradictions, mediating artefacts, and activity systems may not directly map onto TPACK's knowledge domains, creating challenges in developing coherent analytical frameworks that honour both traditions. Researchers must establish clear methodological strategies for integrating analyses across these frameworks without oversimplifying either. Despite these challenges, the complementary nature of CHAT and TPACK extends beyond their macro-micro relationship. CHAT enriches TPACK by revealing how technological knowledge is not merely an individual cognitive attribute but emerges through participation in communities of practice and engagement with cultural tools. Conversely, TPACK brings specificity to CHAT's broader sociocultural lens by identifying the precise knowledge intersections where transformation occurs in teaching practice. Together, they create a dialectical relationship where individual knowledge development (TPACK) both shapes and is shaped by the broader activity systems (CHAT) in which lecturers operate. Furthermore, this integration allows for a more nuanced analysis of power dynamics in technology adoption. While TPACK might identify knowledge gaps, CHAT reveals how institutional hierarchies and policies may create systemic barriers to developing that knowledge. This dual perspective is particularly valuable in health sciences education, where professional hierarchies and disciplinary traditions strongly influence technology adoption patterns.

The integrated approach in the domain-specific context of health sciences enables a holistic understanding of how *BrightSparks* engages with PD and navigates the challenges of integrating

technology into their teaching practices, which will inform the development of the KF4TT. The framework design seeks to support lecturers' professional growth by addressing the sociocultural and pedagogical dimensions of technology integration. Thus, integrated CHAT and TPACK lay the foundation for designing effective and sustainable PD initiatives in health sciences. The diagram below illustrates this integration, showing how CHAT and TPACK highlight the broader sociocultural contexts and the specific knowledge domains required for effective technology-enhanced teaching.

The overlap between CHAT and TPACK in the framework represents their integration in this research. It reflects the importance of examining systemic activity systems and the interplay of technology, pedagogy, and content knowledge to understand how lecturers effectively adopt and implement ETs. Within this integration:

- CHAT concepts include the "lecturer," "teaching pedagogy," and "effective teaching," all of which are shaped by the interactions within teaching and PD activity systems.
- TPACK concepts include technology, pedagogy, content knowledge, and technology integration in teaching, which emphasise the interdependence of these elements for pedagogical innovation.

The integrated conceptual framework visually represents these key concepts and their connections within the CHAT and TPACK frameworks (Figure 3.4). It highlights their relevance to understanding PD and how lecturers engage with technology, pedagogy, and content knowledge to create effective teaching practices. This synthesis underpins the research focus on fostering PD frameworks that promote the transformative integration of ETs.

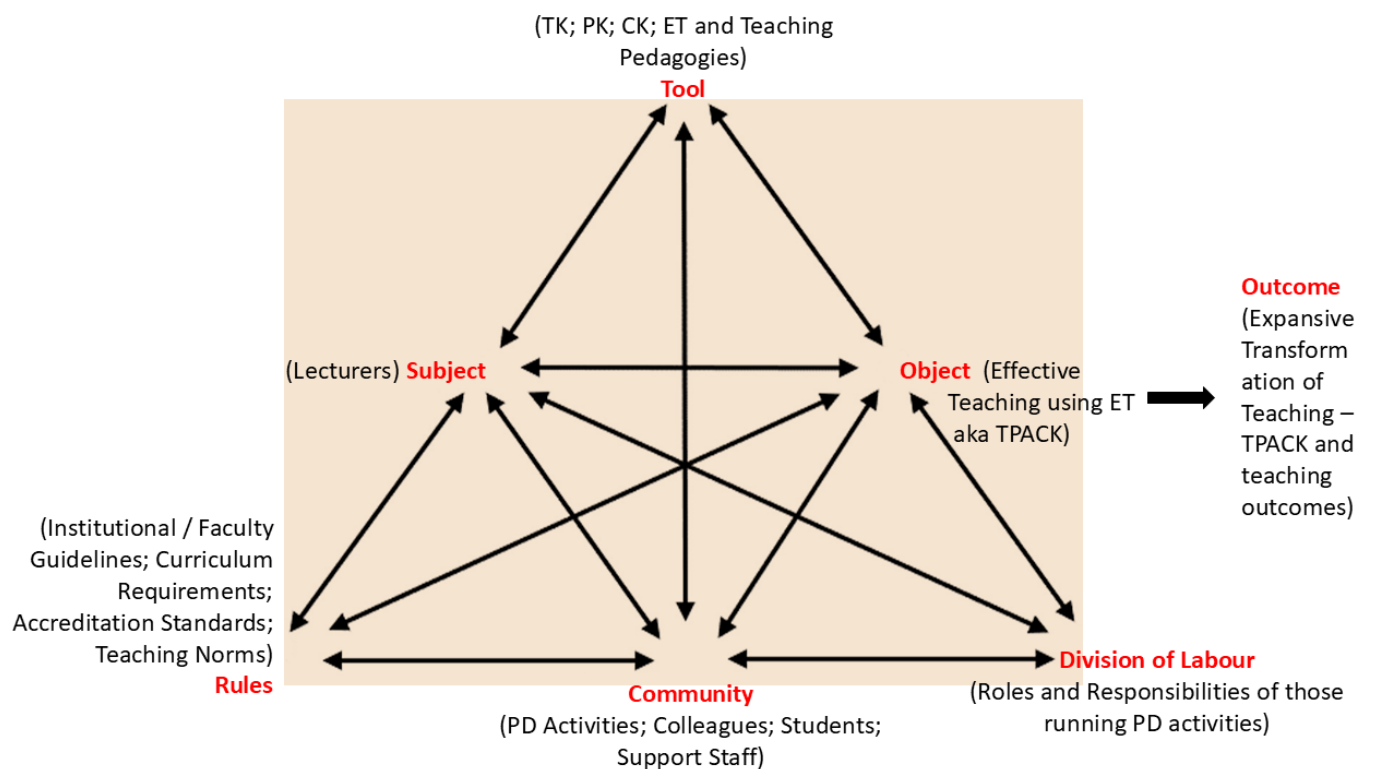


Figure 3.4: Integrated Conceptual Framework

Within this activity system, lecturers serve as the primary subjects, driven by their motives and intentions to achieve the Objective of effective teaching using ET. This goal ultimately aims to foster an interconnected understanding of technology knowledge (TK), pedagogy knowledge (PK), and content knowledge (CK), collectively conceptualised as TPACK. To pursue this objective, lecturers draw upon various Tools and Mediating Artefacts, including their TK, PK, CK, relevant teaching pedagogies, and ET. These Tools are employed within a framework of Rules, such as institutional policies, PD guidelines, curriculum requirements, and accreditation standards, that define the constraints and expectations placed on teaching practice. Lecturers also operate as part of a broader Community, encompassing PD activities, colleagues, students, and support staff, where knowledge, norms, and values are shared. Although TK, PK, CK and ET are located in the Tool node, the bidirectional arrow to Community indicates that these knowledge domains are socially negotiated, shared and refined within PD activities, collegial interactions and wider institutional networks. Meanwhile, the Division of Labour allocates specific roles and responsibilities to different actors in designing, facilitating, and participating in PD initiatives, shaping how lecturers learn and enact TPACK. The Outcome of this system is the transformation of teaching practice, whereby lecturers effectively integrate ET and enhance student learning outcomes.

3.5 Critique of CHAT and TPACK

CHAT offers valuable perspectives but is complex due to its many interconnected elements and explanations of these elements. Concepts like the Division of Labour might be unclear and complex to use in research, making comparisons across studies challenging. The emphasis on context-specificity also makes it difficult to do comparative or repeat studies for reliability and not rely only on qualitative approaches. This complexity stems from its reliance on qualitative methods, which might deter researchers who favour quantitative approaches. Additionally, while CHAT aims to simplify the understanding of human activity, it may sometimes oversimplify certain concepts (Ayub et al., 2023). This becomes evident when the role of power and hierarchy needs to be addressed, as they are influencing factors that operate across systems. Furthermore, complexities and subtle contradictions within and between activity systems can be challenging to measure and analyse. It is, therefore, essential to be cognisant that while CHAT provides a valuable framework for understanding complex, socially situated phenomena, these limitations and challenges need to be taken into account in research design (Al-Ali, 2020; Sannino & Engeström, 2018).

TPACK has been widely used in ET, but it has limitations and challenges that have been addressed in the literature as follows:

- Complexity: Angeli and Valanides (2009) acknowledge that the TPACK framework, with its seven components, is quite complex, making it challenging, but not impossible, to operationalise and measure. Instruments developed to assess TPACK have often been criticised for their validity and reliability (Archambault & Barnett, 2010).
- Lack of guidance: While TPACK identifies the knowledge types required for effective technology integration, it needs to provide a clear roadmap or strategies for developing this knowledge. It should provide more practical guidance for teacher training and PD in technology integration (Koehler et al., 2013).
- The vagueness of boundaries: The boundaries between the multiple types of knowledge in the TPACK framework need to be clarified. It is challenging to separate and differentiate these overlapping knowledge domains, especially in practical contexts. For instance, distinguishing between what constitutes technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPACK) can be complex (Graham, 2011).
- Technocentric focus: Some critics argue that TPACK can be too technocentric, with an excessive focus on the technology rather than the pedagogical practices and learner needs.

This might lead to an overemphasis on finding a use for technology at the expense of teaching and learning goals (Hamilton et al., 2016).

- Static nature: The TPACK framework is criticised for its static nature. It needs to adequately account for the rapidly changing nature of technology and the evolution of teaching and learning contexts (Voogt et al., 2013).

Despite these criticisms, it is essential to note that TPACK is a valuable lens for understanding the multifaceted nature of teacher knowledge required for effective technology integration.

3.6 Summary of Chapter

This chapter describes the application of CHAT and TPACK as pivotal theoretical frameworks in understanding *BrightSparks'* PD practices. My research investigates whether the deployment of TPACK, displayed by *BrightSparks*, informed by CHAT principles, aids in developing a PD knowledge framework that facilitates the integration of ET, thereby addressing the central research question: “Drawing on the theoretical perspective of CHAT, how does *BrightSparks'* application of technological pedagogical content knowledge inform the advancement of a PD KF4TT using ET?

TPACK is instrumental in this study, providing a lens through which the essential knowledge lecturers need for effective technology integration into pedagogy is outlined. It elucidates the constructive interaction between technology, pedagogy, and content knowledge, guiding the assessment of ET incorporation into *BrightSparks'* teaching practices. CHAT offers a comprehensive theoretical perspective to scrutinise the collective, tool-mediated actions within *BrightSparks'* educational setting by focusing on collective human action, knowledge acquisition through first-hand experiences, and the significance of community in the meaning-making process. This approach facilitates analysis of lecturers' evolving activity systems and PD initiatives, emphasising collective learning actions and resolving contradictions to foster expansive learning. By integrating CHAT and TPACK, this study aims to discover how *BrightSparks'* approach to PD and ET integration transforms their teaching practices, identifying PD strategies for ET. This dual-framework analysis sheds light on the intricate dynamics of technology integration in pedagogy. It offers insights into developing a PD framework that could empower lecturers to refine their practices using ET.

I further delve into the activity systems surrounding PD, where the lecturer is the Subject, aiming to enhance their practice with the necessary skills and knowledge for successful ET integration. The

analysis acknowledges potential contradictions within these systems, such as discrepancies between lecturers' expectations and the PD provided, and how these contradictions drive changes within the activity systems. CHAT and TPACK together enable an understanding of the sociocultural context shaping lecturers' efforts to develop and apply TPACK, highlighting the interplay of rules, community, and Division of Labour in this process.

Despite the rich insights offered by CHAT and TPACK, challenges arise from their complexity and the dynamic nature of educational systems. The study addresses these challenges by meticulously applying both frameworks to dissect the multifaceted phenomena of PD and technology integration, providing an integrated conceptual framework that illustrates the interconnectedness and relevance of CHAT and TPACK in understanding effective teaching with technology. This integration acknowledges the methodological challenges of combining frameworks that operate at different analytical levels and employ distinct conceptual vocabularies. It also leverages their complementary perspectives to develop a more comprehensive understanding of technology integration in health sciences education. In the next chapter, I will describe the methodology employed in this study.

Chapter 4 Methodology

4.1 Overview

In this chapter, I present the methodology adopted to investigate the development of a pedagogical competencies framework for integrating ETs through PD. The CHAT theory underpinning this study provides a macro-level lens for understanding *BrightSparks'* practices in light of systemic tensions, sociocultural mediation, and historical influences (Engeström, 1987; Van Der Merwe, 2015). Focusing on activity systems enables this research to explore how lecturers navigate systemic contradictions, such as misalignments between faculty goals and PD practices (Hardman, 2008; Rambe & Bere, 2014). As explained in the previous chapter, it is integrated with TPACK, which offers a micro-level framework for examining how lecturers integrate technology, pedagogy, and content knowledge in their practices. Insights from this integrated theoretical framework were drawn to inform the advancement of a PD K4TTF in Health Sciences. The sequential mixed methods approach enables the study to provide statistically robust and contextually rich insights into *BrightSparks'* practices. (Johnson & Turner, 2003; Creswell & Plano Clark, 2017).

4.2 Research Question

CHAT informs the research question and guides how this study explores the influence of institutional rules, community expectations, and historical factors on *BrightSparks'* ability to innovate and integrate ET into their teaching practices (Hardman, 2005; Mwanza, 2002). For example, contradictions between institutional policies and lecturers' self-directed learning offer opportunities for understanding how PD activities can be enhanced. This research study's central question is: Drawing on the theoretical perspective of CHAT, how does *BrightSparks'* application of technological pedagogical content knowledge inform the advancement of a PD KF4TT using ET?

Table 4.1: Overview of the Research Process

Sub Questions	Primary data sources	Method of data analysis
How do lecturers develop TPACK competencies to integrate technologies to facilitate learning?	Survey	TPACK
How is the integrative use of ET through <i>BrightSparks</i> developed and influenced by CHAT?	Semi-Structured interviews	CHAT

If so, how has the blend of structured and self-directed learning PD activities influenced <i>BrightSparks</i> ' ability to integrate ET into their teaching?	Survey	CHAT
What can be learned from <i>BrightSparks</i> to inform the design and implementation of a PD KF4TT that allows for the integration of ET by FHS lecturers?	Semi-Structured interviews	CHAT and TPACK

4.3 The Theoretical Framing of the Study

CHAT, with its emphasis on sociocultural contexts and mediated actions, directs the methodological approach towards understanding the broader sociocultural influences on lecturers' use of ET (Engeström, 2001). In order to undertake an in-depth exploration of lecturers' experiences, perceptions, and sociocultural factors influencing their engagement with ET, semi-structured interviews have been selected as the data collection method.

CHAT's constructs, Subjects, Tools, Rules, Community, Division of Labour, and Contradictions, are operationalised in this study to analyse *BrightSparks*' practices. Contradictions within activity systems, for example, tensions between formal PD initiatives and informal learning practices, serve as catalysts for expansive learning and innovation (Engeström, 1987; Hardman, 2008). As Hardman (2005) highlighted, these tensions demonstrate how systemic challenges in 'unequal terrains' drive transformative pedagogical practices. Similarly, Rambe and Bere (2014) emphasise that mediating tools, such as ET, play a pivotal role in reshaping educational practices within activity systems. Interview questions are designed to uncover instances where these components are misaligned, leading to challenges or conflicts in practice. This approach allows the data to be analysed through CHAT, revealing themes that highlight contradictions and offering more profound insights into the complexities of ET integration (Engeström, 1987; Larsen et al., 2017).

Simultaneously, TPACK, as an additional lens, played a crucial role in designing the survey instrument. TPACK's focus on the interplay between technology, pedagogy, and content knowledge informed the creation of survey items to assess lecturers' competencies in these areas (Dalal et al., 2021). Its principles ensure that the survey quantitatively measures how lecturers integrate technological knowledge with pedagogical and content knowledge. The survey responses are

subjected to statistical analysis to discern technological knowledge levels and establish correlations with other TPACK components (Mishra & Koehler, 2006; Schmidt et al., 2009; Beri & Sharma, 2021).

During the analysis phase, CHAT and TPACK offer integrated data interpretation lenses. CHAT provides a framework for analysing how sociocultural contexts, institutional policies, and historical influences, significant events like the COVID-19 pandemic and the evolving technological demands, shape lecturers' use of ET (Van den Beemt & Diepstraten, 2016). The historical and institutional influences underscore CHAT's focus on sociocultural mediation. For example, Bozalek et al. (2015) highlight how institutional contradictions drive transformative practices in HE, such as the disparity between policy goals and available resources. This perspective informs the analysis of *BrightSparks'* ability to innovate within these constraints. TPACK offers a micro-level framework for understanding the integration of technology, pedagogy, and content knowledge. It examines survey responses, shedding light on how lecturers blend technological, pedagogical, and content knowledge. Koh (2013) operationalised TPACK through a rubric for assessing lesson activities, emphasising active, authentic, and cooperative learning, which aligns with CHAT's focus on mediated activity and collective transformation. The interviews and surveys reveal the cognitive and practical realities of lecturers' engagement with CHAT and TPACK, providing evidence to inform theory and practice (Archambault & Barnett, 2010; Foot, 2014).

Thus, integrating CHAT and TPACK in the methodology is pivotal in shaping the research design, particularly for data collection methods like surveys and interviews. These frameworks guide the development of research tools while offering a rich theoretical base for examining and interpreting the data. This ensures a nuanced understanding of the complex dynamics involved in integrating technology into educational settings.

4.4 Research Design and Data Collection

The integrated theoretical frameworks informed the choice of a sequential mixed-methods study design. It involves conducting research in distinct phases, usually quantitative, followed by qualitative methods (Teddle & Tashakkori, 2006), as was done in this study. The value of combining the methodologies is that it enhances the depth and breadth of comprehension. The qualitative component, which focuses on exploring and understanding complex phenomena, captures rich contextual information and examines lecturers' subjective experiences (Creswell & Plano Clark,

2017). In contrast, the quantitative aspect emphasises numerical measurement, statistical analysis, and the generalisability of findings to larger populations.

Employing a mixed methods approach allows for comprehensively addressing the research questions, achieving a convergence of results, and providing a nuanced, holistic understanding of my research (Tavakol & Sandars, 2014). It is particularly valuable for understanding multiple contextual factors requiring a multi-dimensional perspective (Creswell & Plano Clark, 2017). The methodological approach offers flexibility in data collection and analysis techniques, promotes a comprehensive interpretation of findings, and captures the data's breadth and depth (Johnson & Onwuegbuzie, 2004; Perez, 2023). This study involves collecting diverse data types that include interviews and surveys. The integration of findings offers more robust and well-rounded conclusions. Mixed methods, furthermore, potentially enhance the generalisability of results, contributing to the breadth of findings, while qualitative data provide depth (Greene, 2007; Teddlie & Tashakkori, 2006). However, because the quantitative strand relies on purposive (non-probability) sampling, any claims of generalisability are limited to analytic transferability rather than statistical inference. This approach, however, can be complex and time-consuming, necessitating proficiency in both qualitative and quantitative methods.

In this study, I demonstrate how each data type complements the other to enable greater sense-making of the data. In the following two chapters, I separate the quantitative and qualitative findings, allowing each to contribute uniquely to the research question, the former identifying general trends and patterns, the latter, the underlying reasons, motivations, and contexts behind those trends.

This chapter additionally discusses the limitations and integration challenges of the overlap between the quantitative and qualitative findings. However, the overlap also reinforces the validity of the results. The overlap suggests convergence or corroboration between methods, strengthening the study's conclusions. However, an attempt is made to ensure that the quantitative and qualitative data maintain their distinct voices and contributions to this research. By organising my findings, highlighting each method's unique insights, and synthesising them effectively, I can enhance the clarity and impact of my research, which advances my understanding of this research topic.

4.4.1 Lecturers

BrightSparks were selected within this study's CHAT framework because of their capacity to navigate systemic tensions and contradictions in their professional environments. This aligns with Rambe's (2012) analysis of how systemic contradictions, such as those between formal norms and informal practices, drive innovation. Mwanza's (2002) Eight-Step Model was used to guide the design of research questions, ensuring alignment with CHAT principles, such as exploring Tools, Rules, and Community dynamics. The selected lecturers are from health sciences and teach undergraduate health professional students. Aiming for diversity in age, gender, and ethnicity, lecturers were chosen through purposive sampling (de Vos et al., 2005). Purposive sampling involves selecting individuals knowledgeable about the phenomenon being studied (Palinkas et al., 2015). Previous attendance records of seminars, workshops, and courses on ETs were considered to identify eligible lecturers. A key criterion was that these lecturers were exceptional in using ET as defined by the TPACK framework, demonstrating innovative and effective ET integration in their teaching. The sampling techniques and selection criteria were tailored to ensure the collected data were relevant, diverse, and representative of lecturers' practices and perspectives in integrating ET. This approach ensures that the study's findings are robust, credible, and reflective of the real-world complexities of ET usage in a health sciences setting. Criteria considered for inclusion of lecturers:

- Were employed in the FHS at UCT and instructed undergraduate students.
- Have attended faculty-based PD programmes or activities.
- Presented work at faculty or institutional levels at some forum, committee, or conference.
- Represent the diversity of lecturers in this health sciences context.

Eligible lecturers were contacted via email and asked to complete a survey detailing their use of ET, involvement in PD, and their perceived level of agency. Of the 57 lecturers who formed the accessible population, 32 completed the survey, yielding a 56% response rate, providing an adequate quantitative base for descriptive statistics (Fincham, 2008). Of those who completed the survey, which indicated their ET usage and PD attendance, 12 were selected for interviews. They were selected based on their survey answers regarding the level and use of ET in teaching. All 12 agreed. Two criteria support the choice of 12 interviewees. First, using Guest et al.'s (2006) saturation benchmark (6-12 for a homogeneous group), we aimed for the upper bound to ensure thematic redundancy. Second, applying Malterud et al.'s (2016) information-power model, a focused study aim, theory-led interview guide (CHAT and TPACK), and dense, criterion-based

sampling means fewer participants can still yield rich data. Including one or two lecturers from each undergraduate programme maximised heterogeneity within this manageable number, balancing depth with coverage.. Selecting one or two lecturers from each undergraduate programme ensured maximum variation while remaining within this recommended range. Participants represented all the undergraduate programmes in the faculty.

Table 4.2: Lecturers Interviewed

Alias	Gender	Rank*	Programme
Lecturer_YAD	F	AP	Prog1
Lecturer_NEI	F	L	Prog2
Lecturer_EZN	M	L	Prog3
Lecturer_RAM	M	SL	Prog4
Lecturer_NAM	M	L	Prog4
Lecturer_RED	F	SL	Prog4
Lecturer_GNE	F	L	Prog1
Lecturer_NOT	F	L	Prog2
Lecturer_AGN	F	L	Prog5
Lecturer_LLI	M	L	Prog4
Lecturer_EIN	F	SL	Prog5
Lecturer_LEH	F	L	Prog4

(*AP = Associate Professor; SL = Senior Lecturer; L = Lecturer)

According to the University of Cape Town (2022) Teaching and Learning Report, the FHS employed 506 academic staff in 2021, when data was collected. Women constituted 53 % of academic full-time equivalents, and the rank distribution was 25 % Lecturers, 37 % Senior Lecturers, 21 % Associate Professors and 16 % Professors.

Table 4.35 Demographic comparison – Interviewees vs FHS Academics

	Interview sample (n = 12)	FHS 2021	Representation
Gender	8 women (66.7 %) 4 men (33.3 %)	53 % women	Women over-represented; men under-represented

Rank	Lecturers 8 (66.7 %)	Lecturers 25 %	Lecturers strongly over-represented; SLs and APs under-represented; no Professors.
	Senior Lecturers 3 (25 %)	Senior Lecturers 37 %	
	Associate Professor 1 (8.3 %)	Associate Professors 21 %	
	Professor 0	Professors 16 %	

Source for FHS data (University of Cape Town, 2022: pp. 122–124)

Comparing the demographics with that of the faculty, the 12 interviewees comprised eight women (67 %) and four men (33 %), indicating a moderate female over-representation relative to the faculty profile. Regarding rank, Lecturers accounted for 67 % of the sample, far exceeding their 25 % share in the faculty. In contrast, Senior Lecturers (25 % vs 37 %) and Associate Professors (8 % vs 21 %) were under-represented, and no Professors were included. This skew reflects the study's purposive focus on lecturers most actively engaged in technology integration rather than an attempt to mirror the faculty's demographic proportions. Age distribution could not be benchmarked because the institutional report does not publish age data, and as previously indicated, participant ages were not collected either. The implications of this sample profile are revisited in the limitations section.

4.4.2 Survey

The survey data aimed to measure the integration and use of ET in content and pedagogy. The survey, containing 11 open and closed questions, utilised Likert scale items adapted from Chai et al. (2013) and Schmidt et al. (2009) to assess ET use. Tran's (2016) work validated this instrument through a content validation process (Yusoff, 2019). While the survey focused on ET use, more profound insights into lecturers' cultural values and beliefs were explored through interview questions.

The survey consists of two sections. The first, Section A, covers PD activities and consists of the following:

- Multiple-choice questions with numerical ratings. These ask lecturers about their attendance at PD activities and perceived importance.
- Multiple-choice questions with categorical ratings. These ask lecturers about reasons for attending PD activities and factors influencing using ETS.
- Open-ended Questions. These ask lecturers to specify curriculum changes related to ET and barriers to implementing these changes.

The second, Section B, asks demographic-related questions. There are open-ended questions about lecturers' teaching experience, qualifications, and courses taught. This information focuses on determining how they may relate to the responses in Section A. The online survey, chosen as an appropriate structured instrument for this study, included open and closed questions. It was based on a survey developed by Tran (2016) for a study which used CHAT as a theoretical framework and considered the PD of high school teachers.

The combination of Likert scales, numerical scales, categorical scales, and open-ended responses ensures that the survey can capture a nuanced and multi-dimensional view of the lecturers' experiences and perceptions. The Likert scale items selected were informed by other researchers (Kvale & Brinkmann, 2009; Chai et al., 2013; Schmidt et al., 2009). In addition to obtaining valuable data, the aim was to identify lecturers excelling in ET integration and gather comprehensive insight into lecturers' experiences and views on PD activities, ET, the influence of ET on the curriculum, and how ET has been implemented. Ultimately, developing awareness of the design of PD programmes and the role of ET in curriculum and its support within the educational institution (Appendix B-Survey). In terms of psychometric properties, the careful design of the scales and the inclusion of validated statements (Tapal et al., 2017) contributed to the reliability and validity of the questions.

A pilot phase and Content Validity Index (CVI) increased the psychometric integrity of the survey to ensure that it accurately and consistently measures the intended constructs (Yusoff, 2019). According to Shi et al., "Content validity is the degree to which an instrument has an appropriate sample of questions for the construct being measured and is an important procedure in scale development" (Shi et al., 2012: p152). The survey's reliability, credibility and validity were bolstered through careful design and the inclusion of validated statements (Yusoff, 2019). This was done to ensure an appropriate sample of questions in the survey for what is being measured (Creswell & Miller, 2000; DeVellis, 2017).

As part of the CVI process, a draft survey was sent to lecturers who have retired or left UCT to obtain feedback regarding the language, completeness, and types of questions utilised. These lecturers had characteristics like those of the intended lecturer population, instructing undergraduate students and showing interest in ET by attending previous PD activities or presenting at events at UCT. Their

written feedback related to the clarity of questions, scales used, time spent, formatting, and sequencing of questions. The survey was subsequently edited to address the issues raised. Their input led to a revised survey, which ensured user-friendliness and relevance. In addition, in responding to one of the suggestions, the order of questions was amended to lessen question fatigue. Finally, the survey was distributed via SurveyMonkey, chosen for its ease of use and ability to keep individual responses confidential (complete anonymity was impossible because participants were recruited by name).

4.4.3 Semi-Structured Interviews

Employing semi-structured interviews offers a balanced data collection approach that enables the gathering of detailed, in-depth data and allows for flexibility to explore unforeseen topics or themes that may emerge during interviews (Kvale & Brinkmann, 2009; Janghorban et al., 2014). This method is particularly beneficial for investigating complex, nuanced phenomena, such as integrating ET into pedagogical practices, as it allows for an understanding of lecturers' perspectives, motivations, and experiences. Field notes were kept to enhance the research design's robustness (Kvale & Brinkmann, 2009). They are a critical reflective tool, enabling the researcher to document thoughts and reflections immediately after each interview. This practice not only aids in capturing the richness of the data but also assists in identifying and addressing any potential gaps or inconsistencies. Including field notes in the methodology demonstrates a meticulous approach to data collection and analysis, ensuring that the research captures the complexity and dynamism of the real-world setting in which ET is being integrated.

Combining the qualitative data from the interviews with the systematic reflection offered by field notes underscores the commitment to a comprehensive and multi-dimensional topic exploration. It provides a rich, contextualised understanding of how ET is embedded within the pedagogical practices of lecturers. Moreover, the guided development of interview questions, informed by CHAT and TPACK, ensures a grounding in academic discourse, contributing to the study's relevance. Questions were designed to explore how institutional rules, community expectations, and the Division of Labour influence *BrightSparks'* integration of ET (Hardman, 2005; Rambe & Bere, 2014). Key topics and questions aligned with the research objectives were outlined and designed to be open-ended, allowing for detailed responses and follow-up queries based on lecturers' answers. Before the interviews, each lecturer received an information sheet explaining the study's purpose,

the interview process, and the handling of the collected data. Informed consent was obtained from all lecturers, ensuring they understood their participation was voluntary and confidential.

The interviews were conducted online via Microsoft Teams at times convenient for participants (Janghorban et al., 2014). Care was taken to ensure that lecturers felt comfortable. They all selected to switch on their cameras, allowing me to observe participants' nonverbal cues, facial expressions, and body language. These cues provided valuable context and allowed eye contact. None of the participants requested to switch to audio-only, the semi-structured nature of the interviews allowed for a flexible yet focused conversation. With the participants' consent, the interviews were recorded on Teams for accuracy, supplemented by notes taken during the discussions. Each interview was planned to last approximately 60 minutes, though this duration was shorter for some lecturers based on the depth of the conversation. Following each interview, the recordings were transcribed with minor edits for readability (e.g., removal of filler words and repetitions) while remaining true to the speakers' intent. Field notes (Creswell, 2009) were made to capture immediate impressions, contextual factors, and potential areas of interest.

4.4.4 Quality Framework

This study attends to quality along two complementary dimensions, design quality, the methodological soundness of each strand, interpretive rigour, and the credibility of the inferences drawn. These dimensions are foregrounded in Teddlie and Tashakkori's (2010) mixed-methods quality framework and are applied separately to both the quantitative and qualitative components before being re-connected at the level of integration.

4.4.4.1 Quantitative Component Quality

As outlined in Section 4.4.2, the 11-item online survey was adapted from validated instruments (Chai et al., 2013; Schmidt et al., 2009) and refined through a content validity index (CVI) and pilot feedback from lecturers with similar profiles to the target population. The expert-review process confirmed item relevance and clarity, while the CVI prompted minor wording changes and removal of redundancies. Subsequent psychometric checks on the 32 returned cases yielded satisfactory results: exploratory factor analysis reproduced the expected three-factor structure (technology use, PD engagement, perceived agency) with loadings $> .60$, and internal-consistency estimates were

high (Cronbach's $\alpha \geq .80$ for each scale). These steps align with Teddlie and Tashakkori's (2010) recommendations for rigorous instrumentation in mixed-methods studies.

Given the purposive nature of the sample, survey findings are interpreted as analytically transferable rather than statistically generalisable. Descriptive statistics map the breadth of technology use across the faculty and inform the purposeful selection of interviewees, thereby strengthening coherence between the quantitative and qualitative strands.

4.4.4.2 Qualitative Component Quality

As outlined in Section 4.4.3, 12 semi-structured interviews were conducted online via Microsoft Teams, guided by CHAT-TPACK questions and supported by field-note reflections. Participants were purposively selected from all undergraduate programmes to maximise variation while remaining within the 6–12-interview saturation range proposed by Guest et al. (2006).

Drawing on Schwandt et al. (2007) application of Egon Guba and Yvonna Lincoln's trustworthiness framework, four overlapping strategies ensured analytic quality:

- a) Credibility was enhanced through prolonged engagement in the faculty context and member checking, whereby each interviewee reviewed a summary of their transcript to confirm the faithfulness of interpretations (§ 4.4.3 for procedure).
- b) Transferability was addressed by providing a thick description of institutional structures and PD culture, enabling readers to gauge applicability to comparable settings (Tavakol & Sanders, 2014; Azungah, 2018).
- c) Dependability was supported by an audit trail, dated reflexive notes and supervisor debriefs documenting coding decisions and any procedural adaptations. Independent coders confirmed theme boundaries, resolving discrepancies through discussion.
- d) Confirmability was strengthened by continuous reflexivity in my dual role as E-Learning Manager and researcher; analytic memos tracked assumptions and how they were bracketed during interpretation (Schwalbach, 2003; Burns, 2009).

4.4.5 Ethics

The risks and discomfort associated with this study were minimal and not greater than those commonly encountered daily. While there may have been some minor inconvenience due to the

time and energy required from participants, every effort was made to fit in with their schedules and be as efficient as possible. This study was conducted following ethical practices for studying human subjects. Participation was voluntary, and informed consent was obtained (Appendix B). Participants could withdraw at any stage without facing any detrimental consequences. Each participant signed an information sheet, a confidentiality agreement, and an informed consent form. Ethics approval was obtained from the Faculty Human Research Committee, and permission was secured from the Human Resources Department to access participants. Data is stored on my password-protected laptop and hard drive to maintain privacy and confidentiality, and no identifying information is recorded. Furthermore, I transcribed all recordings to maximise confidentiality.

Ethical practices were crucial for ensuring research trustworthiness and protecting participants from harm (Suri, 2020). Suri (2020) emphasises the importance of competent practice and sensitive ethics for research credibility. Therefore, research was conducted ethically and competently to ensure credible findings guiding further research. The study adhered to accepted principles, practices, and procedures for stringent methodology and participant engagement (Zyphur & Pierides, 2017). The benefits to participants were the opportunity to review and reflect on their practices and receive acknowledgement of their contribution to innovative integrated teaching. Additionally, they experienced a sense of altruism in supporting their colleagues' PD as the study findings are being used to enhance the PD activities of other lecturers within the FHS.

4.4.6 Limitations of the Study

A purposive, criterion-based sample was used. Therefore, findings cannot be statistically generalised beyond this small group of health-sciences lecturers at the study institution. However, as an E-Learning Manager since 2008, I argue that even a small sample can yield in-depth insights into broader pedagogical patterns. Such qualitative perspectives complement the quantitative findings, offering a more comprehensive understanding of participant views and practices (Flyvbjerg, 2011; Harrison et al., 2017).

4.5 Data Analysis

The data collected from the surveys and semi-structured interviews were analysed using the research question, CHAT, and TPACK. CHAT offers a framework for analysing how the sociocultural context, institutional policies, and historical conditions, including noteworthy events like the COVID-

19 pandemic, influence lecturers' use of ET. This analysis was critical in interpreting interview responses where the sociocultural dynamics and institutional norms came to the forefront.

TPACK, on the other hand, aided in the detailed analysis of technology integration in teaching. This framework examined the survey responses, highlighting how lecturers blend technological, pedagogical, and content knowledge. The interviews and surveys reveal the cognitive and practical realities of lecturer engagement with sociocultural and technology knowledge (CHAT and TPACK), providing evidence to inform theory and practice (Archambault & Barnett, 2010; Foot, 2014).

4.5.1 Qualitative Data - Semi-Structured Interviews

CHAT's focus on contradictions informed the thematic analysis by identifying systemic misalignments and highlighting barriers and opportunities for ET integration. For example, to identify if there were tensions between institutional rules and *BrightSparks*' self-directed practices, which could be catalysts for transformative learning, as Hardman (2008) and Bozalek et al. (2015) found in their studies. Similarly, Rambe (2012) discusses how systemic contradictions could create opportunities for innovation, which would guide the analysis of interview data. The findings derived from the interviews were analysed through these lenses. The themes identified in the analysis corresponded closely to specific aspects of these frameworks, although several insights also emerged that extended beyond the predefined categories, reflecting the iterative and layered nature of the data. Organising the findings according to CHAT and TPACK within each research sub-question facilitated a clear demonstration of how these theoretical frameworks informed my interpretation of the data. Given my active role in coding and analysis, I engaged in reflexivity to acknowledge how my positionality may have influenced theme identification. This structure also allowed for the inclusion of emergent themes that extended beyond predefined categories, further illustrating their relevance within the broader sociocultural context of teaching and learning.

Using CHAT as an interactionist epistemology draws attention to the significant role of social interactions and cultural contexts in shaping human activities and knowledge processes. This interactionist stance is fully commensurate with an interpretivist paradigm because both view reality as socially constructed and meanings as emerging through human interaction (Cleland, 2017; Pervin & Mokhtar, 2022). CHAT was employed to understand and improve educational practices by considering both the interactionist nature of human activities and the epistemological insights it

offers into teaching and learning processes. The analytical framework provided a structured and consistent approach to systematically collect, organise, and analyse data to answer the research question. CHAT's key concepts shaped the data analysis framework, such as mediation, contradictions, and artefacts. The analysis aimed to uncover the complex network of factors shaping technology integration into teaching, reflecting the diversity of roles and experiences among lecturers. This diversity enabled the identification of common themes, trends, contradictions, and variations, providing a rich, detailed understanding of the systemic factors influencing technology integration into teaching.

Initial coding was conducted from the transcripts, incorporating pre-set terminologies in the theories rooted in the literature review and pilot study. Codes from CHAT and TPACK, quality, and pedagogy, among others, were identified and integrated into an Excel database alongside theoretical codes, themes, and additional codes. Participants were assigned aliases to ensure confidentiality, and any identifiable information was meticulously redacted. Each coded excerpt was collated into separate spreadsheets for the two activity systems, Appendix D1 (PD system) and Appendix D2 (ET system), which provide illustrative examples of the deductive CHAT/TPACK codes (e.g., Tool–Subject, Rule–Community). In this analysis, I used a purely deductive approach: all codes were derived a-priori from CHAT and TPACK concepts (e.g., Tool–Subject, Rule–Community, TK–PK overlap). No separate in-vivo or open codes were introduced because the theoretical framework was sufficiently granular to absorb all meaningful data segments. When lecturers' phrasing revealed nuance not covered by an existing label, the segment was nested as a sub-code inside the closest CHAT/TPACK category rather than treated as a new emergent code. This allowed me to maintain analytic coherence while still capturing variation, and the resulting coded excerpts fed directly into the contradiction analysis summarised in Tables 6.1 and 6.2.

Within the CHAT framework, the analysis delved into the dynamics of the activity system, focusing on how lecturers interacted with ET and how this interaction potentially influenced PD. The analysis aimed to uncover contradictions within and among the system's components, following Engeström's (1987) perspective of the activity system as the primary analytical unit. CHAT facilitated a nuanced understanding of the complex interplay within the activity systems identified in this study.

Engeström's Four Levels of Contradictions in Activity Systems:

1. Primary Contradictions: Appear within nodes such as Rules or Community.
2. Secondary Contradictions: This happens when tension exists between one node and another in the activity system.
3. Tertiary Contradictions Occur when an old activity system clashes with a more advanced version of the activity system.
4. Quaternary Contradictions: This happens when the primary activity system clashes with a neighbouring activity system.

Through a detailed examination of the artefacts and responses, the analysis sought to extract the more tacit aspects of lecturers' actions and understandings regarding their use of ET in professional practice. The data was dissected using categories derived from activity theory (e.g., subject position, tools, objects, rules, community, and division of labour), which led to the generation of thematic codes, both individual and interlinked (e.g., subject-tool, subject-rules, subject-object). The initial coding phase culminated in the identification of emerging contradictions, which were further examined through the lens of Engeström's four levels of contradictions in activity systems (Mukute & Lotz-Sisitka, 2012), providing a multi-layered understanding of the activity systems at play.

4.5.2 Quantitative Data Analysis Methods

This section outlines the systematic process of analysing the data collected through the survey. TPACK principles structured the quantitative analysis, and CHAT contextualised the findings within broader activity systems. This dual-framework approach ensured that the quantitative data would be interpreted through a sociocultural lens.

The data analysis stage focused on data cleaning, descriptive statistics, statistical testing, and interpreting these results within the context of ET integration in teaching. The survey asked questions related to PD activities. The use of ET employed a mix of multiple-choice questions with numerical and categorical ratings to gauge attendance at and perceived importance of PD activities, reasons for attending, and factors influencing ET use; open-ended questions were also included to capture detailed insights on curriculum changes and implementation barriers related to ET (for survey see Appendix A).

An alphanumeric code ($n = 29$) was assigned to each participant who completed the survey to protect their identity. The initial phase of the data analysis involved meticulous data cleaning to ensure the integrity of the dataset. This process entailed identifying and rectifying any inconsistencies or missing responses in the survey data. Such a step is foundational, as it guarantees that subsequent analyses are conducted using accurate and complete data, thereby enhancing the reliability of the research findings. Two levels of analysis were done. A first-round descriptive analysis was done to obtain the mean and standard deviation of the survey questions. Using this information, graphs were generated to accompany the descriptive analysis.

After cleaning the dataset in Excel, it was imported and further analysed using SPSS (Statistical Package for the Social Sciences). This phase involved calculating fundamental statistical measures, including frequencies, means, standard deviations, and measures of central tendency. These statistics provided a foundational understanding of the sample characteristics and the distribution of responses from lecturers, which helped obtain a comprehensive description of the overall trends and patterns observed within the data. Additionally, cross-tabulations of different variables, such as variances in qualifications and teaching experience among lecturers, were done, which offered preliminary insights into the data. The advanced statistical procedures included aggregating items within each survey question to derive a consolidated score per question. These ranged to quantify aspects such as the perceived importance of PD activities.

The Shapiro-Wilk Test was selected to assess whether the scores were normally distributed due to its suitability for small sample sizes (Shapiro & Wilk, 1965; Razali & Wah, 2011; Mishra et al., 2019). Given the sample size ($n=30$), non-parametric tests were predominantly used to analyse the data. Specifically, Spearman's rank correlation was employed to evaluate non-linear trends and the ordinal nature of the data (Corder & Foreman, 2014).

The Mann-Whitney U Test examined the association between formal National Qualifications Framework (NQF) qualifications, formal educational qualifications, and scores on PD activity importance or agency (Siegel & Castellan, 1988). The South African Qualifications Authority (SAQA) oversees the NQF, which has levels ranging from one to ten, with each level indicating a different level of complexity and qualification (Chetty et al., 2020). In ascending order, NQF 1 represents basic knowledge and skills, and an NQF 10 qualification signifies the highest level of qualification, a

doctoral degree. The NQF framework was created to enable the comparison of qualifications and educational achievements within South Africa and to assist students, lecturers, and employers in understanding the skills and knowledge associated with each level. This test was chosen because it does not assume a normal distribution, making it appropriate for the collected data type. Given the small sample size, the test was conducted using exact p-values rather than asymptotic ones to enhance accuracy. This consideration is crucial for small sample sizes, where the assumptions of the test might not hold as firmly as in larger samples. Therefore, results from the test were interpreted cautiously, acknowledging the limitations inherent in the sample size and sampling method.

Participants were selected based on specific characteristics relevant to the research question, particularly their proficiency in using ET and identification as potential *BrightSparks*. The purposive sampling method may influence the results' generalisability, as the findings are specific to this study's sample characteristics and context and are therefore offered as analytically transferable insights rather than population estimates. Data distributions for questions A-H were summarised using ranges, mean, and interquartile ranges (Field, 2013). The choice of these descriptive statistics aligns with the non-parametric approach taken due to the non-normal distribution observed in some variables. This methodological approach allows for a nuanced exploration of the data, accounting for the ordinal nature and non-linear trends present in the dataset.

The interpretation of statistical outcomes was linked to the research question, emphasising the practical significance of the findings in enhancing the understanding of ET integration in teaching. The analysis extended to employing Spearman's rank correlation and the Mann-Whitney U Test to assess relationships between scores, demographic characteristics, and formal qualifications. This approach facilitated a nuanced exploration of the data, accounting for non-linear trends and the ordinal nature of the dataset. The findings were interpreted with an understanding that they represent the sample characteristics and the specific context in which the data were collected.

4.5.3 Correlations between the reasons for Attending PD and Using ET

Survey responses were grouped into three distinct categories: student-related, professional-related, and departmental-related motivations to explore the connections between lecturers' reasons for attending PD and using ET. This categorisation allows for a more detailed understanding of what drives lecturers to engage with PD and ET and helps clarify whether particular motivations

are associated with specific practices. The items grouped within each category are summarised in Table 4.3.

- **Student-Related:** This includes items such as Q4a, Q4d, and Q5c, capturing motivations focused on enhancing student outcomes. By examining this category, I aim to understand if lecturers prioritising student learning are more likely to engage with PD and ET.
- **Professional-Related:** Q4c and Q4g fall into this category, focusing on lecturers' professional growth and personal interest. This helps to identify whether motivations centred on self-improvement translate into active use of ET and PD.
- **Departmental-Related:** This category includes items like Q4b and Q4e, reflecting departmental or institutional expectations. These items were grouped to assess how much external factors drive lecturers' engagement with PD and ET.

Once the survey items were grouped into three distinct categories: (1) student-related, (2) professional-related, and (3) departmental-related. Spearman's rank correlation was used to assess the associations between each pair of categories. This analysis aimed to identify any significant relationships between motivations for attending PD and using ET, providing a more detailed understanding of the motivations behind lecturers' engagement in these activities. The item groups for each category are summarised in Table 4.4.

Table 4.4: Items Comprising Categories for Student-, Self- and Departmental-Related Scores

Category	Reasons for attending PD items	Reasons for using ET items
<i>Student-related score</i>	Q4a + Q4d + Q4h + Q4j	Q5c + Q5d
<i>Professional-related score</i>	Q4c + Q4g + Q4i	Q5e + Q5h + Q5i
<i>Departmental-related score</i>	Q4b + Q4e + Q4f + Q4k	Q5a + Q5b + Q5f + Q5g + Q5j

Using a stepped-sequential approach, I conducted correlations to explore how lecturers' views on the importance of PD and their attendance at PD activities relate to their perceptions of the influence of ET in teaching. Spearman's rank correlation was used to see if lecturers who place a high value on PD also tend to view ET as more impactful in their teaching. Similarly, I looked at whether lecturers who attend more PD activities are more likely to recognise the role of ET in their work. These correlations helped to explore possible connections between lecturers' motivations for

engaging in PD and their attitudes toward ET, giving further insight into how PD might support or influence ET use in teaching. The specific results of these analyses are discussed in the next chapter.

4.6 Summary of Chapter

This chapter outlined the methodology employed in this research, which adopted a sequential mixed methods approach to address the research question. The study ensured a comprehensive examination of the topic by integrating quantitative data from surveys with qualitative insights from semi-structured interviews. The methodological approach emphasised CHAT as the central framework for analysing *BrightSparks'* practices. CHAT's constructs provided a systemic lens for designing research tools and interpreting data, while TPACK offered a micro-level focus on integrating ET, pedagogy, and content knowledge. Together, these frameworks enabled a holistic exploration of the systemic and sociocultural factors influencing *BrightSparks'* PD and pedagogical practices (Bozalek et al., 2015; Koh, 2013).

The subsequent chapters present the data, beginning with the quantitative findings from the survey, followed by the qualitative analysis of the semi-structured interviews.

Chapter 5 – Findings: Quantitative Analysis

5.1 Overview and Context

Chapter 5 presents the findings from the survey conducted to explore lecturers' perceptions and experiences with PD, ETs, and agency. The survey provides insights into how lecturers develop TPACK competencies to integrate technology into their teaching practices and, more importantly, sheds light on the continuum of *BrightSparks*, innovative lecturers at different stages of developing and exercising agency in technology integration. The concept of '*BrightSparks* tiers' is introduced, reflecting a progression from those who rely more heavily on structured PD to those who demonstrate greater autonomy and self-directed learning. Examining these variations reveals the critical role of agency in shaping engagement with ET and PD initiatives. Ultimately, these findings inform the design of a PD framework that supports technology transformation by accounting for the diverse pathways along which *BrightSparks* evolve.

The survey results reveal nuanced relationships between lecturers' professional backgrounds, such as academic qualifications and teaching experience, and their sense of agency. Lecturers with doctoral qualifications exhibit a more pronounced sense of autonomy in their teaching practices compared to those with master's degrees. Teaching experience plays a lesser role. These findings highlight the diverse factors shaping lecturers' agency and its impact on their ability to integrate ET.

This chapter lays the foundation for the qualitative phase of the study, where interviews delve deeper into the complexities of lecturers' interactions with ET, the role of PD, and the cultural and contextual factors influencing their pedagogical choices. Together, the quantitative and qualitative findings provide a comprehensive understanding of the interplay between agency, PD, and ET integration, informing strategies to support lecturers' professional growth and technological competencies.

While not a primary focus at the outset of this research, agency emerged as a potentially significant factor influencing lecturers' engagement with PD and ETs. Preliminary investigations suggested that agency is crucial in shaping lecturers' ability to navigate PD opportunities and integrate ETs into their teaching practices. Consequently, the agency was incorporated into the quantitative data collection phase to explore its potential significance in this context.

In this study, agency is operationalised as lecturers' perceived sense of control over their teaching practices and their ability to influence decisions related to curriculum, pedagogy, and technology integration (Ali & Hamid, 2018; Brodie, 2019). The survey included specific questions designed to measure these aspects of agency, focusing on decision-making power, the ability to implement new technologies and influence on curriculum development. These questions aimed to provide insights into the relationship between agency and lecturers' engagement with PD and ETs.

The survey findings are also linked to the study's broader research objectives, including:

- How do lecturers develop TPACK competencies to integrate technologies to facilitate learning?
- What can be learned from *BrightSparks* to inform the design and implementation of a PD KF4TT that allows for the integration of ET by FHS lecturers?

5.2 Questionnaire Results

Following the initial data cleaning and descriptive analysis outlined in Section 4.5.2, the survey data (n = 29) were further processed in Excel before being imported into SPSS for deeper statistical analysis (Appendix C). Beyond descriptive assessments (mean, standard deviation, and graphical representations), additional tests were conducted to examine distribution trends, validate initial findings, and explore relationships between survey items. To facilitate this, sub-items within each question were summarised into composite scores, providing a more precise overall measure for each survey category. The sub-items of each question were summarised to determine a single score per question. For example, items a–h relating to attending a PD activity were summarised to create a score ranging from 8 to 40, with a score of 40 corresponding to the highest importance and 8, the lowest (Table 5.1). The complete survey can be seen in Appendix A.

Table 5.1: Summary of Created Scores from Questionnaire Items with Ranges

Question number	Score title	Score range	Range	Mean / Median (IQR)
3 (importance)	PD activity attendance	8 – 40	9-38	27 (23, 31)
3 (times)	PD activity times	0 - infinity	0-60	26 (21, 34)
4	PD activity importance	11 - 55	35-53	46 (43, 49)

5	ET influence score	10 - 50	19-37	29 (24, 32)
7	Barrier score	10 - 50	14-29	22 (19, 24)
8	Agency score	3 - 15	3-15	12 (10, 14)

All scores assessed using Shapiro-Wilk were found to be normally distributed ($p > 0.05$) except for the agency score ($p = 0.002$) (Shapiro & Wilk, 1965; Chen et al., 2022; Aslam et al., 2022). The reason for the non-normal distribution of the agency scores could be influenced by selection bias because purposive sampling was employed (Goos & Salomons, 2017). All these lecturers were chosen because of their proficiency in using ET in their teaching. In addition, they were identified as possible *BrightSparks* due to their integrative usage of ET. It is also important to note that the interpretation of these findings is only within the context of the sampling method used in this research, and the results may not be generalised beyond the specific sample characteristics.

5.2.1 Demographic Results

A total of $n=29$ participants from this health sciences context completed the survey. Table 5.2 presents participants' information according to their gender and their qualifications, whether a master's degree (NQF9) or (NQF10). Their professional teaching qualifications and the number of years they have been teaching are also noted in the table below.

Table 5.2: Survey Participants' Demographic Data

Gender		Qualification		Teaching Qualification		Years of teaching experience			
Male	Female	Master's	PhD	Yes	No	3-5	6-10	11-15	16+
8	21	18	11	10	19	3	8	12	6
28%	72%	62%	38%	34%	66%	10%	28%	41%	21%

The lecturers in the data are diverse in terms of years of teaching experience within the FHS. While some lecturers have only three years of teaching experience, others are very experienced lecturers with up to 30 years of teaching experience. The mean number of years lecturers have taught in the faculty is 13 years ($\bar{x} = 12.34$ years). There is no direct correlation between participants with a doctorate and an educational qualification. All lecturers, except one, teach an undergraduate course, and the average number of courses is 2.9. Notably, 38% of participants had a doctorate, and 34% had an education qualification. Of lecturers with at least ten years of teaching experience, 69%

demonstrated more advanced qualifications than the average, with 50% having a doctorate and 40% having an education qualification. Advanced academic credentials could indicate lecturers with extensive experience and a solid foundation in educational methodologies. This reflects a depth of commitment to both their subject matter expertise and pedagogical proficiency. Though teaching experience and academic qualifications indicate this factor, it did not pertain to all the participants. One can conclude that the participants are qualified, well-experienced lecturers, a third of whom have an additional educational qualification. It also underscores the fact that while many lecturers have advanced academic credentials, more have yet to pursue formal training in pedagogy, hinting at potential areas for PD. It should be noted that from these participants, 12 were selected to be interviewed, and they represented the

- Highest years of teaching experience
- Highest formal qualification
- Addition of a formal teaching qualification

5.2.2 Participation in PD Activities

Among the 29 participants in the study, a total of 814 PD activities were attended over the 12 months preceding the interview date. On average, each participant attended approximately 28 activities, with the number of activities attended by individuals ranging from 0 to 60.

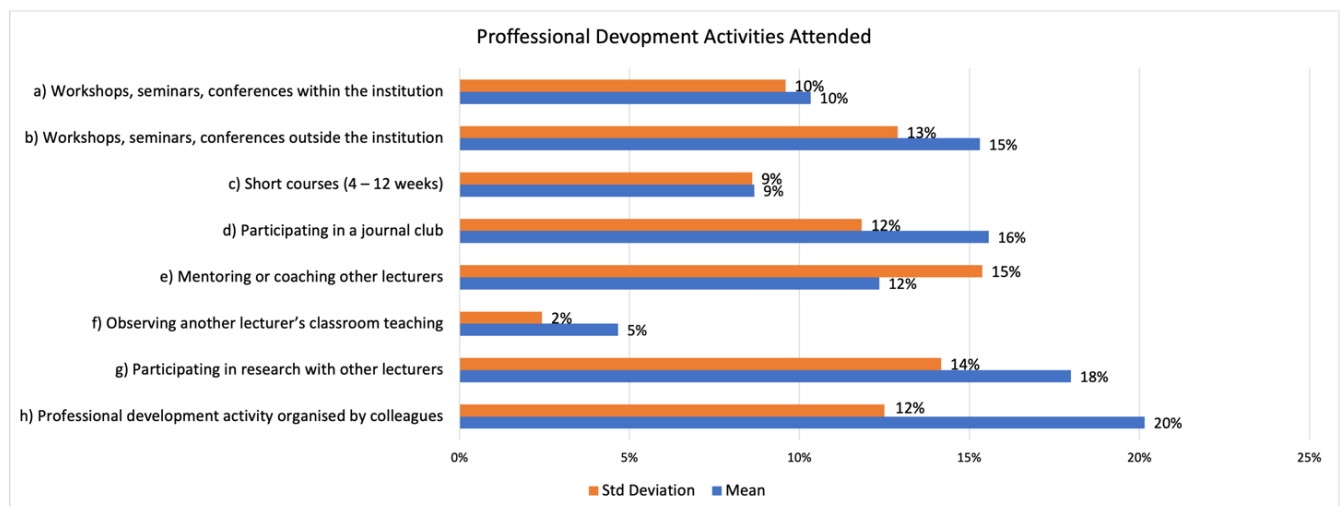


Figure 5.1: PD Activities Attended in the Last 12 Months

The distribution of PD activity attendance among participants shows that, on average, participants attended 28.07 activities. The median number of activities attended was 26, with an interquartile range (IQR) of 21 to 34, indicating that half of the participants attended between 21 and 34

activities. The range of attendance was quite broad, varying from 0 to as many as 60 activities, which highlights significant variability in engagement levels. This data demonstrates that while some participants were highly engaged in PD activities, others attended relatively few, with one participant reporting no attendance.

5.2.3 Priority Areas for PD

Participants were asked to rate the importance of attending various PD activities, with ratings ranging from 1 (low or no importance) to 5 (high importance). As seen in Figure 5.2, most participants rated the importance of attending PD activities highly, with a mean percentage of 75% (3.75 / 5).

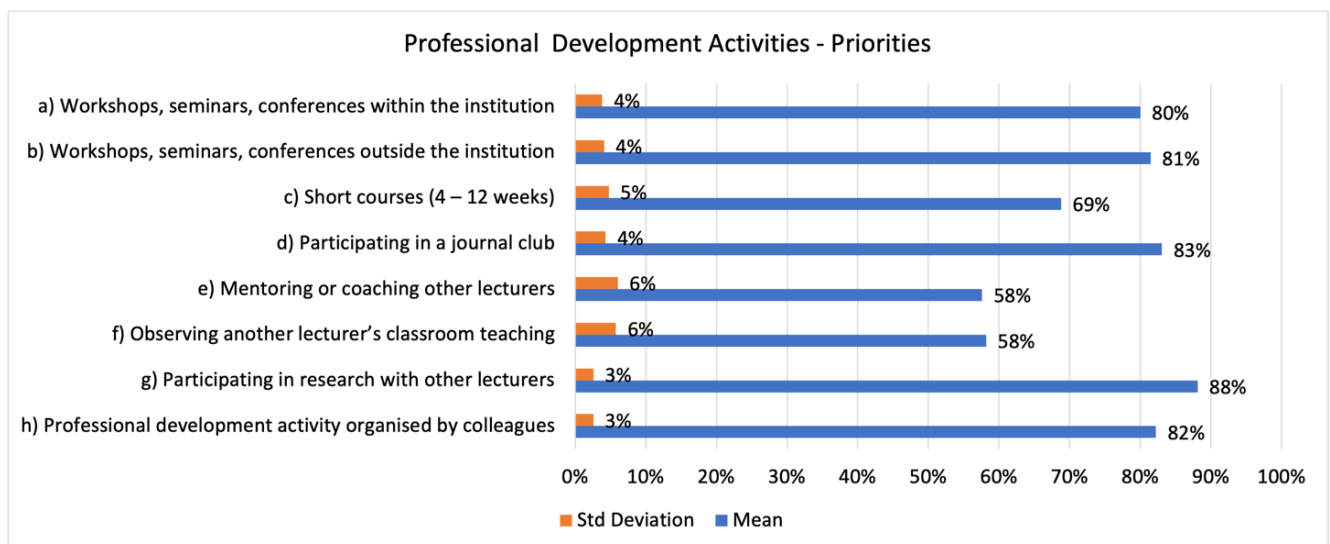


Figure 5.2: Question 3b - Rate the Importance of Attending Various Activities

There were notable differences between the PD activities that lecturers attended and those they considered most important. For instance, workshops, seminars, and conferences held outside UCT were rated more important than those within the institution. However, despite their importance, short courses, which were considered necessary by some, had lower attendance rates. The data revealed significant variation in how participants rated these activities, with a standard deviation of 6% for the importance ratings, indicating differing perceptions among lecturers. Mentoring or coaching emerged as the second most important activity. The variations in these responses may be influenced by the years of experience lecturers have, which likely informs their prioritisation of certain PD activities.

5.2.4 Motivation for Attending Professional Development Activities

The most important motivation for attending PD activities extends beyond professional or departmental requirements, reflecting lecturers' intrinsic motivation to enhance their teaching practices and stay current with evolving ETs. This aligns with research highlighting that intrinsic motivation, such as personal growth, curiosity, and the desire to improve student learning, plays a crucial role in sustained engagement with PD (Harrison et al., 2017; Jones & Dexter, 2018; Barton & Dexter, 2020; Xianhan et al., 2022). Additionally, the data from this question (Figure 5.3) reinforces the significance of PD activities, suggesting that prioritising them is essential for fostering continuous professional learning and institutional improvement.

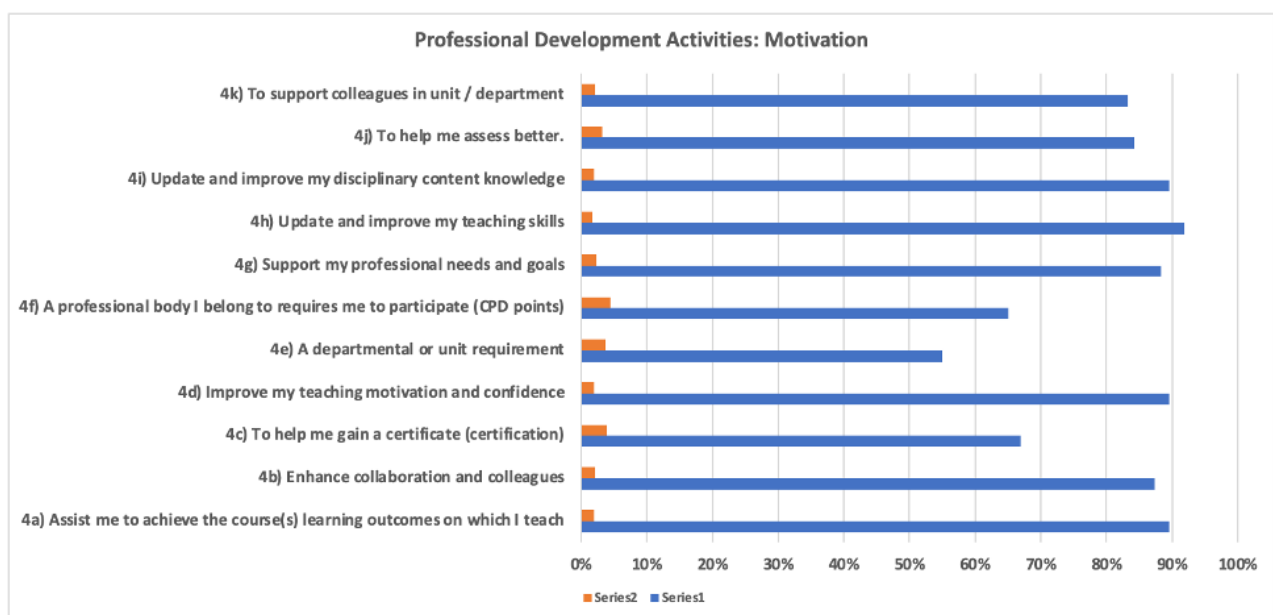


Figure 5.3: Question 4 - Importance of PD

Correlations between the reasons for Attending PD and Using ET

These were investigated, and the results were grouped into three distinct categories: (1) student-related, (2) professional-related, and (3) departmental-related. This categorisation allows for a more granular understanding of the motivations behind lecturers' engagement with PD and ET. The item groups are summarised in Table 5.3. Spearman's rank correlation assessed the association between all pairwise combinations of the categories listed.

Table 5.3: Items Comprising Categories for Student-, Self- And Departmental-Related Scores

Category	Reasons for attending PD	Reasons for using ET
<i>Student-related score</i>	Q4a + Q4d + Q4h + Q4j	Q5c + Q5d
<i>Professional-related score</i>	Q4c + Q4g + Q4i	Q5e + Q5h + Q5i

<i>Departmental-related score</i>	Q4b + Q4e + Q4f + Q4k	Q5a + Q5b + Q5f + Q5g + Q5j
-----------------------------------	-----------------------	-----------------------------

The results of these associations are presented in Table 5.4. Student-related reasons for attending PD were positively associated with the three reasons for using ET. On average, lecturers who scored higher for student-related reasons for attending PD also scored higher for student-, self-, and departmental-related reasons for using ET. Interestingly, no association was observed between professional-related reasons for attending PD and using ET, nor between departmental-related reasons for attending PD and using ET.

Table 5.4: The Associations between Reasons for Attending PD and Using ET

		Reasons for attending PD		
		<i>Student-related score</i>	<i>Professional-related score</i>	<i>Departmental-related score</i>
Reasons for using ET	<i>Student-related score</i>	$\rho = 0.47,$ $p = 0.009$	$\rho = 0.16,$ $p = 0.398$	$\rho = 0.25$ $p = 0.189$
	<i>Professional-related score</i>	$\rho = 0.37,$ $p = 0.045$	$\rho = 0.23$ $p = 0.236$	$\rho = 0.15$ $p = 0.438$
	<i>Departmental-related score</i>	$\rho = 0.40$ $p = 0.030$	$\rho = 0.26$ $p = 0.175$	$\rho = 0.08$ $p = 0.685$

Student-related reasons: A significant positive correlation was found across all three categories regarding using ET compared to student-related reasons for attending PD. This suggests that lecturers who prioritise student outcomes in their PD activities are also mindful of the impact of ET on students, themselves, and departmental expectations. It reflects a holistic understanding that enhancing their knowledge and skills through P, particularly to benefit students, translates across multiple facets of their professional practice.

Professional-related reasons: The lack of association between reasons for attending PD and using ET might indicate that motivations centred on PD or intrinsic interests do not necessarily correspond to using ET. This might be because personal motivations are more varied and less directly tied to specific teaching practices like ET.

Departmental-related reasons: Similarly, no significant correlation between departmental-related reasons for attending PD and using ET suggests that external pressures or mandates from the department do not directly influence how lecturers use ET. This could imply that while departmental policies might encourage PD attendance, they do not translate directly into the practical application of ET. Other factors, like individual preference or student needs, may be more influential.

5.2.5 Use of Educational Technologies in Teaching

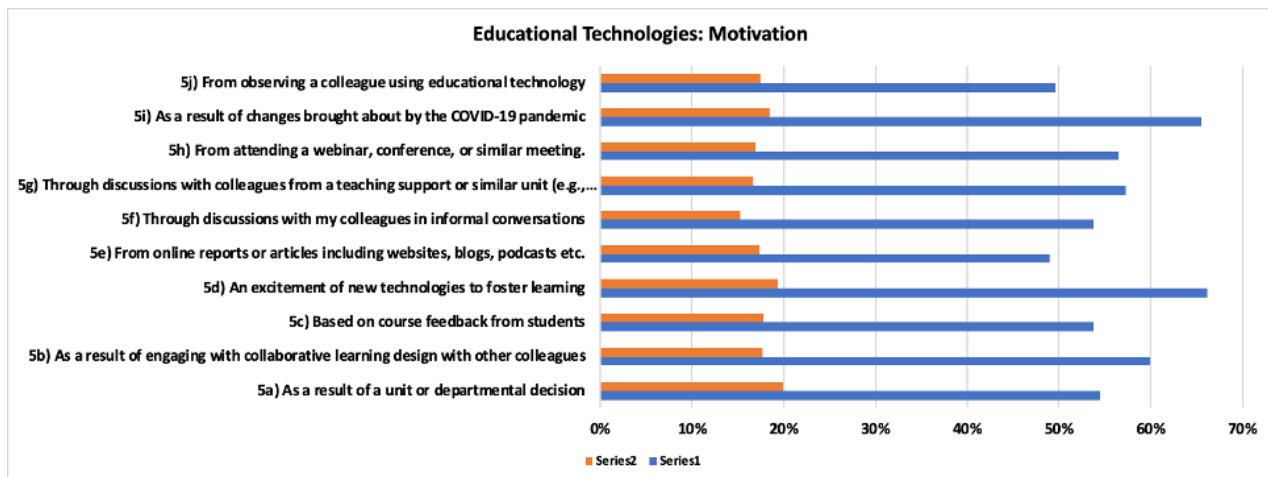


Figure 5.4: Question 5 - Influencing the use of Education Technologies in Practice

Figure 5.4 presents lecturers' responses to the question of what influenced their use of ETs. Many responded that their use of ET was influenced by firsthand observations of their peers' engagement with these technologies, especially during the pandemic when shifts to online learning necessitated novel approaches. Encouragingly, they were excited about the potential of technology to foster student-centric learning. Additionally, both formal and informal PD were reported as factors that positively influenced their use of technology. Respondents also highlighted the impact of knowledge dissemination mediums such as webinars, online articles, and informal conversations among colleagues, as well as student feedback in steering their choices. These findings paint a comprehensive picture of staff who are adaptive to internal and external cues, continuously striving for educational excellence.

5.2.6 Barriers to Implementing ET

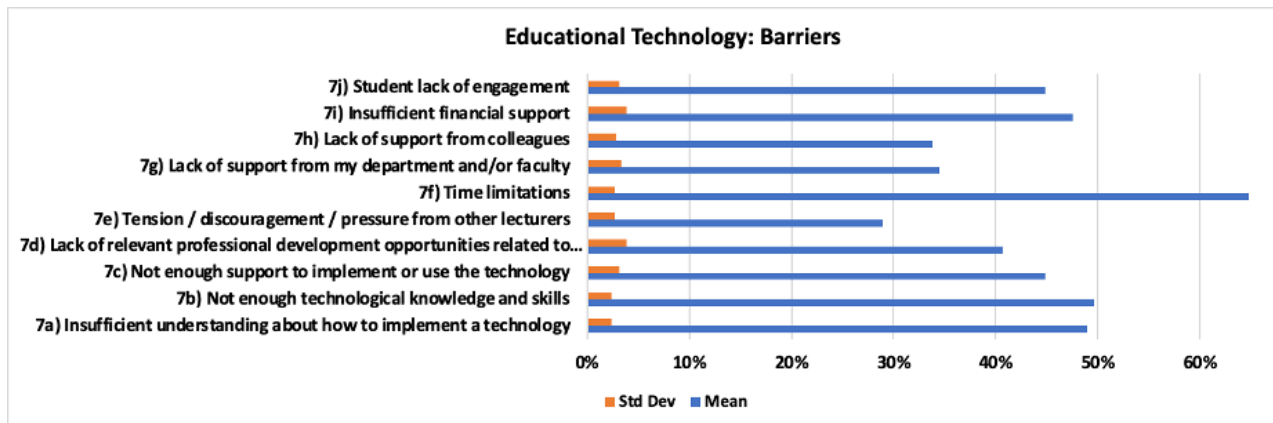


Figure 5.5: Question 7 - Barriers Experienced when Implementing or Using ET

This question explores why lecturers might not implement or use ET in teaching. Integrating technology within pedagogical paradigms is challenging, as the data shows above. Predominant among these challenges is the disengagement of students, coupled with financial constraints that curtail expansive ET adoption. Furthermore, the lecturers involved in this study frequently selected the absence of collegial and departmental support, making the ET integration journey more onerous. Time constraints and implicit pressure from fellow lecturers exacerbated these existing barriers to learning. Moreover, several lecturers also highlighted the absence of targeted PD opportunities and an inherent lack of tech-savviness as significant impediments. Such insights underscore the multifaceted nature of obstacles that lecturers face in ET implementation.

5.2.7 Agency

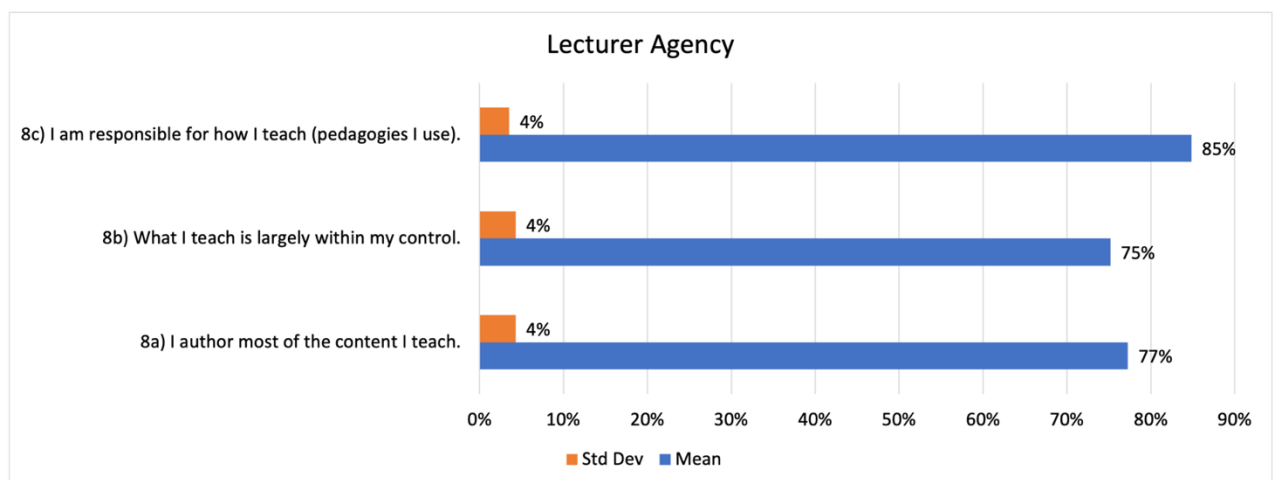


Figure 5.6: Question 8 - Overall Perceptions of Control and Responsibility in Teaching

Figure 5.6 illustrates how participants responded to statements regarding authorship of teaching materials, control over course content, and responsibility for pedagogical decisions. The concept of lecturer agency, which refers to their autonomy and influence over pedagogical choices, is prominently evident in the data presented. Lecturers overwhelmingly indicated that they exercise significant control over the content and methodologies used in their teaching. This sense of agency is reflected in the fact that 93% of participants claimed authorship of most of the content they taught, highlighting their active role in shaping the curriculum and reinforcing their autonomy in the educational space. These findings suggest that despite external prescriptions on topics and learning outcomes, lecturers maintain substantial control over what they teach and how they deliver their courses.

5.2.7.1 Agency vs Qualification

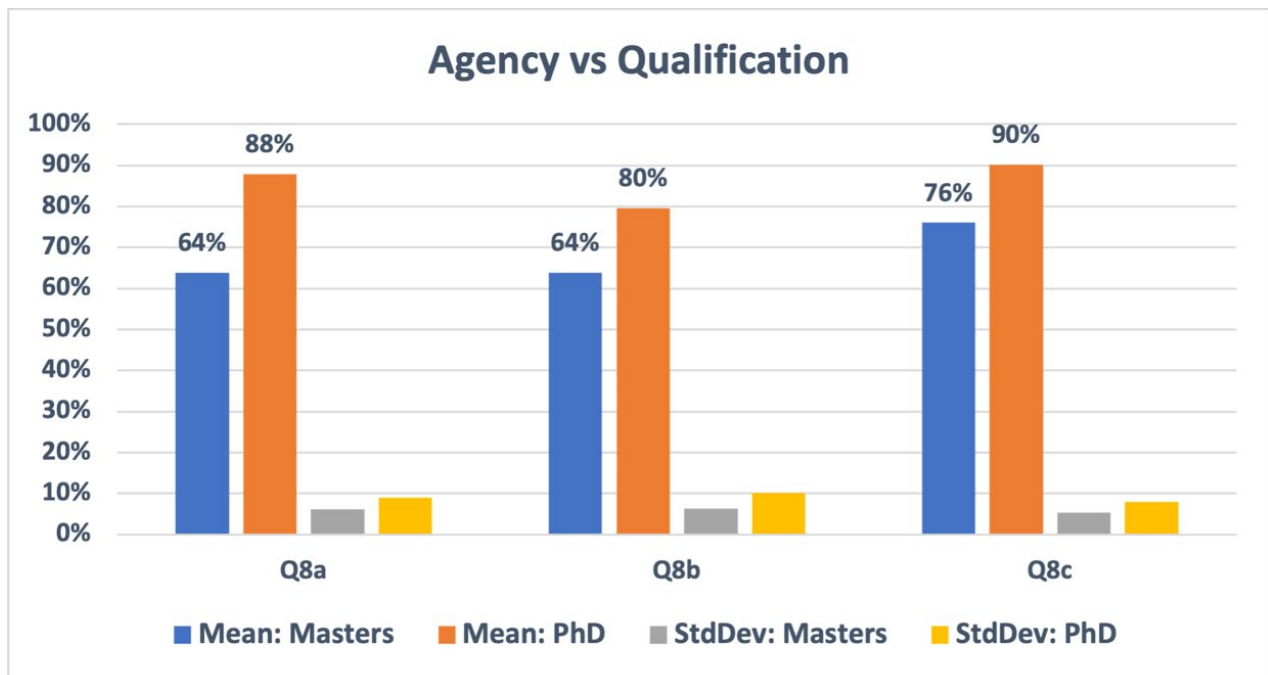


Figure 5.7: Question 8(i) - Perceptions of Control by Qualification (Master vs. Doctorate)

Figure 5.7 compares how lecturers with a master's degree versus those with a doctorate perceive their level of control and responsibility in teaching. The data reveals a strong correlation between higher academic qualifications and increased lecturer agency. Lecturers with a doctoral degree demonstrated greater autonomy across aspects of their teaching than those with a master's degree. For example, 88% of doctorate holders authored most of their teaching content, compared to 64% of their master's qualified counterparts. Confidence in pedagogical choices also reflected this trend,

with 90% of doctorate holders feeling confident in their teaching methods, surpassing the 76% from the master's group. This suggests that higher academic qualifications may enhance a lecturer's sense of ownership and control, reinforcing their agency within the educational context.

5.2.7.2 Agency vs Teaching Experience

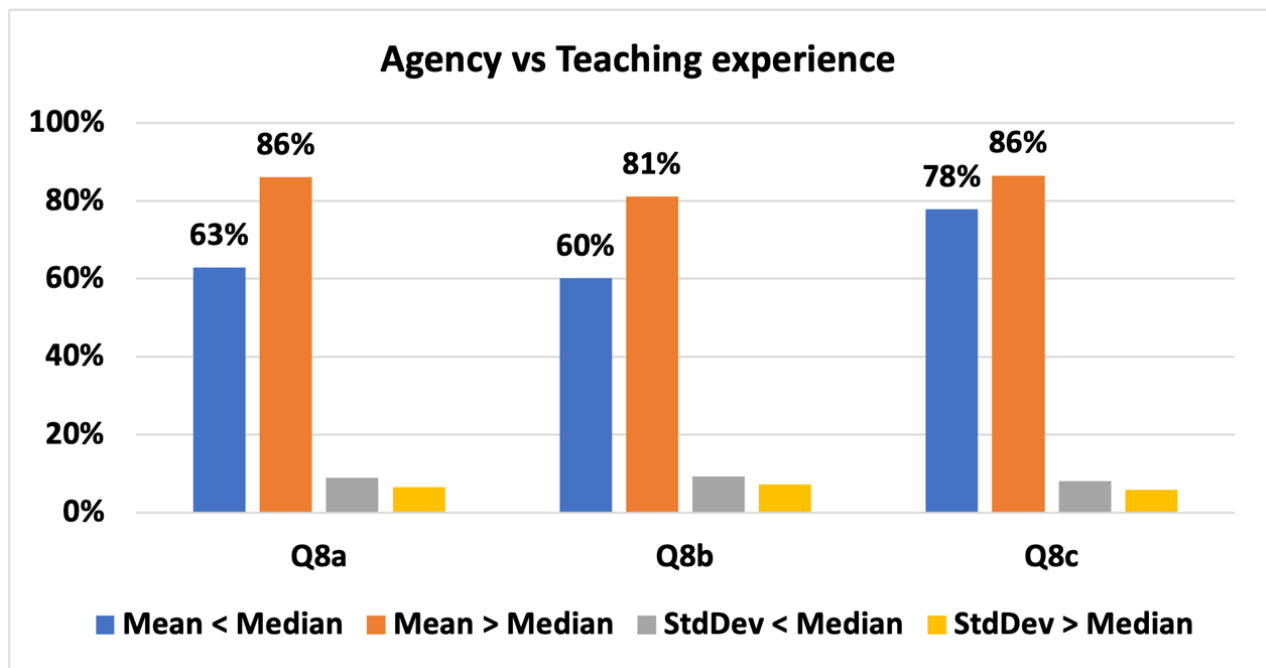


Figure 5.8: Question 8(ii) - BrightSparks' Perception of Control Compared to Teaching Experience

Figure 5.8 contrasts responses from *BrightSparks*, highlighting how years of teaching experience may influence their sense of control over teaching content and methods. Teaching experience plays a significant role in shaping lecturer agency, as illustrated in Figures 5.7 and 5.8. When comparing lecturers with varying years of experience, the data shows that those with more than 12 years (the mean) of teaching experience exhibit similar levels of agency to those with higher qualifications, though with slight variations. Lecturers with a doctorate authored 24% more content than those with a master's degree. When comparing teaching experience, a similar difference (23%) was observed between lecturers with less than 12 years of experience and those with more. However, when the average years of experience for doctorate holders ($\bar{x}$ = 16 years) were compared to those with a master's degree ($\bar{x}$ = 10 years), the similarity across Figures 8(i) and 8(ii) suggests that both qualifications and experience significantly influence agency, though they may do so in different ways. These figures align with the broader categorisation of all participants as *BrightSparks* but suggest a more pronounced level of autonomy and innovation among those holding doctoral qualifications or with extensive teaching experience.

The impact of teaching experience and qualifications is also evident in lecturers' control over teaching content and pedagogical choices. For instance, the difference in agency concerning the content they teach was 24% (qualification) versus 23% (experience). However, when considering pedagogical autonomy, experience played a slightly more significant role (21%) than qualifications (16%). Conversely, qualifications had a more pronounced effect on confidence in teaching methodologies (14% vs. 10%).

5.3 Correlations Between Questionnaire Scores

The only statistically significant correlation ($p = 0.005$) is between the PD activity importance score (Question 4) and the ET influence score (Question 5). On average, higher scores for the importance of attending a PD activity corresponded with higher scores for ET influence ($p = 0.51$). Positive correlations (Figure 9) were also observed between:

- PD activity attendance (Question 3) and ET influence score (Question 5),
- PD activity importance (Question 4) and barrier score (Question 7), and
- PD activity times (Question 3) and agency score (Question 8).

Negative correlations were observed between:

- ET influence (Question 5), agency score (Question 8), and
- Barrier score (Question 7) and agency score (Question 8).

The lack of statistically significant associations between questionnaire items was attributed to the small sample size ($n = 29$).

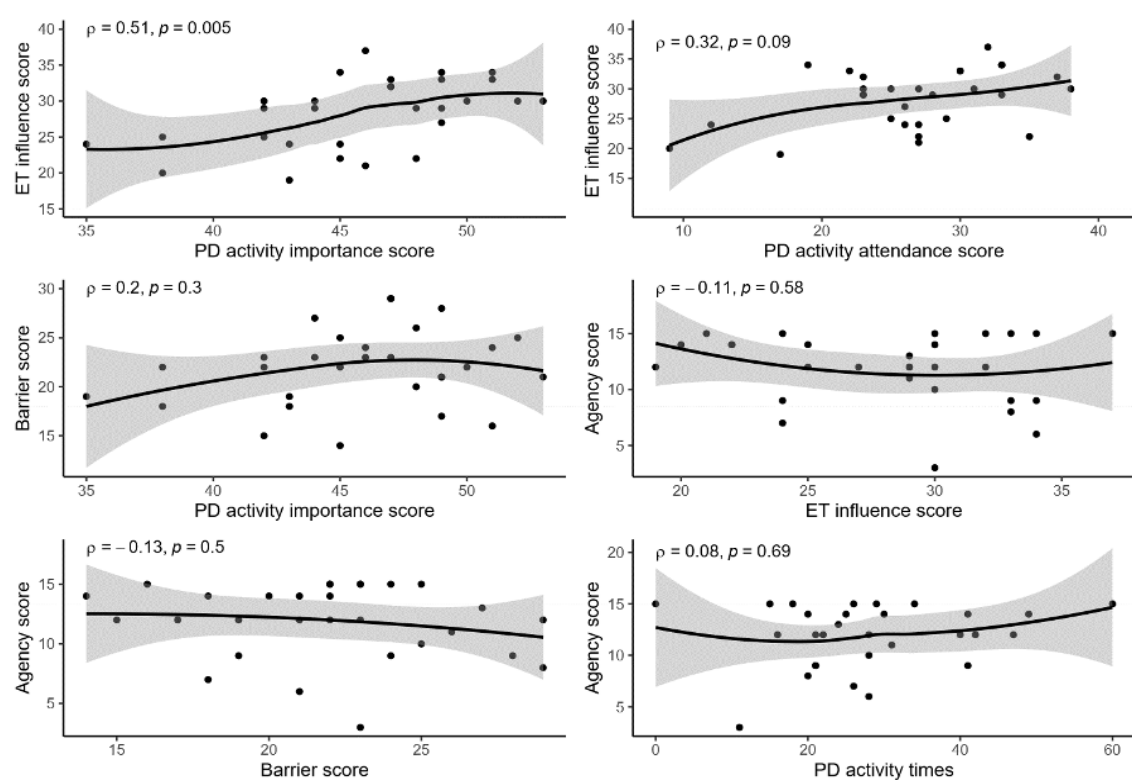


Figure 5.9: Associations Between Scores Created From Questionnaire Items

5.3.1 Demographic Characteristics vs PD Activity Importance or Agency

There was no association between PD activity importance score and years of teaching in the faculty ($\rho = 0.06$, $p = 0.745$). Nor was there any association between the PD activity importance score and number of undergraduate courses taught ($\rho = -0.03$, $p = 0.882$). Conversely, there was a statistically significant positive correlation between agency scores and the number of years teaching in this health sciences context ($\rho = 0.44$, $p = 0.020$). In addition, there was no discernible association between agency scores and the number of undergraduate courses taught ($\rho = 0.04$, $p = 0.850$).

Table 5.5: Association Characteristics and PD Activity Importance or Agency Scores

Score	NQF Rating			Formal Teaching Qualification		
	9	10	p-value	No	Yes	p-value
PD Activity Importance	46 (43, 49)	47 (45, 50)	0.471	46 (43, 49)	46 (43, 48)	0.890
Agency	12 (9, 12)	15 (14, 15)	0.007	12 (10, 15)	13 (12, 14)	0.834

Scores were summarised using the mean and interquartile range in brackets. P-values corresponded to the Mann-Whitney U Test (Table 5.5) in the following ways:

- The mean PD activity importance score for individuals with a master's qualification was 46, with an interquartile range of (43 - 49). The mean PD activity importance score for individuals with a doctorate qualification was 47, with an interquartile range of (45 - 50).
- There was no statistically significant difference between PD activity agency scores and the qualification of participants.
- On average, PD activity importance scores were similar (mean = 46) for participants regardless of formal teaching qualification ($p = 0.890$).
- No statistically significant association was reported between formal teaching qualification and PD activity agency scores ($p = 0.834$).
- On average, participants with a doctorate qualification had statistically higher agency scores than participants with a master's degree (15 vs. 12, respectively, $p = 0.007$).

5.4 Summary of Chapter

This chapter presents the survey findings, illuminating key factors that may contribute to lecturers' development of TPACK competencies and highlighting potential lessons from *BrightSparks*. The results reveal several significant patterns regarding PD's influence, ET's integration, and lecturers' sense of agency. They reflect the diverse perspectives of lecturers, rooted in varying teaching experience and academic qualifications. Notably, higher academic qualifications correlate with a more pronounced sense of autonomy and control in teaching. At the same time, years spent teaching also shape perceptions of agency, albeit to a lesser extent. These findings suggest that specific lecturer attributes and backgrounds could lay a foundation for TPACK growth. However, the process of how TPACK develops in day-to-day practice was further unpacked in the subsequent qualitative chapter, where more nuanced insights into lecturers' experiences and pedagogical choices are explored.

The quantitative results reveal a nuanced relationship between lecturers' professional backgrounds, qualifications and the sense of choice and control they can enact in teaching. Their experiences with PD in ET are less influential. While age was intentionally excluded from the demographic data to minimise age-related biases, it is recognised that factors like teaching experience and the length of a lecturer's career often correlate with age. In this context, teaching experience becomes a proxy for age to some extent, influencing the integration of ET as lecturers bring diverse experiences to their practice.

All participants in this study are *BrightSparks*, yet they occupy different points along a continuum regarding factors such as autonomy, agency, and confidence in their teaching. The data indicate that those holding doctoral qualifications or extensive teaching experience often demonstrate an even greater degree of agency, suggesting they may be positioned further along the *BrightSparks* continuum. Building on my decade of firsthand experience within this health sciences context, these findings highlight the complex interplay of personal experiences, PD, and the evolving role of ET.

Chapter 6 - Findings: Qualitative Analysis

6.1 Overview

This chapter presents the qualitative findings from semi-structured interviews with lecturers in the Faculty of Health Sciences (FHS), focusing on integrating ET into their pedagogy. It explores how PD influences the use of ET, emphasising the interaction of sociocultural practices, professional environments, and technological competencies. The thematic analysis, conducted using a deductive approach grounded in a combined CHAT and TPACK framework, identifies key factors that impact the effective integration of technology in teaching, while allowing room for unanticipated insights to emerge beyond the initial framework. The findings mainly highlight the contradictions between evolving educational demands and existing practices and how these contradictions are navigated through PD activities. The analysis delineates the crucial role of PD in equipping lecturers with the necessary skills and knowledge for effectively using ET, thereby bridging gaps between current capabilities and emerging pedagogical challenges.

The data collected in this study specifically explores the evolution of lecturers' technological and pedagogical competencies and the sociocultural factors influencing the adoption of ETs. CHAT serves as a lens through which to analyse the sociocultural context of lecturers within PD and ET activity systems, offering insights into systemic contradictions and tensions. This perspective is important for understanding challenges, driving developmental change, and allowing for a holistic view of their practices within the FHS. By focusing on how ET is integrated and utilised, this chapter aims to provide empirical insights into the practical implications of ET in educational settings, enhancing the credibility of the findings and demonstrating the interplay between technology, pedagogy, and content knowledge.

In addition, this chapter examines how lecturers came to effectively employ TPACK in their pedagogy, integrating technology and content. This form of integration highlights the need for lecturers to develop cross-domain skills to effectively incorporate ET into their teaching. By applying TPACK in addition to CHAT to analyse the data, this study explores how lecturers demonstrate these intersecting knowledge domains in practice. The focus is on understanding lecturers' proficiency in

technology, pedagogy, and content and their ability to synthesise these into effective, technology-integrated teaching practices.

In-depth analysis of the data collected highlights key findings within the PD activity system. The CHAT framework is applied to reveal tensions, contradictions, and the role of mediating artefacts within ET integration, focusing on the dynamics of human interactions and institutional factors. Additionally, the TPACK framework examines how technological, pedagogical, and content knowledge intersect in the effective use of ET. By comparing quantitative and qualitative data, this chapter offers a comprehensive view of the insights derived from the research.

6.2 Key Findings from Qualitative Data

The data on how lecturers integrate ET with content knowledge and pedagogy highlights several challenges and contextual factors that influence lecturers' pedagogies, including issues related to resource availability, institutional support, and familiarity with technology. These findings underscore areas needing further PD, specifically aligning technology use with pedagogical strategies and subject content.

While the analysis was approached through the lens of the CHAT and TPACK, the findings also revealed dimensions of lecturers' experiences that sometimes exceed the boundaries of these frameworks. It illustrated the interplay between lecturers' technological knowledge, pedagogical skills, and content expertise. The themes identified align with various aspects of these frameworks, such as contradictions within the activity system that impede technology integration and the need for more cohesive support structures. The analysis revealed how lecturers adapt their teaching practices to navigate these challenges, providing practical insights into the effectiveness of current PD initiatives and the areas where further training is needed.

Key themes include the role of the community in supporting or hindering ET use, the influence of institutional rules and norms, and the mediating effects of available technologies on teaching practices. These insights offer a clear understanding of the dynamics at play within the educational system, providing concrete evidence to inform improvements in instructional practices and the design of PD programs.

6.3 Findings Through an Analytical Framework

In preparing to analyse the interview data, I hoped to uncover the complex network of factors shaping how technology integrates into teaching, individual lecturers' practices, and whether broader systemic and contextual forces are at play. Each interview transcription provided an opportunity to enhance the comprehensiveness of the data analysis, as every lecturer offered a unique perspective on integrating technology into their teaching practices, reflecting the diversity of roles and experiences amongst lecturers. This diversity enabled me to identify common themes, trends, contradictions, and variations. It provided a rich, detailed understanding of the systemic factors influencing technology integration into teaching, grounded in the real-life experiences of lecturers.

The analytical framework provided a structured and consistent approach to systematically collect, organise, and analyse data to answer my research question. It offered clear and step-by-step guidance on the processing and analysis of data while providing clear parameters and focuses for its analysis (Gale et al., 2013). It facilitates exploring the relationships between lecturers, artefacts, and the broader sociocultural systems within which they operate (Larsen et al., 2017; Pierson, 2001). CHAT's key concepts - mediation, contradictions, and artefacts - are instrumental in shaping my data analysis framework, as illustrated in the analytical framework table below. The table, which describes the two activity systems of this research, guides the transformation of interview data into structured, meaningful insights relevant to my research question. It assists me in exploring the interactions and relationships in each activity system among subjects, tools, objects, rules, community, and division of labour. Each of the interviews was analysed in the same manner, thereby maintaining consistency and reducing potential bias. (Appendices A and B for interview summaries regarding the PD and ET activity systems as interpreted from what lecturers said.)

As previously explained in the theory chapter, the following terms used in the CHAT framework are presented below for convenience:

Subject: The lecturer's role in the activity system. How they describe their position, responsibilities, and experiences using technology for teaching.

Object: The lecturer aims to create transformative, student-centred learning environments by effectively integrating ETs with pedagogy and content knowledge. This involves leveraging TPACK to enhance teaching practices and improve student learning outcomes.

Tools: The technological (hardware, software, platforms) and conceptual tools (knowledge, skills, strategies) lecturers use in their teaching. How do they describe their use and usefulness, and are there any issues with the technology?

Rules: The formal and informal rules that govern the use of technology in teaching. These might be institutional policies, societal norms, or personal beliefs and ethics.

Community: Lecturers' social environment in which they work. This Community's key players (students, other teachers, administrators, etc.) and how these stakeholders influence the use of technology in teaching.

Division of Labour: How the tasks and responsibilities related to technology use are distributed within their educational context. The roles lecturers, their colleagues, and students play.

Contradictions: The tensions they report in their use of technology – the contradictions or conflicts mentioned.

It is worthwhile expanding on the objective and outcomes for PD as described by the lecturers:

- Improving teaching effectiveness: Enhancing teaching methods and strategies to make learning more engaging and effective for students.
 - *Nomusa - Lecturer_AGN: "My interest in this stemmed from wanting to create user-friendly tools for students, helping them navigate and comprehend course material more effectively. One issue I noticed is that students often realise they are struggling only when they face exams, realising they have not been studying deeply enough. However, if they engage with e-book activities regularly, they can reflect on their progress and identify areas needing improvement."*
- Staying current with educational trends: Keeping current with the latest developments in their respective fields, especially in ET.
 - *Rob - Lecturer_LLI: "I think it is important for doctors to stay up to date with their skill set, not necessarily with things that are not core knowledge for them, but at least the core responsibilities that they have on a day-to-day basis. They should be at least updated with the latest information in that field."*
 - *Lecturer_GNE: "Recognising the importance of digital literacy, I also attended seminars and webinars introduced on platforms like Vula, and I always received notifications from either CILT or Freda, so I attended those."*

- Addressing student needs: Adapting teaching methods and technologies to better cater to the diverse needs of students.
 - *Lecturer_EZN: "This technological approach creates a one-on-one experience, eliminating barriers for students who may hesitate to ask questions in a crowded lecture theatre. I've tested this by encouraging students to reach out for more information through Skype or Zoom calls, resulting in improved relationships and, consequently, increased student engagement and learning."*
- Personal and professional growth: Seeking opportunities for personal improvement, skill enhancement, and career advancement.
 - *Lecturer_RED: "Because I like learning, I think that would be the reason. Deep inside, I really like learning. It's why I love my job at UCT and why I go to professional development events. I enjoy it, and even if I learn nothing, I get to hang out with some people or feel less alone during times like COVID-19. But down to the nitty gritty, I like learning and growing. It's more intrinsically motivated than externally, I would say."*
 - *Lecturer_AGN: "Professionally, what motivates me is the long-term career prospects of physiotherapy. It is a field where you can evolve throughout your life, adapting to different roles as you mature."*
- Curiosity and innovation: Being motivated by curiosity to explore new technologies, approaches, and innovative ways to enhance their teaching and professional practice.
 - *Lecturer_YAD: "I am motivated by my love for learning and my inquisitive nature. I enjoy exploring new ideas and experiences, and I am always eager to expand my knowledge. I see myself as a curious person who embraces challenges and finds excitement in trying things I have not done before."*
 - *Lecturer_RAM: "One of my passions for many years has been innovating in the health sciences education space and higher education in general, especially in the context of the fourth industrial revolution. We are still somewhat behind in certain areas. For me, it is about how my students will benefit and how my courses will improve from all the professional development activities I've been involved in."*

Similarly, the lecturers describe expanding on the objective and outcomes for ET usage, which centres around enhancing teaching and learning effectiveness. This includes several specific objectives, such as:

- Improving student engagement: Using ET to make learning more interactive and engaging for students.
 - Lecturer_RAM: "In my lectures, I always use Mentimeter, which is a classroom response system. This tool is effective for engaging students and doing a quick 'temperature check.' To give you some context, before any lecture, I always post pre-lecture tasks for my students, such as watching a video clip or reading a couple of pages. These tasks are posted at least a week before the lecture so that students come prepared."
- Facilitating accessible and flexible learning: ensuring students can access learning materials conveniently, catering to diverse needs and circumstances, including remote learning scenarios.
 - Lecturer_EZN: *"In my undergraduate courses with around 35 to 40 students, establishing personal connections is challenging. The technology addresses this by enabling scheduled interactions, offering flexibility without the need for physical travel. Regardless of location, as long as there's an internet connection, you can provide personalised feedback to students, addressing a common concern about limited interaction with lecturers."*
- Adapting to changing educational environments: the shift to online learning due to COVID-19 and continuing to incorporate effective online teaching practices post-pandemic.
 - Lecturer_GNE: *"I watched the videos from CILT because at least they were available. And for me, I mean I was at UCT since 2009, so it's difficult to count back that long. But if I were to think of a moment, it would be during COVID-19; I did attend some sessions by CILT. I did attend Vula training as well from the faculty, from EDU. And then I could do anything that I could find that was asynchronous after COVID was the best because then I could go back and watch it by myself and do what needed to be done."*

- Providing diverse learning resources: offering a range of educational materials (like videos, interactive quizzes, and forums) to cater to different learning preferences.
 - *Lecturer_NEI: "I use a laptop and rely on various platforms such as MS Teams, Zoom, and Vula, utilising different tools within Vula like lessons, Q&A sessions, quizzes, forums, and blogs."*
- Enhancing teaching efficiency: using ET to streamline the teaching process, making it more efficient and less time-consuming for lecturers.
 - *Lecturer_LLI: "So in our courses we use mainly video conferencing through Zoom and Teams to bring students together and then using audio visual equipment to host lectures, meetings with professors across the board that we can host in one hour rather than have four different sessions for four different students. We can save time by doing that."*
- Bridging educational gaps, particularly for students from varied backgrounds, including second-language learners, ensures that ET helps to level the playing field in education.
 - *Lecturer_AGN: "The idea for the e-book was to consolidate all the terminology lectures for the entire four-year programme into one book. It was aimed to facilitate the transition, especially for non-English speaking students, from high school English to academic English. But the main concern was the failure rate of non-English speaking or first language speaking students in the first and second year of the program."*

In keeping with the ideas espoused in CHAT, these objectives reflect the lecturers' shared goal of leveraging ET as a set of tools and fundamentally enhancing the educational experience for themselves and their students. The focus is on improving educational outcomes, making learning more accessible and engaging, and adapting teaching methods to meet the evolving needs of students and the educational context.

6.3.1 Contradictions and Mediation

In this study, participants highlighted the contradictions within their activity system. The contradictions are presented as either primary or secondary elements or tertiary elements that

occur between the object of an activity system and the same system, but in a more advanced form. As a reminder, contradictions are conflicts or tensions within or between the elements of the activity system. They are seen as drivers for change and development, often revealing areas where innovation or evolution is needed (Engeström', 2001). Phrases like "on the one hand ... But on the other", "I wish", "it's challenging when", or "it's a paradox" can hint at contradictions. Contradictions within and between activity systems are key drivers of change in CHAT and can take different forms:

- Primary, within elements of an activity system.
- Secondary between the elements of two systems.
- Tertiary, between the Object of an activity system and the same system but in its more advanced form
- Quaternary, between the Objects of different activity systems.

The concept of expansive learning, derived from CHAT, has influenced the understanding of transformation in educational settings when individuals or groups collaboratively identify and resolve contradictions within or between different activity systems (Engeström' & Sannino, 2010). When ET is an object used by the lecturer, yet encounters it as a tool in PD, it causes a quaternary contradiction, resolved when the lecturer rejects technology or learns to integrate it within their teaching. When ET is a tool, a secondary contradiction between ET and other elements causes a lecturer to reject, accommodate or transform. If the lecture is transformed, a tertiary contradiction arises between it and other activity systems, leading to further change. Lecturers frequently cited contradictions between evolving professional demands and static institutional practices. These tensions often highlight areas needing innovation.

The tools, which are mediating elements presented as workshops and online platforms, facilitated lecturers' journeys toward professional growth, bridging the gap between their current state and developmental goals (Higgs & McAllister, 2007; Cameron et al., 2023). In this instance, the tools aided in the transformation of the Subject's current state to achieve the objectives, which are the objectives the lecturer aimed to achieve.

6.3.2 Educational Technology

In the activity system related to ET, the CHAT terminology is expanded as follows:

- Subject: Lecturers adapted to using ET over time, often starting with essential tools like PowerPoint and advancing to more sophisticated platforms. Challenges included student technical literacy, load-shedding, institutional barriers, and adapting teaching styles to online environments.
 - *Lecturer_NEI: "Initially, I found the transition to remote teaching daunting as I don't consider myself tech-savvy. The new technology and the need to learn induced anxiety, including MS Teams. Adapting to these changes was not a choice; it was a necessity. Despite my initial hesitation, I recognised the need to learn and embraced the challenge."*
- Object: The primary objective was to enhance teaching and learning, accommodate diverse student needs, and overcome physical barriers, for example, the pandemic's restrictions. ET was used for accessibility, engagement, and efficient content delivery.
 - *Lecturer_RED: "I think absolutely that we can't escape the fact that COVID happened, continues to happen, and it forced us online in a way we hadn't done before. But even prior, that is perhaps what's interesting, for example, with the audio tools which we developed to help students engage with pathology specimens more meaningfully."*
- Tools: A wide array of ET tools was employed, including LMS, video platforms, interactive tools like Mentimeter, and cloud computing. Lecturers had to innovate with these tools, particularly during COVID-19, facing challenges like platform limitations and resource disparities.
 - *Lecturer_EIN: "Traditionally, I've never used technology other than as a resource in terms of maybe video clips that support my teaching to show students when I'm saying A, this is what I actually mean. During COVID, it had to become more explicit and overt. I had to switch immediately to an online platform where I had to navigate how to use technology to bring across my teaching in a way that still engaged the student."*
- Rules: Lecturers were motivated by student success and responsive to feedback. They navigated institutional rules and personal attitudes towards technology, striving to integrate ET effectively.
 - *Lecturer_GNE: "You always have to be mindful, even when you use videos, pictures, after doing the OER my eyes were open to the whole license, anything which I didn't*

know about. So, it takes a lot of time to look for pictures. And then you have to go somewhere and find whether its license allows it or not.”

- Community: Collaboration and support were key themes, with interactions involving students, colleagues, and leadership. The Community adapted to online teaching, with varying comfort levels among staff.
 - Lecturer_RAM: *“Time and size of the class have been a barrier... We introduced forums to do our PBM. That was a disaster... It’s very good for engagement, but the buy-in from students is very disappointing because they still go back to Google Docs. The buy-in from the students is also a challenge, besides my timing.”*
- Division of Labour: Lecturers were proactive in exploring and sharing ET knowledge. Students engaged with content in diverse formats. Leadership and IT consultants provided crucial support, but there were challenges in resource allocation and training.
 - Lecturer_YAD: *“We currently lack a dedicated team solely focused on technology, and it's something we should consider if we want to align with our division's vision... Unfortunately, technology doesn't have a place in our current budget, and it hasn't been a consideration in the past few years due to a rollover budget.”*

6.3.2.1 ET Contradictions

The contradictions, conflicts or tensions identified within the activity system related to ET were categorised according to the type of contradiction.

Primary contradictions within the several aspects of the activity system:

- Tools: The advantages of using ETs but also its limitations. The affordance of ET al allows it to be a facilitator of knowledge and a limiter when it comes to certain activities, especially within a practical subject.
 - Lecturer_AGN: *“Finding suitable videos was particularly time-consuming because I had to ensure they were relevant and aligned with the learning objectives. Sometimes, I even came across videos without sound, but the visuals were still valuable for teaching purposes... finding shorter, animated videos for subjects like anatomy was a challenge but necessary for effective teaching.”*
- Subject: Lecturers mentioned the conflict between their skills or comfort levels with technology and their role as innovators and integrators of ET in their teaching practice.

- *Lecturer_NEI: "Initially, I found the transition to remote teaching daunting as I don't consider myself tech-savvy. The new technology and the need to learn induced anxiety... Adapting to these changes was not a choice; it was a necessity. Despite my initial hesitation, I recognised the need to learn and embraced the challenge."*
- Object: A similar contradiction was mentioned more than once, as seen by lecturers, between students' perceived and actual capabilities regarding their use of ET for learning.
 - *Lecturer_GNE: "And then where I found it a little bit challenging was when students gave feedback, especially to me, that although they enjoy my lectures, if I could add videos or other mediums... This indicated that I'm teaching a different generation of students, so I needed to come to where they are at through using technology."*
- Rules: The availability of a budget seems to create tension related to allocating resources for ET.
 - *Lecturer_YAD: "We currently lack a dedicated team solely focused on technology, and it's something we should consider if we want to align with our division's vision... Unfortunately, technology doesn't have a place in our current budget, and it hasn't been a consideration in the past few years due to a rollover budget."*

Secondary contradictions were identified between several aspects of the activity system:

- Subject vs Rule: Lecturers' efforts to integrate ET contrast with curriculum structures not fully incorporating ET, indicating a conflict between the Subject (lecturers) and the rules.
 - *Lecturer_AGN: "I'd like to point out that there's no agenda item for educational technology in our division meetings, and the same goes for the Department of Health and Rehab in our departmental meetings. I believe it would be beneficial to include it at least once a semester for discussion. This would broaden everyone's understanding of how educational technologies are developed."*
- Subject and Object: The lecturers mentioned the challenges of teaching large classes, which cause tension related to the effective use of ET. Practically, it was challenging to use ET in large classes, even if it was the lecturer's desire to do so.

- *Lecturer_RAM: "Time and size of the class have been a barrier. The class, and also the students' comfort of using a particular technology, we introduced forums to do our PBM. That was a disaster. We struggled with getting them to use a new technology... Some students get it, and for some students, it's still a challenge."*
- Tools vs Rules: One lecturer identified a tension between traditional teaching methods and ET (tools).
 - *Lecturer_EIN: "Traditionally, I've never used technology other than as a resource in terms of maybe video clips that support my teaching to show students when I'm saying A, this is what I actually mean... during COVID, it had to become more explicit and overt. I had to switch immediately to an online platform where I had to navigate how to use technology to bring across my teaching in a way that still engaged the student."*
- Subject vs Tools: The contradiction between lecturers' preparedness and the abrupt need to adopt ET signals a secondary contradiction, primarily between the Lecturer (Subject) and the tools and rules governing ET use.
 - *Lecturer_NEI: "Initially, I found the transition to remote teaching daunting as I don't consider myself tech-savvy. The new technology and the need to learn induced anxiety... Adapting to these changes was not a choice; it was a necessity. Despite my initial hesitation, I recognised the need to learn and embraced the challenge."*
- Subject vs Community: These tensions arose for multiple lecturers. Lecturers who want to adopt ET but create tension with others in the same department/division.
 - *Lecturer_EZN: "When I started teaching in 2012, I attempted to introduce the affordances of technology in teaching and learning. However, colleagues in my division were initially resistant... there was strong opposition, particularly from one colleague who vehemently opposed it, insisting on keeping everything in the classroom."*

- **Tools vs Community:** As in the tension above, the shift from reluctance to openness towards ET, especially in COVID-19, represents a secondary contradiction between 'tools' (ET) and 'community' attitudes.
 - *Lecturer_YAD: "Our first attempt to introduce digital storytelling to students faced significant resistance. The challenge wasn't their aversion to the concept but rather our approach... To address this, it is essential to inform students upfront about the purpose, positioning, and outcomes of such endeavours."*

The only identified tertiary contradictions were related to the forced transition to online teaching due to the COVID-19 pandemic and lockdown. Tertiary contradictions are between the object of an activity system and the same system but in its more advanced form, which, for multiple lecturers, meant a change in their existing teaching methods. This, in turn, caused a conflict between new (online ET tools) and old forms of the activity (traditional teaching methods). A summary of these contradictions and their impact is shown in Table 6.1

Table 6.1: Contradictions in ET

	The source: Why does this contradiction exist? Consider historical, cultural, and contextual factors that may contribute.	The impact: How does this contradiction affect the activity system? Look at both immediate impacts and potential long-term changes.	The potential for transformation: Based on CHAT, contradictions are seen as opportunities for development. How can these contradictions be leveraged to drive change within the system?
ET's Suitability and Limitations	This contradiction arises from ET's inherent characteristics and limitations, juxtaposed against the diverse and sometimes tactile learning objectives in education. Historically, as ETs evolved, they were often developed with a focus on scalability	The immediate impact includes frustration among lecturers and students when ET cannot fully replicate the nuances of in-person learning experiences. In the long term, this could lead to a dichotomy in curriculum design, separating subjects	This contradiction offers an opportunity to innovate in the development and application of ET, pushing for technologies that offer more immersive, interactive experiences. It could lead to the co-design of curriculum and technology, where

	and accessibility, sometimes at the expense of depth and interaction quality that certain subjects require, especially in fields that demand hands-on experience.	into those deemed suitable for ET and those not, potentially stifling innovation in how complex subjects can be taught digitally.	lecturers participate in developing ET, ensuring it meets the nuanced needs of diverse learning outcomes.
Adapting to ET Despite Not Being Tech-Savvy	The digital divide among lecturers reflects broader historical, cultural, and generational differences in technology use and access. This divide is not just about personal proficiency but also about the pace at which educational institutions adopt and integrate new technologies compared to the rate of technological change in society.	In the short term, this can lead to inconsistency in the quality of teaching and learning experiences, depending on the lecturer's comfort with technology. In the long term, it could widen the gap between institutions that can effectively integrate ET and those that cannot, affecting the quality of education provided.	Addressing this contradiction can promote comprehensive PD and support structures for lecturers at all levels of tech proficiency. It opens avenues for peer learning and mentoring, creating a culture of continuous learning and adaptation among lecturers. It can enhance the inclusivity and effectiveness of ET in teaching.
Forced Transition to Online Teaching Due to COVID-19	The sudden and unprecedented shift to online teaching due to the COVID-19 pandemic lockdowns revealed the latent contradiction between traditional teaching modalities and the potential of ET. The rapid transition was necessitated by an external event, highlighting the unpreparedness of many educational institutions for such a digital pivot.	Initially, this led to significant disruption, with varied success in maintaining educational standards. The long-term impacts include reassessing the role of physical classrooms and traditional pedagogical approaches, as well as accelerating the integration of digital learning tools and methods.	This contradiction has already demonstrated its transformative potential by forcing innovation in teaching and learning practices. The experience can be leveraged to develop more resilient, flexible educational models that blend online and offline learning experiences, preparing lecturers and students for future challenges.

Getting Buy-In from Colleagues	This contradiction stems from the diverse attitudes and beliefs about the role and value of ET in education among staff, influenced by individual experiences, disciplinary traditions, and institutional cultures. Resistance often arises from a lack of familiarity with ET, perceived threats to traditional pedagogical authority, or doubts about the effectiveness of ET in enhancing learning outcomes.	Short-term impacts include slow adoption rates of innovative teaching methods and technologies, creating disparities in student learning experiences. Long-term, it could limit the institution's ability to evolve its teaching practices, potentially impacting its competitiveness and relevance.	Overcoming this contradiction requires fostering a culture of collaboration and a shared vision for the role of ET in enhancing education. Initiatives such as collaborative curriculum design, shared PD opportunities, and evidence-based practices can demonstrate the value of ET, encouraging broader adoption. Transformative change can be achieved by aligning individual motivations and institutional goals towards enhancing learning outcomes through the effective integration of ET.
Reluctance vs. Openness to ET	This contradiction arises from a complex interplay of historical inertia in educational practices, cultural attitudes towards technology and change, and contextual factors such as previous negative experiences or lack of exposure to effective ET use. Historically, institutions often exhibit a slow pace of change, valuing traditional pedagogies and methods. Culturally, there can be a	In the immediate term, this contradiction manifests in varied levels of ET adoption among lecturers, potentially leading to inconsistencies in student experiences and outcomes. It can cause tension among staff, between early adopters and those more resistant to change, and may result in a fragmented approach to curriculum design and delivery. Over the long term, however, this contradiction may spur	This contradiction holds significant potential for transformative change. By fostering a culture of experimentation and reflective practice, the FHS can leverage this tension to encourage lecturers to critically assess and share their experiences with ET, promoting a more cohesive and collaborative approach to its integration. Providing structured support, such as PD opportunities and peer

	broad range of attitudes towards technology, from scepticism to enthusiastic adoption, influenced by past successes or failures in technology integration, personal comfort levels, and perceived relevance to educational outcomes.	ongoing dialogue and reflection on the role of technology in education, encouraging more deliberate and evidence-based approaches to its integration.	mentoring, can help bridge the gap between reluctance and openness, leading to a more adaptable and innovative educational environment.
--	--	---	---

6.3.2.2 ET Mediating Artefacts

Mediating artefacts are tools and signs (e.g., technologies used by participants) that mediate learning activities and how various technologies influence and transform traditional teaching methods. They are the tools and processes that help or hinder lecturers in achieving their goals or outcomes related to using ET in their teaching. ET plays a variety of mediating roles. The examples identified from interviews highlight how ET acts as a mediator within the activity system, bridging the gap between the Subject (lecturers) and the Outcome (enhanced learning using ET). The instances of mediation are divided into various categories.

Transformation of teaching and learning practices related to mediation includes integrating ET into the curriculum and LMS, digital stories, flipped classrooms, scaffolding approaches, and discipline-specific tools like virtual microscopes.

- *Lecturer_NAM: "In the videos, I perform clinical examinations, and students are required to spot mistakes and identify what has been done well. This process is particularly useful for observational learners, as it helps them make connections and follow a path, especially when we use a scaffolding approach. I've structured the videos to progress from simple to complex clinical examination tasks."*
- *Lecturer_RED: "We developed an audio tool to help students engage with pathology specimens more meaningfully. Since we don't have enough consultants to come walk around with every student, the audio tool acts as a consultant in their ears."*

The impact of these technologies is that they transform traditional curriculum delivery, making it more interactive and suited to modern educational needs. They mediate by facilitating a shift from

passive to active learning environments, where students are more engaged and can apply what they learn in real-world contexts. The implication is that the faculty should encourage the development and sharing of best practices for integrating these tools into various disciplinary contexts. It will also provide PD, training, and resources that enable lecturers to experiment with and refine these approaches.

Adaptation to challenges, such as mediation examples, includes using WhatsApp for teaching due to data constraints, adapting to COVID-19 through online platforms, and creating e-books for centralised learning.

- *Lecturer_LLI: "We realised that we had to use different methodologies to bring those students together... I still remember from the hard lockdown the difficulties we experienced in interacting with students who were far away and who had no better than an edge signal... So, a lot of our content moved online, and now that students have come back to the clinical platform, we've kept a lot of that and saved time by allowing the students to study in their own time."*
- *Lecturer_AGN: "In 2019, finding appropriate and correct videos was much harder compared to now. I had to develop videos for my practical skills teaching because the students wouldn't be able to be in the same venue as me at the same time... I used a link or software to condense the size of the videos and then uploaded them."*

The impact is that ET mediates the adaptation to both infrastructural limitations and unprecedented challenges like the pandemic, ensuring continuity and accessibility of education. These tools provide flexible solutions that maintain educational quality under varied conditions. In order to leverage these forms of mediation, the faculty could develop a repository of adaptable ET solutions for different contextual challenges and foster a culture of innovation and resilience by sharing success stories of adaptation using ET.

Examples of enhanced student engagement and responsibility mediation are polls, forums, and student-created videos, which are tools that allow for flexible student engagement.

- *Lecturer_RAM: "In my lectures, I always use Mentimeter, which is a classroom response system. This tool is effective for engaging students and doing a quick 'temperature check'... before any lecture, I always post pre-lecture tasks... so that students come prepared."*

- *Lecturer_EZN: "Podcasts have been amazing. They've helped regain some connection with the students... Even when you post assignments, whether it's text or voice notes, students somehow feel the same engagement. Podcasts and audio-narrated PowerPoints have been instrumental."*

These tools impact learning by mediating the learning experience via promoting interactivity, collaboration, and self-directed learning. They transform the student role from passive recipients to active participants in their learning journey, enhancing engagement and motivation. In order to leverage this form of mediation, the faculty can implement policies and practices that encourage student choice and voice in the selection and use of ET tools, as well as provide platforms for student feedback on ET effectiveness and suggestions for exploring new tools.

Some general considerations for leveraging ET mediation include offering ongoing PD, training, and support so that lecturers can explore and integrate new ET tools effectively, focusing on pedagogical benefits and student engagement. In addition, sufficient and effective infrastructure and support systems need to be in place to facilitate the smooth integration of ET into teaching and learning practices.

- *Lecturer_GNE: "I watched the videos from CILT because at least they were available. During COVID, I attended Vula trainings from the faculty... anything asynchronous was best because then I could go back and watch it by myself and do what needed to be done."*
- *Lecturer_NOT: "PD and ET use are often discussed in meetings. Some in the division share their experiences, which helps, but meaningful engagement requires effort. Without quality control and clear support, ideas often go unimplemented."*

Highlighting the benefits of ET through fostering a collaborative environment among lecturers emerged as a key strategy. This approach included sharing experiences, challenges, and successes in using ET, facilitating peer learning and support, as well as implementing feedback mechanisms for regularly evaluating the impact of ET tools on teaching and learning outcomes. By incorporating feedback from both lecturers and students, these practices can guide continuous improvement. In this way, ET mediates teaching and learning processes by transforming traditional approaches, adapting to challenges, and enhancing student engagement and responsibility. Recognising and

strategically leveraging these mediating roles enables lecturers to create a more dynamic, effective, and responsive educational ecosystem.

6.3.3 Professional Development

In the activity system related to PD, the formulation of the themes uses the following terms as guidelines in that analysis:

- Tools: Workshops were predominantly used for PD, with some lecturers valuing the autonomy of online platforms while others expressed reservations about their effectiveness.
 - *Lecturer_GNE: "Recognising the importance of digital literacy, I also attended seminars and webinars introduced on platforms like Vula, and I always received notifications from either CILT or Freda, so I attended those."*
- Subject: As a collective, lecturers took individual responsibility for PD, with variance in tech-savviness noted among peers.
 - *Lecturer_NEI: "Initially, I identified myself solely as a speech therapist. However, I recognised a distinct difference in teaching, prompting me to pursue a postgraduate diploma in professional education. This experience broadened my perspective... Now, my motivation is centred on becoming a better teacher, embracing technology to enhance the learning experience."*
- Rules: Practices were sometimes static despite an evolving professional environment, and CPD requirements were seen as mechanisms driving growth.
 - *Lecturer_LLI: "I think it's important for doctors to stay up to date with their skill set, not necessarily with things that aren't core knowledge for them, but at least the core responsibilities that they have for day-to-day on a day-to-day basis."*
- Community: Some lecturers valued collaboration, while others felt isolated, with hierarchy and power dynamics sometimes posing challenges.
 - *Lecturer_EZN: "When I started teaching in 2012, I attempted to introduce the affordances of technology in teaching and learning. However, colleagues in my division were initially resistant... I argued that online resources could provide extra support for students, but my ideas were dismissed."*
- Object: The goal of PD varied among lecturers, from adapting to technology to enhancing teaching methodologies or a combination of both.

- *Lecturer_YAD: "I am motivated by my love for learning and my inquisitive nature. I enjoy exploring new ideas and experiences, always eager to expand my knowledge. I see myself as a curious person who embraces challenges and finds excitement in trying things I haven't done before."*
- Outcomes: Outcomes centred on improved teaching and technological adaptation, but lecturers also valued personal satisfaction.
 - *Lecturer_RED: "I like learning and growing. It's more intrinsically motivated than externally, I'd say. Although I did get promoted, which is handy for my career trajectory, that was not my initial motivation. It was just helpful when I had to prepare the huge ad hoc promotion document."*
- Division of Labour: A perceived gap existed between departmental leaders' tech knowledge and the lecturers, with hierarchical structures sometimes complicating PD.
 - *Lecturer_AGN: "I'd like to point out that there's no agenda item for educational technology in our division meetings... I believe it would be beneficial to include it at least once a semester for discussion. This would broaden everyone's understanding of how educational technologies are developed."*
- Contradictions and Mediation: Evolving professional demands sometimes clashed with static institutional practices, and tools like workshops and online platforms were seen as bridging gaps in development.
 - *Lecturer_RED: "Because I like learning, I think that would be the reason. Deep inside, I really like learning... I enjoy it, and even if I learn nothing, I get to hang out with some people or feel less alone during times like COVID."*

6.3.3.1 PD - Contradictions

The contradictions, conflicts or tensions identified within the activity system related to PD were categorised according to the type of contradiction. Primary contradictions arise within an element of the activity system. These are internal contradictions that reflect conflicts inherent to the components of the system itself. The one highlighted is within the Community. The tension between the desire for individual PD in ET and the collective nature of curriculum development and peer support within the 'community' component exemplifies a primary contradiction.

- *Lecturer_AGN: "I'd like to point out that there's no agenda item for educational technology in our division meetings... I believe it would be beneficial to include it at least once a semester*

for discussion. This would broaden everyone's understanding of how educational technologies are developed."

- *Lecturer_NOT: "PD and ET use are often discussed in meetings. Some in the division share their experiences, which helps, but meaningful engagement requires effort. Without quality control and clear support, ideas often go unimplemented."*

This conflict underscores the lecturer's efforts versus the collective norms and practices.

Secondary contradictions were more numerous. These occurred between the elements of the activity system, reflecting conflicts between components. The recognised need for PD versus financial and temporal limitations underscores a contradiction between Outcome, lecturers' PD and the Rules, the broader faculty or departmental systems managing resources.

- *Lecturer_YAD: "We currently lack a dedicated team solely focused on technology, and it's something we should consider if we want to align with our division's vision. While generating innovative ideas and identifying useful software is essential, the crucial factor is budget allocation. Unfortunately, technology doesn't have a place in our current budget, and it hasn't been a consideration in the past few years due to a rollover budget."*
- *Lecturer_NOT: "PD is viewed positively, but burnout is high. People are overwhelmed and lack time for PD that could benefit them long-term. Good teaching content takes time, unlike emergency content that was quickly put together."*

The efforts to innovate teaching methods through blended learning before and during COVID-19, despite facing student resistance, highlight another contradiction between Outcome and Community.

- *Lecturer_RAM: "The class size and also the students' comfort of using a particular technology. For example, we introduced forums to do our PBM. That was a disaster... The buy-in from students is very disappointing because they still go back to Google Docs. I said, 'Guys, you can do much more in Padlet. You can comment on each other.'"*
- *Lecturer_RED: "You would have staff, individual people who are resistant to the idea of using technology and teaching. If you want to try a new thing, you sometimes need money or funding for a piece of equipment. I can't just decide to do virtual reality pathology teaching. I don't have the funds for that."*

This tension reflects conflicts between the lecturers' goals and the students' when innovative objectives clash with resistance from students and workload concerns from lecturers.

Tertiary contradictions are encountered when a novel element is introduced into the activity system, attempting to resolve secondary contradictions but creating tensions. The institutional support for PD within the FHS, juxtaposed with the prioritisation of teaching, reflects a tertiary contradiction.

- *Lecturer_NEI: "I faced challenges with technology implementation due to issues like internet connectivity, disconnections, and occasional load shedding. These factors, especially disconnection, played a significant role, causing difficulties with my wi-fi. This issue is crucial not only for teaching staff but also for students."*
- *Lecturer_LEH: "MS Teams is often a struggle for me... I don't have the Zoom access from UCT because I'm part-time and it just seemed too much of an uphill battle to try and get it as a part-timer."*

This tension between the 'Division of Labour' and the 'Rules' suggests conflicts regarding the importance of PD in operationalising support for ET. By examining the sources, impacts, and potential for transforming these contradictions, particularly in the context of PD in ET, into teaching practices, insights are gained into the complex processes of adaptation, resistance, and development.

Table 6.2: Contradictions in PD

	The source: Why does this contradiction exist? Consider historical, cultural, and contextual factors that may contribute.	The impact: How does this contradiction affect the activity system? Look at both immediate impacts and potential long-term changes.	The potential for transformation: Based on CHAT, contradictions are seen as opportunities for development. How can these contradictions be leveraged to drive change within the system?
PD Needs vs Financial	The contradiction between the recognised need for ongoing PD in ET and the constraints of financial	The immediate impact of this contradiction includes limited uptake of ET innovations, potential burnout among staff	This contradiction presents an opportunity for institutions to reassess and realign their strategic priorities, budget

and Time Constraints	resources and time allocation stems from broader institutional priorities, budgetary allocations, and the division of labour within educational organisations. Financial constraints often reflect broader economic conditions and institutional priorities that may not place PD in ET at the forefront. Time constraints are similarly linked to the broader context of academic workloads, including teaching, research, and administrative responsibilities, which can limit the capacity for additional PD activities.	attempting to self-direct their learning without institutional support, and a possible widening gap between the skills staff possess and those needed for effective ET integration. Over the long term, this could lead to diminished educational quality, reduced competitiveness of the institution, and a workforce ill-prepared for technological advancements.	allocations, and workload models to support continuous PD in ET. By recognising PD as central to institutional excellence and student success, resources can be more effectively allocated to support these initiatives. Additionally, adopting flexible models of PD, such as micro-credentials or just-in-time training, can alleviate time and financial constraints, fostering a culture of lifelong learning and adaptation among staff.
Innovation vs. Workload and Student Resistance	The tension between the drive to innovate in teaching practices through ET and the realities of staff workloads, coupled with student resistance, originates from the evolving expectations of educational delivery in the digital age. Staff face the dual pressures of maintaining high-quality teaching and fulfilling research and service obligations, while students' expectations of teaching and learning methods are also changing, sometimes in	In the short term, this contradiction can lead to stress and frustration for lecturers, who may feel unsupported in their efforts to innovate. It can also result in mixed responses from students, who may resist methods that diverge from their expectations or comfort zones. Long-term impacts include potential attrition among innovative staff and a risk of stagnation in educational practices,	This contradiction can be leveraged to promote a more integrated approach to workload management and curriculum design that incorporates innovation as a core value and supports it with adequate resources and recognition. Engaging students as active partners in the innovation process can help mitigate resistance and foster a shared responsibility for learning. Addressing this contradiction requires a cultural shift towards valuing

	opposition to novel approaches.	threatening the institution's relevance and adaptability.	and supporting innovation, with clear communication, resources, and policies aligning with this goal.
--	---------------------------------	---	---

6.3.3.2 Professional Development - Mediation

Mediation, in the context of CHAT, refers to the role of tools, symbols, and signs in facilitating or hindering the transformation of the Subject towards achieving the desired Outcome. For the lecturers in this study, the desired Outcome is the integration of ET through PD.

The following themes emerged.

- The lecturers' interpretation of PD ranged from seeing it as integral to their professional identity to seeing it as a tool for enhancing current teaching practices. The implication is that the ways in which lecturers perceive the purpose and value of PD influence their engagement with PD activities and resources and, ultimately, their motivation and commitment to PD. This potentially facilitates or hinders their professional growth. Seeing PD as integral to professional identity may drive deeper engagement with PD activities, while viewing it merely as a tool might limit engagement to immediate, practical needs.
 - *Lecturer_YAD: "I am motivated by my love for learning and my inquisitive nature. I enjoy exploring new ideas and experiences, always eager to expand my knowledge. I see myself as a curious person who embraces challenges and finds excitement in trying things I haven't done before. I am drawn to unique concepts, diverse styles, and alternative approaches, which fuel my motivation to continuously learn and grow."*
 - *Lecturer_RED: "Because I like learning, I think that would be the reason. Deep inside, I really like learning. It's why I love my job at UCT and why I go to professional development events."*
- Lecturers used a wide range of tools for PD (workshops, online courses, peer learning, and self-directed exploration), and the preference for flexible learning options acts as a mediating artefact. Online tools serve as crucial mediators by providing convenient and accessible means for engaging with PD. The implication is that these tools can either facilitate or limit PD engagement. The effectiveness of these tools in mediating the PD process depends on their alignment with lecturers' preferences, needs, and the specific skills

they aim to develop. The convenience and accessibility of online tools, for instance, can significantly enhance the ability to pursue PD, especially in tight schedules and institutional constraints.

- *Lecturer_GNE: "I regularly watch the videos from CILT because they are available. During COVID, I did attend some sessions by CILT. I did attend Vula trainings as well from the faculty and from EDU. And then I would watch anything that I could find that was asynchronous after COVID was the best because then I could go back and watch it by myself and do what needed to be done."*
- *Lecturer_NEI: "Initially, I identified myself solely as a speech therapist. However, I recognised a distinct difference in teaching, prompting me to pursue a postgraduate diploma in professional education. This experience broadened my perspective, revealing the lack of evidence-based practices in my teaching."*
- The engagement with PD activities, especially in ET, and the resultant enhancement in skills and confidence illustrate positive mediation: PD activities and tools support lecturers' professional growth. However, challenges such as adapting to new ET and feeling overwhelmed by the rapid pace of change indicate negative mediation effects, which can hinder effective PD. This means there is a delicate balance between positive and negative mediation, effectively influencing lecturers' ability to integrate PD into their teaching practices. Tailored support and guidance in navigating PD resources and technologies can mitigate the adverse mediation effects, enhancing skill acquisition and confidence.
 - *Lecturer_RAM: "During COVID, I did attend some sessions by CILT. I did attend Vula training as well from the faculty, from EDU. And then I would watch anything that I could find that was asynchronous after COVID was the best because then I could go back and watch it by myself and do what needed to be done."*
 - *Lecturer_NOT: "PD is viewed positively, but burnout is high. People are overwhelmed and lack time for PD that could benefit them long-term. Good teaching content takes time, unlike emergency content that was quickly put together."*
- Lastly, institutional constraints, including budgetary and time limitations and varying levels of departmental support, are significant mediators that impact the extent to which lecturers can engage in PD. Lack of structured support and resources constitutes negative mediation, hindering lecturers' ability to fully exploit PD opportunities. Addressing these negative mediators requires strategic changes in the faculty, including allocating dedicated PD

resources and developing supportive policies and practices. Enhancing departmental support and providing structured PD pathways can transform these mediators from hindrances into facilitators of PD.

- *Lecturer_YAD: "We currently lack a dedicated team solely focused on technology, and it's something we should consider if we want to align with our division's vision. While generating innovative ideas and identifying useful software is essential, the crucial factor is budget allocation. Unfortunately, technology doesn't have a place in our current budget, and it hasn't been a consideration in the past few years due to a rollover budget."*
- *Lecturer_NAM: "One of my biggest challenges was struggling to get a laptop from the department to do my work. When I finally got one, it was slow and outdated because it had been used for other purposes... Despite the teething problems, I hope for better support within our department for funding and technology."*

An interplay of mediators affects lecturers' PD journey in ET. Both facilitating and hindering mediators are present, shaping the pathway from the current state of PD engagement towards the desired enhancement of teaching capabilities. Leveraging positive mediators while addressing and mitigating negative ones is crucial for successfully integrating PD into lecturers' professional practices, underscoring the need for strategic support and resources at both the individual and institutional levels.

6.4 Technological Pedagogical Content Knowledge Analysis

TPACK is used with CHAT to understand how lecturers integrate technology into their teaching. Effective technology integration only happens when there is a skilful interwovenness of the teaching methods (Pedagogical Knowledge), subject matter (Content Knowledge), and technology (Technological Knowledge). However, determining the different domains of TPACK from interviews is a complex task, as it involves understanding the nuanced ways lecturers integrate these three aspects - technology, pedagogy, and content.

- a) **Technological Knowledge:** Lecturers speak about the specific technologies they use in their teaching, their comfort level with these tools, the process for learning to use ET, and their thoughts about the benefits and drawbacks of using technology in teaching.

- b) Pedagogical Knowledge: Lecturers discuss their teaching strategies and methodologies, beliefs about effective teaching and learning, how they structure their lessons and strategies for engaging students and assessing their learning.
- c) Content Knowledge: Lecturers talk about the content they teach, how well they understand it, how they approach it, and how they adapt their teaching based on the specific content demands.

In order to apply TPACK as an additional lens to my data analysis, I explore how lecturers demonstrate these intersecting knowledge domains in their practice. The aim is to understand the lecturers' proficiencies in technology, pedagogy, and content and, more importantly, their ability to synthesise these into effective, technology-integrated teaching practices. TPACK is indicated when lecturers discuss how they make decisions about using technology and choosing ET in alignment with their teaching methods and content. Other indications would be adaptations they made to their teaching strategies based on the technology they used. These are indications of their ability to synthesise technological, pedagogical, and content knowledge. Each lecturer's TPACK is shaped by their experiences, context, and beliefs about teaching and learning.

6.4.1 Technological Knowledge

In this section, I present the findings of the specific technologies lecturers use in their teaching, their comfort level with these tools, the process of learning to use ET, and their thoughts about the benefits and drawbacks of using technology in teaching. The findings capture the variation in technological knowledge of the 12 lecturer interviewees. Given the diverse backgrounds of lecturers across various disciplines within Health Sciences, it is evident that different technologies are employed depending on the context. This leads to a broad spectrum of usage patterns, often resulting in independent silos of practice. How lecturers apply technology may vary significantly, and they often find themselves on a continuum, ranging from aspiring technology users to those who have fully integrated technologies into their teaching. Notably, this analysis does not compare specific technologies, as all fall within the typical range used in health sciences education. Instead, it recognises that each lecturer has a unique professional and personal journey regarding technology integration and PD.

For each of the lecturers, a brief description follows of their TK: specific technologies they use in their teaching, comfort level with these tools, process for learning to use ETs, and their thoughts about the benefits and drawbacks of using technology in teaching. Lecturer_YAD's TK comprises the integration of ET, such as LMS tools, blogs, and polls. They exhibit a high comfort level with these tools, adopting a "How hard can it be?" attitude, indicating a self-directed and confident approach to learning new technologies. They see the benefits of technology in enhancing teaching and learning, but recognise the contextual challenges, for example, actual patient care, which technology cannot replace.

- Lecturer_NEI has expanded the use of ET due to the pandemic, utilising Zoom and MS Teams platforms, as well as blogs. Initially overwhelmed by the technology, they now find it easier and timesaving. The lecturer's process for learning ET involved adapting out of necessity, overcoming barriers, especially internet connectivity, and valuing learning from colleagues.
- Lecturer_EZN's TK includes podcasts, narrated PPTs, and WhatsApp to support students with disabilities and facilitate flipped classrooms. They are comfortable using ET to support pedagogy and have engaged in PD to enhance their skills. The lecturer emphasises the need for student buy-in and identifies connectivity as a significant barrier.
- Lecturer_RAM integrates a variety of ETs, from Mentimeter to multimedia tools, to enhance teaching and learning. Their comfort with ET is indicated by their willingness to engage with technology despite challenges such as large class sizes. They have faced barriers, e.g. budget constraints and finding the time to attend workshops to learn about new technologies.
- Lecturer_NAM uses ET with the educational goal of making learning fun and progressive. Comfortable with ETs, they focus on student engagement and learning outcomes, addressing the challenges of integrating technology and reflecting on the need for strategic support and resources.
- Lecturer_RED embraces ET as an early adopter and is comfortable using discipline-specific tools. They have faced challenges, particularly budget limitations, but have used their time to experiment and learn new technologies. The lecturer has benefited from institutional support and recognises the transformative power of ET.
- Lecturer_GNE uses ET out of necessity to engage students facing challenges such as bandwidth and wi-fi access. The lecturer has sought PD opportunities to enhance their ET skills and remains motivated by student success and feedback.

- Lecturer_NOT's TK involves using ET to deliver content and engage students outside clinical settings. Comfortable with using a variety of ET, they have attended workshops to overcome challenges such as bandwidth limitations and are driven by student success.
- Lecturer_AGN has adopted ET to deliver content and enhance student skills. Finding appropriate videos has been a particular barrier, followed by a lack of student engagement in forums. They have engaged in PD to improve their use of ET.
- Laterrell's TK reflects their adaptation to ET during COVID-19, moving content online and innovating with tools such as Zoom. They have overcome load-shedding challenges and proactively sought PD to improve their technological competencies.
- Lecturer_EIN initially integrated simple technologies and faced challenges engaging students with online platforms. The lecturer values collaboration and has worked to improve their ET skills through workshops and sharing with colleagues.
- Lecturer_LEH has a decade-long experience with ET, starting with PowerPoint and expanding to diverse digital tools. They are comfortable running workshops and teaching others about ET, with a focus on student engagement and training. Challenges included load-shedding and connectivity issues, but they have been receptive to PD and faculty support.

6.4.2 Pedagogical Knowledge

Based on the interviews, I describe each lecturer's PK, teaching strategies and methodologies, beliefs about effective teaching and learning, structure of their teaching, and strategies for engaging and assessing students' learning.

- Lecturer_YAD's PK revolves around active exploration and resilience in teaching, employing LMS tools, blogs, and polls to support student-centred learning. They believe in integrating technology to enhance teaching methods and the value of learning by doing. Their strategies for engaging students are based on self-discovery and mastery, demonstrating an affinity for hands-on skills and collaborative curriculum development.
- Lecturer_NEI adapted teaching strategies due to COVID-19, using virtual classrooms and ET to maintain student engagement. This lecturer believes in the power of technology to save time and make teaching materials more accessible. There is a focus on ensuring students are well-prepared for clinical experiences, indicating a preference for practical, application-oriented teaching.

- Lecturer_EZN employs flipped classroom models, podcasts, and WhatsApp to support diverse learning needs, including for students with disabilities. They believe in adapting pedagogy to the online environment and using ET to support learning. The strategies they used involve student training on ET usage and finding ways to make the curriculum accessible.
- Lecturer_RAM uses multimedia tools to offset heavy content and believes in the benefits of using ET to help struggling students. Lessons are structured, emphasising student feedback and engagement, often sharing practices with other lecturers to foster a collaborative learning environment.
- Lecturer_NAM uses ET as part of a scaffolding approach to teaching, focusing on making learning fun and progressive. This lecturer is dedicated to enhancing the relationship between students and lecturers, improving accessibility, and providing personalised feedback, which reflects their belief in student-centred pedagogy.
- Lecturer_RED uses discipline-specific ET tools and is strongly inclined toward student engagement. Lessons are structured to save time and improve learning efficiency, fostering an environment where students can access content in versatile settings. The lecturer's strategies reflect a blend of policy-driven and individualised teaching methods.
- Lecturer_GNE uses ETs to improve communication and demonstrate complex topics. Their teaching has adapted to encourage student engagement and be responsive to student feedback. There is a commitment to addressing students' varying technological literacy and access levels.
- Lecturer_NOT employs videos and simulations to enhance teaching, believing in the efficacy of visual and interactive methods. Pedagogical strategies are influenced by the need to prepare students for clinical practice, emphasising skill development through ET.
- Lecturer_AGN has embraced flipped classroom models and case studies to augment material and believes in the power of ET to engage students. The lecturer is motivated by student feedback and seeks to address their learning needs using ETs.
- Lecturer_LLI has maintained several COVID-era practices, utilising ETs to make learning more accessible. The pedagogical approach is influenced by the need to adapt to challenges such as loadshedding and enhance student accessibility to learning materials. The lecturer's pedagogy reflects a practical and flexible teaching strategy.

- Lecturer_EIN has overcome initial challenges with student engagement online, utilising tools like forums and LMS features. The lecturer values sharing best practices among colleagues and believes in experimenting with new teaching methods to find what works best for student engagement.
- Lecturer_LEH has a solid foundation in using ET for engagement, running workshops for peers, and training students on the ET they want students to use. Various technologies enhance student interaction, and positive student feedback motivates lecturers to continue being innovative pedagogically.

6.4.3 Content Knowledge

In exploring CK, I looked at the subject matter lecturers teach and how well they understand it, approach it, and adapt their teaching based on the specific content demands.

- Lecturer_YAD's CK is evident in integrating specific technologies like LMS tools into the curriculum to support and enhance current teaching methods. The lecturer ensures that technology is selected and used to meet curriculum outcomes. This indicates a deep understanding of the subject matter and its delivery.
- Lecturer_NEI's CK is manifested in their adaptation to online teaching, indicating a comprehensive understanding of their Subject and how to present it through different ETs. They try to integrate ET into courses based on individual lecturer needs, showing adaptability in content delivery.
- Lecturer_EZN demonstrated CK through their use of podcasts and narrated PPTs to adapt content for online learning. They have effectively used ET to flip classrooms and make content accessible, especially for observational learners, suggesting a nuanced approach to the subject matter.
- Lecturer_RAM's CK is evident in their use of multimedia tools to teach complex content, indicating a firm grasp of their Subject. They are mindful of student feedback to enhance their teaching, showing responsiveness to content delivery and student comprehension.
- Lecturer_NAM uses ET to scaffold learning, which implies a strategic approach to their CK. They adapt their content delivery to make learning engaging and accessible, considering the students' diverse backgrounds and learning paces.

- Lecturer_RED uses discipline-specific tools, indicating specialised CK. They have adapted to teaching online and have sought to overcome barriers to ET access, showing a commitment to ensuring that content is delivered effectively despite external challenges.
- Lecturer_GNE has faced challenges with ETs, particularly in engaging students with the content. Their efforts to use ET to communicate and demonstrate topics suggest a focus on applying their CK to meet the demands of the digital learning environment.
- Lecturer_NOT's use of simulations and teaching videos reflects a targeted CK that adapts to the practical needs of clinical education. They focus on preparing students for hands-on experiences, demonstrating an understanding of translating subject matter into practical skills.
- Lecturer_AGN focuses on flipped classroom models and case studies, indicating a CK well-suited to interactive and applied learning. The lecturer adapts their content delivery to engage students and address their learning needs through ET.
- Lecturer_LLI has adapted content to online formats and has maintained ET practices post-COVID, suggesting a flexible CK that can be delivered through various platforms. They balance the content demands with accessibility issues, like loadshedding, showing adaptability.
- Lecturer_EIN has moved from traditional video and audio to a broader range of ET, reflecting a CK that embraces diverse content delivery modalities. They have faced challenges with student engagement, which has influenced how they adapt their teaching strategies to the content's demands.
- Lecturer_LEH has transitioned from using PowerPoint to various tools and cloud computing, indicating a CK that is not only deep but also broad. Their leadership in teaching others to use ET shows a confident approach to content adaptable to evolving technology demands.

6.4.4 TPACK

A summary of the level of TPACK attained by each lecture using the following as a scale (Kadioğlu-Akbulu et al., 2020; Wang, 2022):

- a. Elevated TPACK: Indicates a remarkably elevated level of expertise, surpassing proficiency.
- b. Strong TPACK: Suggests a solid grasp and practical application of TPACK principles.

- c. Significant TPACK: Reflects a noteworthy integration of technology, pedagogy, and content.
- d. Good TPACK: Indicates a foundational understanding and initial integration of TPACK elements.

Table 6.3: Levels of TPACK of Lecturers

Lecturer	TPACK Level	Description
Lecturer_YAD	Elevated TPACK	Uses technology for its own sake and to enhance the educational process. Aligns ETs with pedagogical goals, willing to experiment and adapt.
Lecturer_NEI	Strong TPACK	Adapts to online teaching with various platforms and modifies teaching strategies to integrate TK, PK, and CK.
Lecturer_EZN	Elevated TPACK	Uses flipped classrooms and digital tools for students with disabilities, synthesises TK, PK, and CK.
Lecturer_RAM	Significant TPACK	Uses multimedia tools to support student learning and adapts teaching based on technology's effectiveness.
Lecturer_NAM	Strong TPACK	Scaffolding learning with ET and adapting content as well as pedagogy based on student needs and ET.
Lecturer_RED	Elevated TPACK	Uses discipline-specific tools, adapts teaching to an online environment, and proactively seeks PD for better integration.
Lecturer_GNE	Significant TPACK	Adapts ET for engagement, responsive to student interaction, seeks PD to improve TK and integrate PK and CK.
Lecturer_NOT	Elevated TPACK	Uses videos and simulations to adapt clinical teaching and effectively integrates CK with appropriate ET.
Lecturer_AGN	Elevated TPACK	Uses flipped classrooms and case studies with technology, adapts teaching to technology and is responsive to student engagement.
Lecturer_LLI	Elevated TPACK	Maintains ET practices post-COVID, creatively addresses accessibility challenges, and adapts content delivery to available technology.
Lecturer_EIN	Significant TPACK	Adapts to using various ETs for engagement, aligning technological choices with pedagogical methods and content needs.

Lecturer_LEH	Elevated TPACK	Confidently runs workshops on ET, adapts pedagogy to various technological tools, and synthesises TK, PK, and CK.
--------------	-------------------	---

In Table 6.3 above, each lecturer's level of TPACK has been classified based on the interview data. This classification considers how lecturers make decisions regarding the use of technology in their teaching, including how well it aligns with their pedagogical approaches and subject content. Additionally, the categorisation reflects whether lecturers have adapted their teaching strategies in response to the technologies they use and the content they teach.

The analysis shows that nine of the twelve lecturers exhibit advanced TPACK integration. Lecturers in this category demonstrate advanced integration of technological, pedagogical, and content knowledge. They have transformed teaching and learning through innovative and strategic uses of technology that enhance both content delivery and pedagogical effectiveness. Three exhibit a competent integration of technology into their teaching. While they use technology to support and supplement traditional pedagogical methods, they have not fully exploited its potential to transform the learning experience. No lecturer displayed minimal or ineffective use of ET, which would be characterised by minimal or ineffective technology use that does not significantly align with or enhance pedagogical objectives or content understanding.

Details for each lecturer are summarised in Appendix D2, which records the CHAT codes (Subject, Object, Tools, Rules, Community, Division of Labour) extracted from their interview. These coded elements formed the basis for interpreting each lecturer's level of TPACK integration, ranging from advanced, discipline-specific use of technology to early-stage alignment of tools with pedagogy and content.

Many lecturers have successfully integrated technology into their teaching practices. They use digital tools and platforms to enhance teaching, make content more accessible, and support diverse student learning needs, for example, those of students with disabilities. A recurring theme among these lecturers is their ability to select technologies aligning with their pedagogical goals and the content they teach, which are clear indicators of TPACK. Additionally, lecturers displayed adaptability and responsiveness, modifying their teaching strategies based on the technologies they used, student feedback, and the effectiveness of the tools. The COVID-19 pandemic significantly

prompted lecturers to adapt to online teaching environments, further integrating technology into their pedagogical approaches and modifying content delivery for online formats. Many lecturers sought PD opportunities to strengthen their technological knowledge and its integration with pedagogy and content. A theme of experimentation and innovation was evident, with lecturers demonstrating a willingness to try new technological tools and adjust their teaching methods accordingly. These additional facets provide depth to the TPACK analysis, offering a holistic view of how lecturers navigate the complex interplay of technology, pedagogy, and content in their educational practices, illustrating the multifaceted nature of teaching and learning in the digital age.

6.4.5 CHAT – Professional Development

Based on the responses from the 12 lecturers regarding their use of ET, the interviews are corroborated by survey results, and several themes are evident in their approaches to gaining ET proficiency. These commonalities reflect self-directed learning, informal practices, and peer collaborations. This multifaceted approach highlights the value of practical, experiential learning over formal training, especially in rapidly evolving fields like ET. Overall, there is a need to balance the specialised nature of PD, the different ETs, and their impact on PD needs. The themes which arose can be summarised as follows:

Lecturers used PD to develop specific professional skills. This is particularly evident in their efforts to stay abreast of advancements in ET and teaching methodologies. Engaging in PD, especially in ET, has generally enhanced lecturers' skills and confidence in teaching methods. This is crucial in the current education landscape, where digital literacy is increasingly important. Notably, the COVID-19 pandemic catalysed all (100%) lecturers to delve into ET. The sudden shift to online teaching compelled them to rapidly acquire and implement digital tools, thereby accelerating their learning curve in ET.

- *Lecturer_NOT: "I started with Vula lessons and teaching videos some years back, about six years ago. I've used simulations in clinics for around 10 years and a hearing simulation clinic for about eight years. Since the pandemic, it's been more essential to help students gain skills without patient contact."*
- *Lecturer_RAM: "During the ERT phase, we were in survival mode, thrown in at the deep end. For me, this wasn't a blessing. I didn't want to overwhelm students by introducing new tools like Mentimeter without face-to-face interactions to guide them."*

As indicated by the survey, almost half (42%) of the lecturers used informal learning experiences. This was confirmed in the interviews. This involved experimenting with different ET tools in their teaching, learning through trial and error, and adapting them to suit their specific teaching contexts. More than half (58%) of the lecturers highlighted the importance of peer collaborations. They learned from colleagues who were more adept at using ET, shared best practices within their departments, and participated in informal group discussions or workshops. Such peer-to-peer learning provided practical insights and fostered a supportive learning environment. A third of the lecturers (33%) also mentioned using ad-hoc methods, for example, attending sporadic workshops or training sessions offered by their institutions or partaking in departmental initiatives that were not formally structured as a PD programme. Though not consistently available, these opportunities contributed significantly to their skill development in ET. It was also evident that there is a distinction in how they interpret PD; some see it as integral to their professional identity. In contrast, others view it as a tool for enhancing their teaching practices.

- *Lecturer_GNE: "I regularly watch the videos from CILT because they are available...after COVID was the best because then I could go back and watch it by myself and do what needed to be done."*
- *Lecturer_RED: "Because I like learning, I think that would be the reason. Deep inside, I like learning...when it comes to matters related to education, I'm often the one to attend these events and provide feedback to our colleagues."*

There were diverse approaches from lecturers as to how they pursue PD. This includes workshops, online courses, peer learning, and self-directed exploration. Specifically, around 50% actively engaged in workshops or other forms of training to enhance their skills, while the other half demonstrated a strong inclination towards self-taught strategies. This includes exploring online resources like YouTube tutorials and webinars. These online tools allowed flexible learning options that enabled them to engage with PD at their own pace and according to their preferences due to the tools' convenience and accessibility.

- *Lecturer_NOT: "I've attended workshops on using technology, MS Teams, and breakout rooms. EDU and CILT offered courses that motivated me by showing how tech can benefit teaching."*
- *Lecturer_EIN: "When I identify the gap in myself...that often has driven me to look, OK, what am I going to go and investigate in terms of how to do things better?"*

Lecturers experienced challenges despite the perceived benefits. Some lecturers faced challenges adapting to new technologies, often overwhelmed by the rapid pace of change and the excessive number of available tools. In addition, there were institutional constraints. Budgetary, time constraints and varying levels of departmental support significantly impact the extent lecturers can engage in PD. In some cases, the lack of structured support makes it difficult for them to use PD opportunities fully.

- *Lecturer_YAD: “One of my biggest challenges was struggling to get a laptop from the department to do my work. When I finally got one, it was slow and outdated...Finance is always tight, and there is always talk of austerity measures.”*
- *Lecturer_NOT: “PD is viewed positively, but burnout is high. People are overwhelmed and lack time for PD that could benefit them long-term.”*

The balance among self-directed learning, informal practices, and peer collaborations reflects these lecturers' dynamic and evolving PD landscape. While lecturers recognise the importance of PD in enhancing their teaching capabilities, particularly with ET, they also grapple with challenges related to adapting to new technologies, navigating the plethora of available tools, and dealing with institutional constraints. The successful integration of formal PD into their practice hinges on the availability of resources, personal initiative, and institutional support.

6.4.6 CHAT – Educational Technologies

The overarching trend indicates moving towards adapting to ET to an even greater degree than before, primarily driven by the necessities of the COVID-19 pandemic. While most lecturers are engaging with ET and exploring new methods to enhance their teaching, challenges like the overwhelming nature of these technologies, budget constraints, and varying levels of institutional support have impacted their experiences. The attitudes towards ET range from upbeat and innovative to cautious and resistant, reflecting diverse experiences and perspectives within this group.

Most (about 75%) lecturers have evolved using ET, moving from essential tools to more sophisticated platforms. They show a transition from traditional methods to embracing diverse digital tools. A smaller group (25%) expressed significant challenges adapting to ET, citing a

preference for traditional methods. A significant majority (80%) emphasised using ET to enhance student engagement and learning, employing various interactive tools. Some lecturers (about 42%) explicitly mentioned that ET enhanced student engagement and allowed for more innovative teaching approaches. However, concerns about the effectiveness of using ET to increase student engagement were raised by a third of lecturers on the efficacy of ET in comparison to traditional methods, especially in terms of student interaction and feedback.

Lecturers all mentioned challenges, not only in adapting to ET. Half of them (50%) mentioned challenges related to technical and resource limitations, like bandwidth issues and lack of wi-fi access. Half the lecturers found navigating new technologies challenging due to the rapid shift in teaching methods, and a third reported anxiety or discomfort due to unfamiliarity with ET. Many (40%) realise that student tech-savvy is a myth, that students are not as tech-savvy as presumed, and that the majority (over 60%) found maintaining student engagement and interaction online challenging. Other notable challenges were departmental budget constraints (25%) and a lack of resources or structured support for ET (50%). In contrast, 50% indicated receiving support from their departments.

Personal attitudes towards ET varied widely among lecturers, with a third expressing enthusiasm and a similar proportion expressing apprehension, particularly regarding online teaching effectiveness. A majority (58%) expressed a positive yet cautious attitude towards ET, recognising its benefits but mindful of its challenges, and a smaller group (25%) showed resistance or reluctance, often preferring traditional teaching methods.

Lecturers employed a variety of strategies to compensate for challenges. Some (30%) actively sought PD to enhance their ET skills and self-learning opportunities, such as online courses and exploring new tools. In general (50%), there was an attitude of sharing; almost half engaged in sharing resources and strategies within their departments or divisions, and those who did not share learnt from peers. They realised they had to adapt due to the pandemic, motivating the majority (nearly 70%) to be amiable towards experimenting with new tools and methods. The pandemic's influence was noted by almost all lecturers (over 90%), who had to rapidly transition to online teaching, necessitating a greater reliance on ET. All lecturers mentioned the impact of COVID-19 on teaching methods, and a third of them adopted blended learning methods to respond to the

pandemic. Institutional policies and departmental expectations impacted lecturers' use of ET, and half mentioned the need to navigate those expectations consciously. A shift towards a more open departmental (or divisional) culture regarding a more comprehensive acceptance from colleagues around the use of ET was encouraged.

6.5 Summary of Qualitative Data

This section presents an integrated summary and analysis of the qualitative data to explore lecturers' use of ET and their engagement with PD activities. The detailed analysis based on extracts from the semi-structured interviews provides evidence supporting the key insights discussed earlier. Table 6.4 offers a high-level summary of the qualitative data related to *BrightSparks*' use of ET, highlighting emerging patterns and themes.

Table 6.4: High-level Summary of the Qualitative Data Responding to *BrightSparks*' Use of ET

Subject	Lecturers display a proactive and adaptable approach to using ET, often motivated by personal interest, necessity, or institutional pressures. Many began experimenting with ET early in their careers, while COVID-19 accelerated widespread adoption, compelling those less familiar to learn quickly. Although ET use is sometimes constrained by budget limitations, time pressures, and connectivity issues, lecturers generally value ET for enhancing student engagement and adapting pedagogy to online or hybrid formats. They rely on self-learning, institutional resources, and peer support to integrate ET effectively, often sharing best practices with colleagues. While some feel anxious about unfamiliar technologies, most appreciate the support they receive and the autonomy to choose their tools. Lecturers aim to balance innovative ET use with accessibility and practicality, driven by a commitment to improving student outcomes.
Object	The objective of <i>BrightSparks</i> when participating in PD or self-directed learning is to integrate ET to enhance and transform their teaching practices effectively. By leveraging their TPACK, they aim to create flexible, accessible, and engaging learning experiences that improve student outcomes. <i>BrightSparks</i> use ET as a teaching aid and a transformative tool to address specific needs, for example, supporting second-language students, aiding students with disabilities, and providing interactive, scaffolded learning for complex content. The COVID-19 pandemic further highlighted their adaptability as they developed creative online

	and hybrid instruction approaches. They demonstrated transformative teaching strategies, for example, using collaborative platforms, gamification tools, or flipped classrooms to engage students in meaningful learning. Despite the systemic barriers of budget constraints, connectivity issues, and limited departmental support, <i>BrightSparks</i> exhibit agency by navigating these challenges and remaining motivated to innovate. They actively share their ET practices with colleagues, promote peer learning, and encourage autonomy and experimentation within their communities. These lecturers view ET not as a one-size-fits-all solution but as a valuable, context-sensitive tool for advancing student and lecturer goals. Through their proactive engagement with ET and reflective practices, <i>BrightSparks</i> provide a model for others to follow, helping to build capacity for effective ET integration across their institutions.
Tools	Lecturers use diverse ET tools to support teaching, foster engagement, and address specific educational goals. Commonly used tools and methodologies include LMS platforms, Zoom, MS Teams, digital stories, simulations, polling software, and various interactive applications like Mentimeter and Padlet. ET is integrated into the curriculum based on individual needs and interests, allowing students some autonomy in selecting tools for assignments and presentations. COVID-19 accelerated ET use, leading lecturers to explore flipped classrooms, online discussions, and video content to bridge the gap created by reduced face-to-face interactions. However, challenges like budget limitations, time constraints, and varied student access to ET tools persist. Despite these barriers, lecturers value ET for enhancing flexibility, interaction, and accessibility in learning, often relying on workshops, peer sharing, and institutional support to stay updated on effective tool use.
Rules	Their use of ET is guided by a balance between curriculum objectives, student engagement, and practical constraints. ET integration is largely self-driven, with lecturers embracing a "learn by doing" approach, motivated by student needs, accessibility, and progressive learning outcomes. However, many feel ET should align with institutional strategic plans and be supported by leadership, moving beyond isolated use. Feedback from student evaluations and departmental expectations also shapes ET usage, encouraging tools that enhance learning

	quality, access, and engagement without overwhelming students. COVID-19 underscored the importance of adapting to online teaching, with a new reliance on ET to support self-directed learning and collaboration. Despite hierarchical structures and policy gaps, lecturers look to each other for innovative practices, using student-centred and adult learning principles to ensure ET remains purposeful, accessible, and aligned with educational goals.
Community	The PD community surrounding ET use includes a supportive network of colleagues, students, leadership, and specialised consultants. Colleagues play a key role in sharing ET practices, with champions and early adopters often guiding others through technology integration. Leadership within departments, including HODs, provide essential funding and policy support while learning consultants and Learning Designers offer technical guidance. Students are central to this community, as their feedback and needs shape ET choices, and their engagement with technology influences the adoption of new tools. External resources, for example, the UCT Teaching Community and Centre for Innovation in Learning and Teaching (CILT) workshops, further contribute to skill development. However, the rapid pace of ET implementation, accelerated by COVID-19, poses challenges in balancing learning and application. This community collectively fosters a shared learning environment despite differences in individual comfort with ET and occasional resistance from more traditional faculty.
Division of Labour	Lecturers take on multiple roles, from learning and adapting ET to creating and sharing content, highlighting effective practices, and encouraging colleagues to follow suit. Students are expected to engage with ET independently, consolidating their learning and providing feedback, though disparities in access to data and devices pose challenges. Colleagues support each other, sharing insights and resources, while leadership provides essential policy direction, budget, and strategic support for ET integration. IT consultants and learning champions are key in offering training, resources, and one-on-one support. However, the rapid pace of ET changes tends to be overwhelming. These roles enable a shared responsibility for building a tech-enabled learning environment to enhance student engagement and educational outcomes.

Table 6.5 focuses specifically on lecturers' statements about their experiences with and perceptions of PD, providing a closer look at how they engage with and value these activities.

Table 6.5: Lecturers' Experiences with and Perceptions of PD

Subject	Lecturers view their PD role as proactive and multifaceted, often balancing personal curiosity with institutional requirements. While COVID-19 catalysed many to engage with ET, they vary in their comfort levels, with some finding ET integration overwhelming. Many lecturers distinguish between PD for career-specific growth and staff development for broader skill enhancement, yet recognise the overlap. Autonomy, self-motivation, and a willingness to learn from colleagues are essential to their roles. Ultimately, they approach PD to improve teaching effectiveness, stay current, and foster resilience in adapting to new tools and pedagogies.
Object	The object of this activity system is to enable lecturers to effectively incorporate ET into their teaching practices, fostering both their growth and that of their colleagues. Lecturers desire to enhance their teaching practices, remain current with evidence-based approaches, and address diverse student needs, including accessibility, engagement, and interactive learning. Participation supports their PD and reinforces their commitment to lifelong learning. Central to this object is the development of TPACK, which equips lecturers to design and deliver responsive, student-centred learning experiences. For many, student feedback and curiosity further drive their engagement in PD, fuelling the continual adaptation and enhancement of their teaching practices.
Tools	The tools lecturers use emphasise interactive and collaborative formats, such as workshops, conferences, journal clubs, and webinars. Face-to-face (f2f) workshops and conferences are valued for fostering connections, networking, and hands-on learning. While online tools (for example, YouTube, webinars, and asynchronous courses) offer flexibility, they are often perceived as less engaging. Support from CILT, including access to studios and resources, provides a significant institutional base for PD. However, time constraints, the need for practical, sensory learning experiences, and technological barriers among some colleagues influence the choice and effectiveness of these tools.
Rules	Lecturers seem to be governed by formal and informal norms shaped by departmental expectations, financial constraints, and time limitations. Although PD is encouraged and often required through departmental seminars, CILT webinars, individual initiatives, and financial limitations frequently necessitate personal time investment. Competing responsibilities, particularly research obligations, further challenge consistent

	engagement in PD. Motivation for PD is often intrinsic, driven by a desire for growth rather than promotion. Institutional norms, for example, using Learning Management Systems like Vula and Amathuba, shifted in response to external factors, particularly COVID-19, and PD was primarily influenced by faculty and departmental decisions. Despite structured requirements, for example, completing PD plans, the process is often self-driven, with lecturers advocating for resources and balancing professional duties with personal development goals.
Community	The lecturers' communities include department members, such as the Head of Department, colleagues, support centres like CILT, and the Education Development Unit. Colleagues play a central role by sharing knowledge, experiences, and resources, creating an environment of mutual support, though engagement varies by individual. External networks, like the UCT Teaching online community and Elsevier seminars, further contribute to PD. While departmental support is strong, barriers such as burnout and limited awareness of available resources hinder full participation. The community demonstrates diversity in engagement, with younger staff more inclined to adopt new methods, and there is a recognition of the need for accessible, 'go-to support' figures to foster consistent development.
Division of Labour	Lecturers have a hands-on, experiential approach where they develop their skills and support colleagues through shared learning. While collaboration and peer sharing are valued, especially in divisional meetings, challenges like budget constraints, lack of transparency in funding, and dependency on line managers for PD access create inequities. Organisational hierarchies and competing priorities often restrict broader collaboration, limiting cross-departmental innovation. Despite these barriers, lecturers are motivated by a shared commitment to student success. PD is seen to enhance curriculum delivery and address student needs, and it is often informed by student feedback and curriculum reviews.

The information from Tables 6.1 and 6.2 was then further analysed, summarised, and reduced to the information as seen below in Table 6.6, which applies CHAT to examine the two interrelated activity systems, *BrightSparks'* use of ET and their participation in PD activities.

Table 6.6: Two Activity Systems Analysed Using CHAT

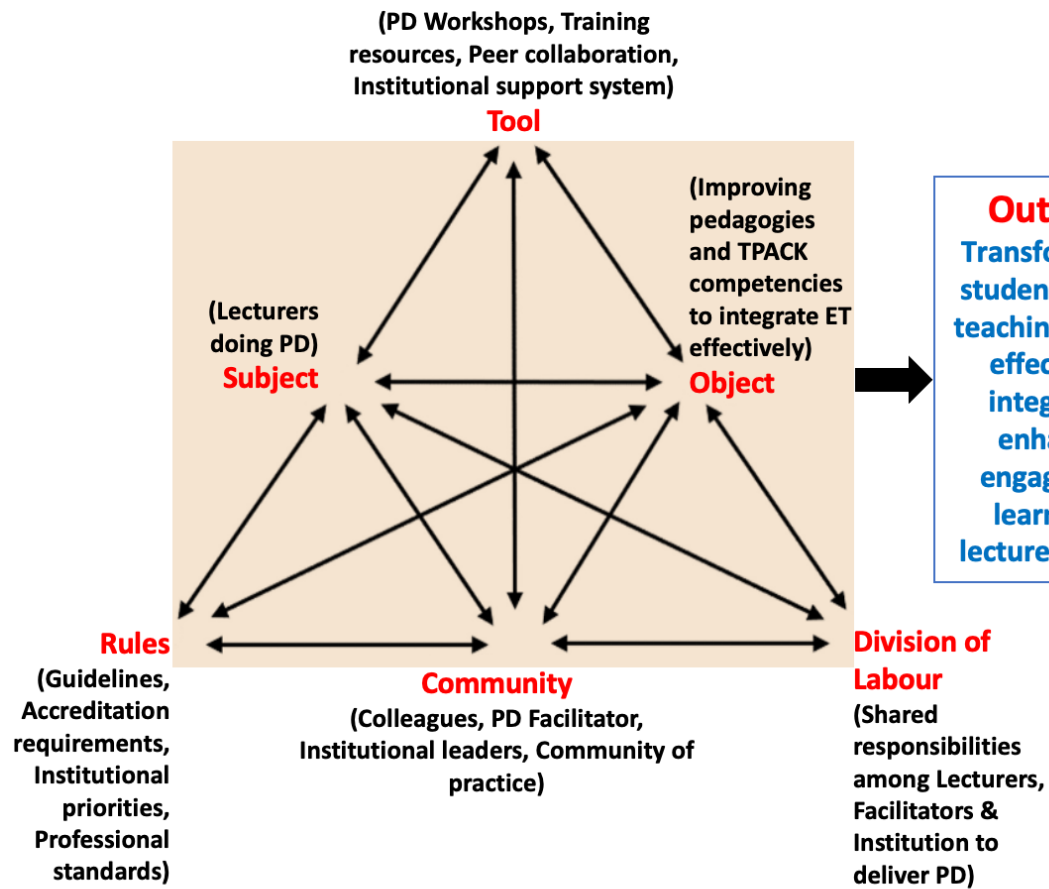
	Definition	Activity System: <i>BrightSparks'</i> use of ET	Activity System: PD
--	-------------------	---	-------------------------------

Subject	Participants. The lecturer's role, position, responsibilities, and experiences.	Lecturers: individuals who have adapted their teaching methods to include various ETs	Lecturer - the diverse experiences of the lecturers with PD, especially their engagements with ET.
Object	Goals or objectives that the lecturer aims to achieve.	Transform teaching and learning using ET to enhance engagement, accessibility, flexibility, and student-centred practices.	Improve teaching effectiveness and develop TPACK through participation in structured PD activities.
Tools	The technological (hardware, software, platforms) and conceptual tools (knowledge, skills, strategies) used.	Tools, for example, PowerPoint, Zoom, MS Teams, Mentimeter, LMS platforms, videos, cloud computing, and interactive online resources, such as forums and quizzes	Used by the lecturers, for example, workshops, online resources, and departmental training programmes.
Rules	Formal and informal rules. Institutional policies, societal norms, personal beliefs, and ethics govern the interactions within the activity system.	Institutional policies and personal attitudes: Guidelines include institutional policies on online teaching, personal beliefs about technology, and student engagement and assessment expectations.	The departmental policies, budget constraints, and time limitations that impact the lecturers' PD,
Community	The social environment, norms, and social relations characterise them, how they work, and the key stakeholders involved.	Students, department colleagues, leadership, and IT consultants. The Community comprises students who engage with the content, colleagues who share resources, leadership that provides support and budget, and IT consultants offering training and assistance.	This includes the departmental dynamics, the support (or lack thereof) from colleagues and administration, and the varying attitudes towards PD.

Division of Labour	How tasks are distributed, and the roles stakeholders play.	Lecturer - exploring new technologies, sharing knowledge, and adapting teaching methods. Student - engaging with content and providing feedback. Colleagues - sharing experiences, supporting each other, and adopting new methods. Leadership - providing resources, budget, and strategic direction. IT consultant - offering technical support and training workshops.	This would reflect the distribution of tasks and roles within the department, including how PD is managed, the role of line managers in facilitating PD, and the influence of departmental structure on PD opportunities.
---------------------------	---	--	---

Finally, Figure 6.1 visually represents the third-generation activity systems, highlighting the interactions, tensions, and contradictions that shape the lecturers' practices and professional growth. Arrows in the diagrams indicate how the components influence each other: for example, the 'Subject' (lecturers) shapes and is shaped by 'Tools' and the 'Object.' Likewise, 'Rules' and 'Community' affect the 'Division of Labour.' In each triangle, the 'Object' is at the top to signify its role as the desired outcome that the activity system aims to achieve. Because these systems are dynamic, there are additional arrows between the 'Subject' and the 'Tools' as they work toward the 'Object,' all within the context of 'Rules,' 'Community,' and 'Division of Labour.' This visual layout captures the complexity of the activity systems surrounding PD and the use of ET in academic settings, drawing on data from the 12 lecturers. Moreover, the objective within each system diagram represents the primary goals or intended outcomes of integrating ET into teaching or participating in PD activities. The Outcome of the activity systems is: "The development of transformative, student-centred teaching practices through effective integration of ET, leading to enhanced student engagement, learning outcomes, and professional growth for lecturers."

PROFESSIONAL DEVELOPMENT



BRIGHTSPARKS

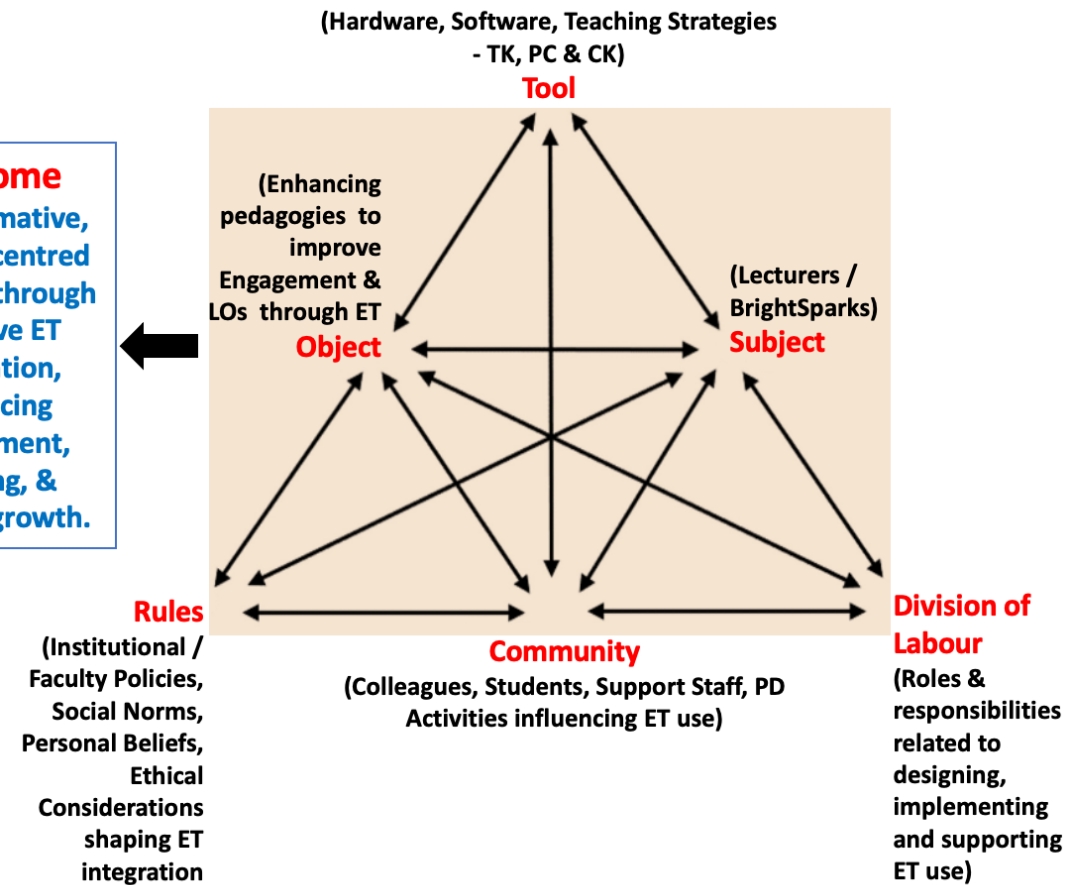


Figure 6.1: Third Generation Activity Systems

The tables and figures offer a consolidated view of the findings, laying the foundation for the subsequent comparison of themes emerging from the quantitative and qualitative data.

6.6 Themes from the Quantitative Data Compared with Qualitative Data

Integrating the themes from both quantitative and qualitative analyses enhances our understanding of the dynamics influencing lecturers' PD experiences, their use of ET, and their perceived agency in pedagogical decision-making. This integration, which leverages the strengths of both data sets, captures the experiences of individual lecturers as revealed through qualitative analysis alongside broader patterns and trends indicated by quantitative data (Appendix C). The analysis highlights the critical role of PD in supporting effective ET integration and underscores the influence of lecturer demographics on PD engagement and ET usage, as well as the barriers lecturers face in integrating ET into their teaching. To contextualise the research findings, it is crucial to have a deeper understanding of who these *BrightSparks* are demographically. It is also important to note that while teaching experience often correlates with age, it does not necessarily determine it. This distinction is crucial in understanding what sets *BrightSparks* apart from other lecturers. Analysing commonalities and differences among the data can help uncover shared characteristics of *BrightSparks* and identify common factors within their educational environments. Furthermore, this approach is beneficial for recognising similar patterns among tech-aspiring lecturers. These insights complement each other and enrich our understanding of integrating ET in educational settings and developing responsive PD frameworks. This comprehensive view forms the basis of the Discussion chapter, where future research avenues and interventions are suggested, particularly in developing a PD framework responsive to lecturers' diverse needs, experiences, and challenges.

There is an alignment between PD engagement and ET integration. The positive correlation between the importance lecturers place on PD activities and their engagement with ET suggests a theme of alignment. Lecturers who value PD highly are more inclined to integrate ET into their teaching practices, indicating that effective PD is a key driver of successful ET adoption. This aligns with qualitative themes emphasising the importance of PD for enhancing ET skills. The quantitative finding that lecturers prioritise certain PD activities over others contributes to elaborating the qualitative insights into lecturers' preferences and perceived value of diverse types of PD, indicating a potential gap between available PD opportunities and lecturers' needs or interests.

The lecturers' academic qualification impacts their level of agency and the extent to which they prioritise PD. The data indicates that lecturers with higher academic qualifications (doctorate degrees) exhibit a stronger sense of agency in their teaching methodologies and content delivery. It further indicates that academic advancement contributes to increased confidence and autonomy in pedagogical decisions, influencing the PD activities these lecturers prioritise or find most beneficial. This is corroborated by qualitative themes regarding lecturers' empowerment and autonomy in making pedagogical decisions.

The data suggests an association between the number of years of teaching experience, the PD activities lecturers seem to pursue, and the ET they adopt. Trends indicate that lecturers with more teaching experience tend to prioritise PD activities that support more sophisticated or discipline-specific technology use. In contrast, colleagues with fewer years of teaching gravitate toward foundational applications. However, the definitions of 'basic' versus 'innovative' ET use vary due to the diverse teaching contexts of lecturers. This variability underscores the importance of context in determining how experience influences PD needs and ET integration strategies.

Most lecturers face some form of barrier or challenge despite their motivations to use ET. The contrast between motivations for using ET, for example, peer influence and responses to the COVID-19 pandemic and reported barriers, particularly student disengagement and financial constraints, highlights a conflict between aspiration and reality. This theme encompasses the challenges lecturers face in realising their ET integration goals despite strong motivations to enhance teaching and learning through technology. Quantitatively, lecturers identified student disengagement, financial constraints, and lack of institutional support as significant barriers to ET integration. These findings complement qualitative themes about challenges in ET adoption, offering a more detailed picture of the specific obstacles lecturers face. The quantitative insight into the impact of these barriers provides a basis for exploring targeted interventions to support lecturers in overcoming these challenges.

There is a discrepancy between the significance they attach to PD and what they attend. The divergence between the high importance lecturers attribute to PD and their actual attendance rates at PD activities suggests a theme of constraints. This theme might explore the various obstacles, time, resources, and institutional support that hinder lecturers from participating in PD activities they deem essential for their PD and ET integration efforts. This challenges qualitative themes that suggest a straightforward relationship between valuing PD and participating in PD activities, pointing to underlying factors such as time constraints, accessibility issues, or mismatches between PD offerings and lecturers' needs that may hinder attendance.

Diversity in lecturers' demographics and pedagogical choices is also an evident theme. Variations in how lecturers of different years of teaching experience and academic qualifications engage with PD and ET point to a theme of demographic diversity influencing pedagogical choices. This includes how diverse backgrounds and experiences lead to varied perceptions of agency, preferences for PD activities (Table 6.5), and approaches to integrating ET. This finding elaborates on qualitative themes by suggesting that lecturers' backgrounds and experiences influence their engagement with PD and ET, highlighting the need for a PD programme adaptable to diverse lecturer profiles.

Lastly, the level of agency lecturers have in decision-making related to their practice shows that most lecturers report a high degree of agency in choosing pedagogical content and methods, especially among those with higher qualifications or more teaching experience, which underscores a theme of empowerment. This theme examines how lecturers perceive their role and autonomy in shaping educational experiences through PD and ET. This corroborates the qualitative themes regarding the empowerment and autonomy lecturers feel when making pedagogical decisions. These themes from the quantitative data facilitate a richer understanding of the complexities involved in PD for ET integration, reflecting a different facet of the educational landscape and highlighting areas for further exploration of what form PD should take to better support lecturers in harnessing ET for enhanced teaching and learning outcomes.

6.7 Summary of Chapter

The data from the lecturers' interviews have revealed an intricate merging of technological integration into pedagogical practices in health sciences education. The integrated analysis deploying CHAT and TPACK not only elucidates the complex process of technology integration but also highlights PD's role in fostering such integration. In capturing the diversity of experiences from *BrightSparks*, my analysis illustrates the span of integration practices, from the seemingly seamless incorporation of technology, pedagogy, and content knowledge to those grappling with the demands of technological integration. This range underscores the importance of tailored and context-specific PD strategies.

Furthermore, the data unveils the multifaceted context of lecturers' activity systems, revealing how community norms, division of labour, and educational tools shape technology integration. Such insights provide invaluable guidance in framing PD activities that resonate with lecturers' contexts. Exploring the TPACK framework allows me to assess how lecturers amalgamate technology, pedagogy, and content

knowledge, a crucial yardstick for effective technology integration. This insight lends itself to informing the design of PD programmes that target specific facets of TPACK.

Therefore, the analysis guides the development of a PD KF4TT, where “transformation” refers to a fundamental shift in teaching practices and lecturer mindsets that effectively integrates ETs to enhance learning outcomes. The key lies in a nuanced understanding of lecturers’ context and their interplay of technology, pedagogy, and content knowledge. This understanding should form the basis of any PD framework to enhance technology integration.

The findings lay the foundation for the Discussion chapter, where I delve into developing an empirically grounded and theoretically informed PD framework to bridge the gap between *BrightSparks* and other lecturers in health sciences education.

Chapter 7 – Discussion

7.1 Overview

This chapter builds on the findings of the previous two chapters and discusses the research's significance and implications. Specifically, I examine how *BrightSparks*, those Health Sciences lecturers who demonstrate elevated levels of TPACK, incorporate and use ET. The analysis aims to address a gap in the literature. Current literature fails to fully address the complexities of ET integration in HE, particularly in terms of how diverse PD strategies (formal, informal, and self-directed) support or hinder this process. A key outcome will be a framework for PD outlining the knowledge, skills, and behaviours lecturers need to integrate ET (Mercader, 2020; Bhat, 2023; Chugh et al., 2023a) effectively. The framework was constructed from the data gathered to explore how *BrightSparks* have built their TPACK competencies and the role of different PD formats (formal vs. informal, self-initiated vs. institution-initiated, self-led vs. instructor-led) to achieve pedagogical transformation. A further layer of analysis in the construction of the PD framework examined how CHAT, as a theoretical framework, can explain what contributed to the formation of *BrightSparks* and the lessons to be drawn from their experiences to enhance PD. Understanding *BrightSparks'* ability to integrate technologies as they do is vital, as it underscores how a flexible, multi-dimensional PD model can support a wide range of Health Sciences lecturers in effectively using and innovating with ET.

I explore the contradictions and tensions highlighted by CHAT, which serve as catalysts for change and development within an activity system. These contradictions are seen in the inconsistencies between established rules and practices, conflicts between available tools and educational objectives, or disagreements within the faculty. I look at how *BrightSparks* apply TPACK in their teaching to uncover insights into strategies that could enhance competencies needed for ET integration, essential in the context of the increasing demand for using ET in education, and highlight the critical role ET plays in modern learning environments. The themes identified in this chapter correspond to my sub-research questions, revealing how cultural and historical contexts shape the use and integration of ETs in Health Sciences education by *BrightSparks*. Importantly, it shows that adopting technology is not simply about mastering new tools and digital skills; it involves a complex interplay of pedagogical approaches and content knowledge within a broader educational context. Understanding these dynamics is essential for designing effective PD programmes that empower lecturers to integrate ETs meaningfully in their teaching. In addition, several important findings regarding *BrightSparks'* use of ET have been made. Overall, the data provides insight into the factors that promote or inhibit ET adoption in teaching, highlighting the role of PD in enhancing lecturers'

confidence and capacity to implement technological innovations in their practices. This chapter concludes with a discussion of the study's limitations, which should be considered when interpreting these findings.

7.2 Contradictions

The qualitative findings from the semi-structured interviews provide insight into *BrightSparks*' experiences with integrating ET into teaching practices and PD's role in shaping how they navigate the complexities of ET integration, particularly in a context where sociocultural factors and institutional norms create both opportunities and barriers. Using CHAT, contradictions were identified, which are important as possible catalysts for developing the skills and competencies needed for effective ET integration.

7.2.1 Contradictions in PD

Below are the contradictions identified in the PD activity system and possible strategies for resolution. The data analysis highlighted several contradictions and inherent tensions (Section 6.3.3.1) and conflicts arising from interactions between different system elements (Section 6.3.3.2). The qualitative findings provide insights into potential contradictions lecturers could face when integrating ET and suggest strategies to resolve those contradictions and promote systemic change and development in comparable educational contexts.

Table 7.1: PD Contradictions and Strategies for Resolution

Contradiction	Strategies for Resolution
<i>BrightSparks</i> express reluctance to adopt ET due to a lack of confidence, perceived irrelevance to their teaching context, or fear of increased workload (Section 6.3.2.1; 6.3.3.2). Conversely, others are open and enthusiastic, seeing ET as an opportunity to enhance student engagement and learning outcomes (Section 6.3.2).	a) Regular, hands-on workshops highlighting the practical benefits and pedagogical strategies associated with ET, catering to different expertise and interests. b) Encourage a culture of peer mentoring where more experienced faculty guide and support others in integrating ET into their teaching practices. c) Share success stories from lecturers who have successfully integrated ET into their teaching, demonstrating tangible benefits and potential challenges overcome.
<i>BrightSparks</i> reported that budget and time constraints are significant barriers to PD engagement (Section 6.3.2 Lecturer_YAD). Many express frustrations over the lack of institutional support and	a) Secure funding for PD in ET by exploring internal and external funding opportunities. b) Recognise and reward participation in PD activities as integrated into their job descriptions, ensuring lecturers have the time and incentive to engage in PD.

recognition for their PD efforts (Section 6.3.3.2 Lecturer_YAD, Lecturer_NOT)	c) Offer PD in flexible and accessible formats (e.g., online modules, workshops, micro-credentials) to accommodate different schedules and learning preferences.
<i>BrightSparks</i> expressed concern about the additional workload associated with integrating ET (Section 6.3.3.2 Lecturer_NOT) and the time-intensive nature of developing digitally suitable resources (Section 6.3.2.1 Lecturer_AGN). Additionally, <i>BrightSparks</i> noted potential resistance from students accustomed to traditional teaching to new technologies (Section 6.3.2.1; 6.3.3.1 Lecturer_RAM).	a) Introduce ET innovations gradually, allowing lecturers and students to adapt to new tools and methods and reducing resistance and workload concerns. b) Involve students in a participatory design and evaluation of ET innovations, aligning new tools and methods with their needs and expectations, thereby reducing resistance. c) Develop a system of recognition and rewards for lecturers who innovate in their teaching practices, emphasising the value placed on innovation and its contribution to the institution's mission.

7.2.2 Contradictions in using ET.

Addressing the contradictions identified in the ET activity system involves rethinking curriculum design, assessment methods, and the role of the lecturer in facilitating learning (Kozina, 2011). From the data, *BrightSparks* thinks that institutional policies and guidelines should also be updated to support ET integration, encompassing criteria for teaching evaluations, curriculum approval processes, and resource allocation models. Furthermore, revisiting the roles of lecturers, students, and administrative staff in the context of ET is important. This might involve assigning, for example, those with expertise in instructional design to support lecturers in effectively using ET.

Strengthening the relationship between those in health sciences and the broader institutional community is also essential to ensure that ET integration aligns with the skills and competencies required by lecturers. By implementing these strategies, lecturers in health sciences can resolve the identified contradictions and leverage them as catalysts for transformative change, ultimately creating more adaptive, responsive, and effective teaching pedagogies that harness the potential of ET to enhance teaching and learning outcomes.

Table 7.2: ET Contradictions and Strategies for Resolution

Contradiction	Strategies for Resolution
<i>BrightSparks</i> acknowledged that while ET enhances learning, it has limitations, particularly in courses requiring hands-on, practical experience (Section	a) Creating or acquiring tailored ET tools for the specific needs of a course, especially those requiring hands-on

6.3.2.1: Lecturer_AGN, Lecturer_EIN). There remains a tension between the theoretical advantages of ET and its practical applicability in all teaching contexts, with some lecturers adopting ET creatively to mitigate these challenges (Section 6.3.2: Lecturer_RED, Lecturer_NEI).	experience. This could involve augmented reality (AR) or virtual reality (VR) simulations for practical skills. b) Design a curriculum that integrates ET with in-person sessions, allowing each mode's strengths to offset the other's limits. This approach ensures that essential hands-on skills are taught effectively.
Many <i>BrightSparks</i> feel overwhelmed by the rapid pace of ET change and their perceived lack of digital literacy (Section 6.3.2: Lecturer_NEI, Lecturer_GNE). This results in a contradiction between the need for ET integration and the varying levels of technological proficiency among lecturers (Section 6.3.2.1: Lecturer_NEI), with some struggling to adapt while others proactively explore new technologies (Section 6.3.3: Lecturer_EZN, Lecturer_NOT).	a) Offer comprehensive PD programmes for lecturers to improve their digital literacy and pedagogical skills in using ET. These programmes should be tailored to different skill levels and include peer mentoring. b) Encourage an institutional culture where experimenting with new technologies is encouraged. Create a safe space for lecturers to experiment with and learn from each other, reducing the fear of failure.
The abrupt shift to online teaching during the COVID-19 pandemic presented challenges for <i>BrightSparks</i> in ET integration, including inadequate preparation and support. (Section 6.3.2: Lecturer_NEI, Lecturer_EIN, Lecturer_RED). This transition created a tertiary contradiction between traditional teaching practices and the sudden necessity to adopt digital tools, requiring them to rapidly adapt despite infrastructural and pedagogical challenges (Section 6.3.2.1: Lecturer_EIN), as well as navigating institutional constraints and support gaps (Section 6.3.3.1: Lecturer_NEI, Lecturer_LEH).	a) Post-pandemic, institutions should have reflected on the lessons learned and developed more resilient, flexible teaching models that can adapt to sudden changes, including a mix of synchronous and asynchronous online learning strategies. b) Ensure lecturers and students can access technology and support systems for effective online learning. This includes infrastructure and support such as reliable internet access, training, and technical support.
<i>BrightSparks</i> noted that securing buy-in from colleagues remains a significant challenge to the broader adoption of ET. Resistance often stems from scepticism about its benefits or a lack of understanding of how technology can enhance teaching (Section 6.3.2.1: Lecturer_EZN, Lecturer_YAD). Some colleagues express reluctance to move away from traditional teaching methods,	a) Use evidence-based practices to demonstrate the effectiveness of ET in enhancing learning outcomes. Showcasing case studies and testimonials from peers can help win over sceptics. b) Establish working groups for lecturers to share experiences, strategies, and resources for integrating ET. Collaborative platforms can contribute to building a collective vision and reducing resistance.

creating tensions between early adopters and more hesitant colleagues (Section 6.3.3.1: Lecturer_AGN). These barriers indicate a broader cultural shift required for successful ET integration within departments.	
---	--

7.3 Main Themes

The sub-research questions guided the thematic analysis of the quantitative and qualitative findings, serving as the foundation for the key themes. For ease of reference, I am restating the research question: “How does *BrightSparks*' application of technological pedagogical content knowledge inform the advancement of a PD framework for technology transformation using ET?” The themes were informed by the theoretical frameworks of CHAT and TPACK, which provided a comprehensive lens through which the data were analysed. The analysis (Section 6.4) focused on understanding how lecturers develop TPACK competencies, the influence of CHAT on *BrightSparks*' integrative use of ET, and the role of PD. Additionally, the findings from *BrightSparks* offer valuable insights for designing a PD framework to transform teaching practices through effective ET integration.

7.3.1 Theme A - Developing TPACK Competencies

This theme relates to the sub-question: How do lecturers develop TPACK competencies to integrate technologies to facilitate learning? The quantitative data shows a significant correlation between the importance placed on PD activities and the development of TPACK competencies (Section 5.3 for analysis). Lecturers who value PD highly also tend to have higher scores in integrating ET (Section 5.2.5), reflecting the effectiveness of PD in enhancing TPACK competencies (Section 5.2.2). There is a positive correlation between higher academic qualifications (e.g., doctoral degrees) and a greater sense of agency, which may, among other factors, contribute to the development of TPACK competencies (discussed in Section 5.2.7). More experienced lecturers demonstrate higher levels of TPACK integration, suggesting a higher probability that competencies, knowledge and skills develop over time and with experience (Section 5.3.1 for supporting data). This is vital when considering the institutional context in which participants are, a research-intensive faculty, in this context, where this is vital to promotion. For more junior lecturers, it could be that the demands of focusing on research within their field can be particularly time-consuming, potentially reducing the time they have available to build and integrate TPACK-related skills.

Qualitative data reveals that lecturers feel empowered when they have autonomy in their teaching practices, which is crucial for developing TPACK competencies (Section 6.3.3: Lecturer_YAD, Lecturer_RED). *BrightSparks* actively seeks PD opportunities and experiments with ET tools to enhance student engagement (Section 6.3.2: Lecturer_EIN, Lecturer_GNE). This self-directed approach to learning enables them to refine their technological, pedagogical, and content knowledge, reinforcing the need for PD frameworks that support autonomously driven innovation. Many lecturers express that PD activities, particularly those tailored to their specific needs and subject areas, are most effective in helping them integrate ET into their teaching. Interviews highlight several challenges in developing TPACK competencies, such as time constraints, lack of institutional support, and varying levels of digital literacy among colleagues. Lecturers further note that while PD is valuable, the irrelevance of some PD activities, particularly regarding integrating ET, significantly affects their ability to develop and apply TPACK effectively. This meant they had to consider avenues other than formal PD to develop skills and competencies.

The findings align with the TPACK framework by demonstrating that PD activities enhance lecturers' technological, pedagogical, and content knowledge (Section 6.3.3; Lecturer_YAD, Lecturer_GNE, Lecturer_RED). For example, *BrightSparks* reported that PD opportunities, such as workshops and webinars, helped them develop digital literacy and refine their pedagogical strategies for integrating ET (Section 6.3.2: Lecturer_EIN, Lecturer_GNE). These findings emphasise the importance of PD in equipping lecturers with the skills and knowledge needed to navigate the complexities of technology-enhanced teaching. The quantitative data support that formal PD can improve TPACK competencies by providing the necessary skills and knowledge. The development of TPACK competencies can be understood through CHAT by examining the contradictions within the activity system of PD. For example, the tension between the need for continuous professional growth and the constraints of time and resources reflects a primary contradiction in the system (Section 6.3.3.1: Lecturer_YAD, Lecturer_NOT). They acknowledged the importance of PD for staying current with teaching practices but highlighted significant challenges such as limited budgets, lack of institutional support, and time pressures (Section 6.3.3: Lecturer_NEI, Lecturer_RAM). These constraints often hinder lecturers' ability to fully engage in PD opportunities, underscoring the systemic barriers within the activity system.

This study's findings indicate that PD participation and individual *BrightSparks*' experience and qualifications contribute to developing TPACK competencies. Quantitative findings indicate strong correlations between PD engagement and the enhancement of TPACK competencies (Section 6.5.1). Participants who frequently participate in PD are better equipped with the knowledge and skills to integrate ET effectively. This finding

concurs with Dintoe (2019). However, it is necessary to consider the difficulty in directly measuring the impact of PD (Knight et al., 2007). Qualitative insights highlight that participants perceive PD as vital for developing TPACK competencies, particularly when PD activities are relevant, practical, and tailored to their needs (Section 6.3.3.2). However, challenges such as time constraints and varying levels of digital literacy can hinder the development of TPACK. This finding compares favourably with those of Almerich et al. (2016) and Suarez-Rodriguez et al. (2018), who emphasise the need for technical competencies and knowing how to use them effectively as a foundation for integrating technology into pedagogy. Integrating both data types under this theme highlights the importance of continuous, high-quality PD in building the competencies for effective ET integration. It also underscores the need for PD programmes to be adaptable to individual lecturers' contexts and needs.

7.3.1.1 Correlations between the reasons for attending PD and using ET

The quantitative data shows that correlations between the reasons for attending PD and using ET (Section 5.2.2) were investigated and grouped into three distinct categories: student-, professional-, and departmental-related reasons. This categorisation offers a more nuanced understanding of *BrightSparks'* motivations for engagement with PD and their use of ET. A significant positive correlation was found across all three categories, particularly between reasons for using ET and student-related reasons for attending PD. This implies that participants who prioritise student outcomes in their PD activities are also mindful of the impact of ET on students, themselves, and departmental expectations, reflecting a holistic approach to professional practice. Studies by Lidolf and Pasco (2020) and Moeller and Reitzes (2011) align with these findings, indicating that PD designed with a student-centred focus enhances lecturers' technological skills and promotes effective integration of ET into teaching practices. This implies that PD programmes emphasising student benefits foster more effective ET adoption across different contexts. The holistic understanding of PD's impact on both student-related outcomes and lecturers' professional practice aligns directly with the development of TPACK competencies.

7.3.1.2 PD Importance and ET Influence

The quantitative data shows a statistically significant correlation between the importance of PD activities and the influence of ET, highlighting a valuable insight from the earlier descriptive analysis - *BrightSparks*, who valorise PD, tend to perceive a greater influence of ET in their teaching (Section 5.2.3). Desimone (2009) and Valleria and Sadat (2021) emphasise that lecturers who value PD highly are likelier to engage in continuous learning and adopt innovative teaching practices, including ET. This indicates that participants who recognise the importance of PD are more inclined to perceive and utilise ET in ways that enhance

teaching and learning outcomes. This finding is crucial in explaining how *BrightSparks*' development of TPACK is supported by continuous professional learning and development.

7.3.1.3 Role of PD in Supporting TPACK Development and Overcoming Challenges

Interview data illustrate that PD plays a pivotal role in shaping how participants navigate the complexities of integrating ETs into their teaching practices (Section 6.3.3.2). This is particularly significant in contexts where sociocultural factors and institutional norms create opportunities and barriers. Effective PD helps participants adapt to the evolving nature of technology while simultaneously addressing challenges posed by traditional classroom delivery methods (Hanover Research, 2014). Furthermore, PD facilitates the acquisition of the necessary skills for integrating ET, as highlighted by Rosales (2021), who emphasises the importance of PD programmes in equipping lecturers for technology integration and mitigating the complexities of adopting new technologies. By focusing on both content and pedagogy, PD enables *BrightSparks* to use technology not just as a tool but as an integral part of their teaching strategies. This finding illustrates the core TPACK principle that technology becomes pedagogically impactful only when intertwined with disciplinary content and learning goals (Mishra & Koehler, 2006). In doing so, *BrightSparks* contest the still-prevalent "technology-first" view, where digital tools are layered onto existing methods with little epistemic shift (Graham, 2011). Their practice shows that pedagogy and content foregrounding turn ET from an accessory into a structuring element of learning design. Crucially, this transformation is sustained through faculty collaboration and communities of practice. Formalising such CoP structures at a faculty level would consolidate the individual gains identified in this study (Tarling & Ng'ambi, 2016).

Hanover Research (2014) notes that PD helps lecturers tackle challenges such as outdated teaching methods and infrastructure limitations. This dual focus helps lecturers overcome internal barriers such as a lack of confidence, digital literacy, increased workload, and inadequate skills (Section 6.3.3.1). As a result, PD makes lecturers more open to integrating ET effectively. However, as Durff and Carter (2019) argue, while PD can address internal barriers, it can also highlight external ones, including insufficient resources, scepticism, and limited administrative support, thus exacerbating the challenges of integrating ET.

Moreover, some lecturers (Section 6.3.2.1) remain sceptical about the educational value of ET, unaware of research in this area (Tejada Fernández, 2013; Timothy, D., 2016; Tuma, 2021; Vallera & Sadat, 2021). Addressing these barriers requires comprehensive PD programmes that build confidence, demonstrate the relevance of ET through research evidence, and show how technology can streamline rather than complicate

teaching practices. PD can do this by offering targeted training that addresses technical and pedagogical needs, ensuring that lecturers have the skills and confidence to integrate ET effectively into their teaching.

7.3.1.4 Theme A - Summary

The statistical analysis (Section 5.3) revealed a significant correlation between PD participation and TPACK competency development. Lecturers who attended PD sessions more frequently reported higher confidence in using ET in their teaching, mainly when PD focused on student outcomes. This aligns with previous studies (Rosales, 2021; Hanover Research, 2014), which emphasise the role of continuous training in developing both technical and pedagogical skills for effective technology integration.

Interview data supports this, with *BrightSparks* consistently describing PD as essential for building their TPACK competencies (Section 6.3.3.2). Many reported increased confidence in using technology after attending PD workshops providing technical skills and strategies for pedagogically sound applications. Lecturer_EIN shared they made the effort to learn using a new technology through informal and formal PD activities which allowed them to feel “more and more comfortable” experimenting with new tools.

The findings suggest that PD programmes should address both technical and pedagogical aspects of technology integration, focusing on improving student outcomes to be more effective in developing lecturers' TPACK competencies. This aligns with the TPACK framework, demonstrating that structured PD enhances lecturers' technological, pedagogical, and content knowledge. Furthermore, CHAT contributes to understanding the conditions under which TPACK competencies develop by highlighting contradictions in the PD activity system, such as the tension between continuous professional growth and the constraints of time and resources (Section 6.3.3.1).

7.3.2 Theme B - Role of CHAT in Integrating ET in Teaching

In this theme, I discuss how *BrightSparks*' integrative use of ET is developed and influenced by CHAT. Quantitative findings show a positive correlation between participants' sense of autonomy and their use of ET (Section 5.2.7). *BrightSparks*, which have greater control over their teaching, are more likely to integrate ET, suggesting that agency is a critical factor in ET adoption. Kauppinen et al. (2020) and Jones and Charteris (2017) describe lecturers as agents of change, engaging in ongoing PD as a crucial step toward transformative practices. The data also highlights barriers such as insufficient resources, lack of institutional support, and resistance from both lecturers and students. These barriers create contradictions within the activity system, hindering the smooth integration of ET (Section 6.3.2.1 and 6.3.3.1).

Lecturers who perceive a supportive culture around ET are more likely to adopt it in their teaching. Qualitative data points to social and cultural factors, such as peer influence, community norms, and institutional policies, as key influences on lecturers' ET use (Section 6.3.2). Interviews reveal contradictions within the CHAT framework, such as tensions between traditional teaching methods and adopting new technologies (Section 6.3.2.1). Some participants expressed reluctance to adopt ET due to perceived incompatibilities with their pedagogical beliefs or a lack of clear institutional guidelines on ET use (Section 6.3.3.1).

In exploring how *BrightSparks* develop TPACK competencies, I applied CHAT and TPACK in a layered approach. CHAT highlighted the roles of community, rules, and division of labour in shaping technology use (Section 6.3.2). The contradictions identified, such as resistance to change and lack of support, demonstrate the dynamic and evolving nature of activity systems as participants navigate ET integration (Section 6.3.2.1 and Section 6.3.3.1). Hence, CHAT illuminated the social and cultural dynamics that influence ET adoption, complementing TPACK's focus on the interplay of technological, pedagogical, and content knowledge. Combined with the quantitative data that revealed factors affecting ET use, for example, agency and barriers, the findings underscore the complex interplay between individual agency and systemic factors in ET integration.

7.3.2.1 Barriers of Time and Institutional Support to Integrating ET

The quantitative data shows a correlation between the perceived importance of PD and the awareness of barriers to implementing ET. While PD is acknowledged in institutional criteria, participants express frustration over the limited time and funding allocated for participating in PD programmes, which can hinder their ability to fully engage in these opportunities. Effective PD requires strong institutional support, including incentives for participation and alignment with the institution's mission, to achieve meaningful engagement and lasting impact (Durff & Carter, 2019). *BrightSparks* stand out because of their sense of agency, which drives them to seek solutions. PD should explicitly raise awareness of the obstacles lecturers might face, enabling a deeper engagement with technology integration challenges. Durff and Carter (2019) highlight that while PD can reduce internal barriers, it additionally reveals external barriers that hinder effective ET integration. Bećirović (2023) and Belland (2009) indicate that PD helps lecturers identify both external barriers - financial constraints, workload, and time - as well as internal barriers, for example, attitudes towards technology (Hanover Research, 2014). This data is relevant to understanding barriers hindering lecturers' participation in PD activities. According to the CHAT framework, these barriers can be

understood as contradictions between tools, rules, and the division of labour, which may create obstacles to technology integration.

7.3.2.2 Navigating Sociocultural and Institutional Factors in ET Integration

The interview data show that the successful integration of ET depends not only on PD activity but also on sociocultural and institutional support structures (Section 6.3.2 and 6.3.3). Without strong institutional backing, the full potential of PD in addressing sociocultural challenges and fostering ET adoption may remain unrealised. The data highlighted the challenge for participants in aligning institutional expectations with their teaching practices (Section 6.3.3.1). This reinforces the need for PD programmes attuned to the broader institutional and sociocultural dynamics within which lecturers operate. CHAT emphasises the critical role of sociocultural factors in shaping teaching practices, including the need to rethink curriculum design, assessment methods, and lecturers' roles in facilitating learning. According to Flewelling (2024), consistent and engaging PD is essential, particularly in diverse sociocultural contexts where it can bridge digital divides and improve the quality of learning environments, providing lecturers with the tools to integrate ET despite institutional or sociocultural barriers.

Institutional policies and guidelines are crucial in supporting ET integration by providing a structured framework that ensures access to resources, training opportunities, and a clear path for career advancement (Schildkamp et al., 2021). Policies that encourage the use of digital tools in curriculum design can help lecturers adapt to the demands of modern education (Kadakia & Krumholz, 2022; OECD, 2024). However, institutional guidelines must also offer the necessary resources and support systems to ensure lecturers can implement ET effectively.

By providing ongoing support and addressing contradictions between institutional barriers and teaching practices, PD helps lecturers overcome challenges to ET integration (Section 6.3.3.1). CHAT emphasises the significance of the socio-historical context and situates PD programmes within the activity systems of institutions (Section 6.4.1). PD designed with CHAT principles should address institutional barriers, align policies with practical needs, and equip lecturers with the tools to navigate sociocultural challenges in their teaching environments.

7.3.2.3 Theme B - Summary

While no significant correlation was found between institutional mandates (for example, departmental pressures) and lecturers' use of ET, the data suggest that participants who participated in PD for student-

centred reasons were more likely to use ET. This indicates that personal motivations and agency play a more significant role in ET integration than top-down institutional directives. The qualitative data provided nuanced insights, with participants describing how PD helped them navigate tensions between institutional expectations and their teaching practices. For instance, Lecturer_NEI expressed initial anxiety about adopting new technologies but highlighted how PD provided the necessary skills and confidence to integrate these tools effectively (Section 6.3.2.1). Similarly, Lecturer_YAD emphasised the lack of institutional support for technology use but acknowledged that PD offered valuable guidance and resources to bridge this gap (Section 6.3.3.2). One of the lecturers, Lecturer_GNE, mentioned feeling pressured by how others use ET and that they put pressure on themselves to learn how to do it as well. This aligns with the CHAT framework, where PD is a mediating tool to resolve contradictions by equipping lecturers to balance institutional goals with their teaching approaches (Section 6.4.1).

These findings reveal the social and cultural influences on ET integration, for example, institutional norms, peer support, and resistance to change. They explain why some lecturers embrace ET while others resist it: those who attend PD on ET integration are more likely to adopt technology in their teaching, whereas those facing resource constraints or conflicting beliefs may be less likely to participate in PD or learn how to integrate ET effectively. The implications are that PD programmes informed by CHAT should focus on helping lecturers navigate these institutional and cultural challenges. Addressing these contradictions can lead to more meaningful ET integration, aligning institutional goals and individual teaching practices. The CHAT framework also complements TPACK by providing a broader context for understanding the social and cultural factors influencing ET adoption. While TPACK focuses on individual competencies, CHAT emphasises the systemic and collective influences on technology adoption, highlighting the dynamic nature of activity systems as lecturers integrate ET into their teaching practices.

7.3.3 Theme C - Role of PD in *BrightSparks*' Ability to Integrate ET in Teaching

In this theme, I explore how structured and self-directed PD activities influenced *BrightSparks*' ability to integrate ET into their teaching. Quantitative data suggests a strong positive relationship between PD participation and the effective integration of ET (Section 5.3). *BrightSparks*' regular participation in PD results in their feeling more confident and capable of using technology. In addition to improving confidence and competence, PD raises awareness of potential barriers to ET integration. Frequent participants in PD are more likely to identify and articulate barriers to ET use, possibly because they are more engaged with the complexities of technology integration. This underscores the role of PD in developing lecturers as teachers, as espoused in the *National Framework for Enhancing Academics as University Teachers* (DHET, 2019).

While quantitative data underscores the link between PD and ET integration, qualitative insights provide further depth by illustrating *BrightSparks'* specific experiences with PD (Benor, 2000; McMahon et al., 2015). Many participants appreciate flexible PD activities catering to varying levels of expertise. For example, Lecturer_NOT emphasised that while PD is valued, high workloads and burnout make it difficult to participate fully in these opportunities (Section 6.3.3.1). Lecturer_YAD noted the lack of dedicated funding for PD, describing it as a key barrier to accessing high-quality resources (Section 6.3.3.2). Similarly, Lecturer_NEI highlighted the importance of flexible and asynchronous PD options, which enabled self-paced learning despite time constraints (Section 6.3.3.2). These insights underline the need for PD activities that address these barriers while remaining accessible and practical for lecturers at various levels of expertise. This finding aligns with existing research, highlighting the need for more accessible and adaptable PD models. For example, McMahon et al. (2015) suggest that PD tailored to diverse teaching needs and preferences can contribute to more effective and comprehensive PD strategies.

The data support the TPACK framework by showing that PD activities enhance *BrightSparks'* technological, pedagogical, and content knowledge. Effective PD helps build the competencies to integrate ET into their teaching practices. The role of PD can be seen as a mediating tool that helps resolve contradictions or challenges in ET integration, thus facilitating systemic change (Section 6.3.3.2). PD is critical in supporting *BrightSparks'* ability to integrate ET into their teaching practices (Section 6.3.3.1). Lecturer_YAD emphasised that PD must align with institutional and individual goals to be impactful. Lecturer_NEI further highlighted the importance of tailoring PD activities to specific teaching contexts and providing flexibility to accommodate diverse needs (Section 6.3.3.2). These qualitative insights suggest that PD's effectiveness hinges on its relevance to participants' professional goals and teaching environments. PD that is flexible, practical, and responsive to the lecturer's needs is most valued and impactful (Timperley, 2011; Horn & Staker, 2015; Bragg et al., 2021). These findings highlight that PD must be well-designed, contextually relevant, and accessible to support ET integration effectively and address ET's technical and pedagogical aspects to be most effective.

7.3.3.1 Correlations between reasons for attending PD and using ET.

The quantitative data shows that correlations between the reasons for attending PD and using ET were investigated and grouped into three distinct categories: student-related, professional-related, and departmental-related reasons. This categorisation offers a more nuanced understanding of the motivations behind *BrightSparks'* engagement with PD and their use of ET. A significant positive correlation was found

across all three categories concerning reasons for using ET compared to student-related reasons for attending PD. There is an alignment with Lidolf and Pasco's (2020) and Moeller and Reitzes' (2011) findings, indicating that PD designed with a student-centred focus enhances lecturers' technological skills and promotes effective and meaningful integration of ET into teaching practices (Section 6.3.3.2). For example, Lecturer_NEI emphasised the role of PD in adapting ET to student needs, while Lecturer_YAD noted how PD fosters strategies for engaging students through technology (Section 6.3.3.2). This finding implies that lecturers prioritising student-related outcomes are more likely to adopt a broader approach to technology integration. This suggests that PD programmes emphasising student benefits might lead to more effective ET adoption across different contexts. While student-related motivations strongly correlate with ET integration, professional-related motivations reveal a more nuanced relationship.

7.3.3.2 Professional-Related Reasons

The lack of association between professional-related reasons for attending PD and the use of ET suggests that motivations centred on PD or intrinsic interests do not necessarily translate to the use of ET. Career advancement or certification might focus on general pedagogical skills rather than specific ET practices. Personal motivations may be more varied and less directly tied to specific teaching practices, such as ET. Literature indicates that professional motivations for attending PD, such as career advancement or certification, may not always correspond with the practical adoption of ET. Studies by Guskey (2002) and Desimone (2009) indicate that PD can enhance content knowledge and pedagogical skills, but does not always result in changes to classroom practices unless it is aligned with practical classroom needs. This implies that while PD might enrich lecturers' knowledge or skill sets, it does not always lead to the application of ET in teaching, pointing to a disconnect between intrinsic professional growth and technology use. While personal and professional motivations do not strongly correlate with ET use, institutional factors do, as discussed below.

7.3.3.3 Departmental-Related Reasons

No significant correlation was found between departmental-related reasons for attending PD and the use of ET. This indicates that external pressures or mandates from the department do not directly influence how lecturers use ET. While departmental policies might encourage PD attendance, they do not necessarily lead to the practical application of ET. The latter appears to be more influenced by individual preferences or student needs. Kirkwood and Price (2011) and Granić (2022) support the idea that institutional mandates often have limited influence on technology adoption. Instead, individual agency and the specific needs of students are stronger drivers. Institutional mandates might also fall short in influencing ET adoption for

reasons such as a lack of alignment with individual teaching contexts. The implication is that while departmental encouragement is important for PD participation, actual ET usage may require more personalised or student-focused approaches within teaching contexts.

7.3.3.3 Student-Centred Motivations

Findings indicate that *BrightSparks*, who engage in PD to improve student learning and outcomes, are more likely to integrate ET into their teaching for various reasons, including student benefit, personal growth, and departmental expectations (Section 6.3.2 and 6.3.3). This reflects a broader pedagogical perspective that emphasises the holistic development of teaching practices to enhance student learning experiences. Murthy et al. (2017) support that student-centred PD leads to broader and more effective ET integration. These findings suggest that PD programmes aimed at improving student learning can have far-reaching effects, encouraging lecturers to integrate technology not only for the benefit of students but also for their PD and institutional expectations. The implication of student-centred motivations is crucial for understanding how PD influences *BrightSparks*' teaching practices, aligning directly with this theme. The positive correlations for student-related motivations and the lack of correlation for professional- and departmental-related motivations provide key insights into how different types of PD influence *BrightSparks*' ability to integrate ET. These findings underscore the critical role of PD programmes that emphasise student-centred outcomes in fostering effective ET integration and the limitations of professional and institutional motivations, which often fail to translate into practical, technology-driven teaching innovations.

7.3.3.4 PD and Agency

The quantitative data shows a positive correlation between PD attendance and *BrightSparks*' sense of agency, suggesting that regular engagement in PD fosters empowerment and autonomy in pedagogical decision-making. Studies further support this, demonstrating that PD enhances lecturer agency by equipping them with decision-making capabilities (Worth & Van den Brande, 2020; Mohammad Nezhad & Stolz, 2024). This highlights the critical role of ongoing PD in building teaching skills and empowering lecturers to make autonomous decisions in their practices. For *BrightSparks*, this empowerment is evident in their ability to integrate ET effectively, as their sense of agency is directly influenced by sustained PD participation (Section 6.3.3 and 6.3.3.2).

7.3.3.5 Agency and Years of Teaching

The quantitative data (Section 5.2.7) shows a significant positive correlation between agency scores and teaching experience, which indicates that more experienced *BrightSparks* tend to feel greater autonomy and

control in their teaching practices. Gore et al. (2023) and the Learning Policy Institute (2016) confirm that experienced lecturers often exhibit higher levels of professional agency, which enhances their ability to integrate ET and adapt to students' needs. An implication is that PD programmes should account for experience level, as experienced lecturers may benefit more from activities that enhance their sense of agency rather than focusing solely on imparting new technical skills. Furthermore, this correlation highlights how long-term engagement in structured and self-directed PD contributes to lecturers' confidence and autonomy in technology integration, reinforcing the value of sustained PD throughout a teaching career.

7.3.3.6 Fostering a Supportive PD Environment

The interview data highlights the importance of fostering a PD environment that addresses technological proficiency and supports lecturers in meaningfully integrating ET into their pedagogy (Section 6.3.3 and 6.3.3.2). Rosales (2021) underscores the need for holistic PD approaches that balance technical and pedagogical dimensions of technology use. The importance of institutional support for the successful adoption of ET, identified in this study - administrative backing, access to resources, and a collaborative culture - corroborates Hanover Research's (2014) findings. PD can transform teaching practices by addressing internal and external barriers, such as resource limitations and teacher attitudes, promoting student-centred and interactive learning environments (Hanover Research, 2014). Ultimately, PD programmes that provide technological and pedagogical support in a collaborative and resource-rich environment are more effective in fostering ET integration.

7.3.3.7 Mitigating Challenges and Resistance through PD

Interview data reveal that *BrightSparks'* reluctance to adopt ET stems from a range of factors, including a lack of confidence, perceived irrelevance to their teaching context, and concerns about increased workload. (Section 6.3.2.1). Rosales (2021) supports these findings, observing that many lecturers feel unprepared or inadequately trained to integrate technology into their pedagogy. These issues are often exacerbated by a lack of institutional support and the perception that adopting new tools will complicate rather than simplify teaching practices (Hanover Research, 2014). Additionally, scepticism around the educational value of ET, particularly when its impact on student learning outcomes is unclear, contributes to resistance (Durff & Carter, 2019). Overcoming these barriers requires comprehensive PD programmes that not only build confidence and demonstrate the relevance of ET but also show how technology can streamline teaching, making it more efficient rather than burdensome. Durff and Carter (2019) found that PD programmes offering ongoing support and training increased lecturers' confidence regarding integrating ET into their teaching practices, as their reluctance and concerns about workload were addressed.

7.3.3.8 Digital Literacy and Tailored Professional Development

As noted in the interview data, many participants felt overwhelmed by the rapid pace of technological change and their perceived lack of digital literacy (Section 6.3.2.1). These findings underscore the importance of PD programmes tailored to accommodate varying levels of digital proficiency, helping to bridge this gap. Hamidah and Mubarak (2020) suggest that lecturers' lack of proficiency with digital tools limits their ability to integrate ET effectively. Tailored PD programmes that focus on bridging specific digital literacy gaps can enhance lecturers' confidence and enable more meaningful use of technology in their teaching practices (Uerz et al., 2021). Providing differentiated support ensures that all lecturers are equipped to integrate ET effectively regardless of their level of digital proficiency. Ultimately, the findings suggest that tailored PD is crucial in empowering lecturers to overcome technical and pedagogical challenges, fostering a supportive environment for their growth and the successful adoption of ET.

7.3.3.9 Theme C- Summary

The data showed a statistically significant correlation between *BrightSparks'* views on the importance of PD and their ability to integrate ET (5.3). Those who attached significant value to PD were likelier to perceive ET positively impacting their teaching. In contrast, no significant relationship was found between PD driven by professional or departmental pressures and ET use. This suggests that intrinsic motivations, such as a desire to improve student outcomes, are more influential in fostering successful ET integration.

The interviews confirmed these findings. Participants who actively pursued PD, particularly enhancing student learning, reported more success integrating ET into their teaching practices (Section 6.3.3). One participant, Lecturer_NAM noted how structured support systems and resources as invaluable in showing how to use technology in a way that benefits students, not just to tick a box for the department." In contrast, some expressed frustration when "bureaucratic processes can slow you down" (Lecturer_RED).

These findings suggest that PD programmes should prioritise student-centred learning and the practical application of ET to promote meaningful integration. Programmes driven primarily by external mandates or professional advancement may be less effective. Additionally, empowering lecturers to develop their sense of agency in using ET, rather than simply complying with institutional expectations, is critical for fostering deeper engagement with technology.

Theoretically, the data support the TPACK framework by demonstrating how PD enhances *BrightSparks'* technological, pedagogical, and content knowledge, equipping them to integrate ET effectively.

Furthermore, from a CHAT perspective, PD is a mediating tool that resolves contradictions within the activity system, bridging the gap between lecturers' current skills and the competencies required for ET integration. This systemic role of PD facilitates broader institutional change in teaching practices.

7.3.4 Theme D - What Can Be Learned from *BrightSparks* to Inform PD?

In this section, I explore what can be learned from *BrightSparks* to inform the design and implementation of a PD framework for technology transformation that facilitates health sciences lecturers' integration of ET. The quantitative findings indicate that participants who value and engage in PD (Section 5.2.2) are more likely to integrate ET into their teaching. Data shows that PD activities tailored to specific needs and providing practical benefits are most effective in promoting ET use. Lecturers prioritising PD are more attuned to the benefits and challenges of ET integration and demonstrate a more substantial commitment to self-directed PD. This underscores the value of PD that aligns with lecturers' intrinsic motivations and focuses on technological and pedagogical growth (Patry et al., 2017; Geertsema, 2021; Xianhan et al., 2022). Geertsema's (2021) findings support that lecturers who take ownership of their professional growth, irrespective of external pressures, are more likely to adopt innovative practices and effectively navigate challenges in technology integration.

This dedication to self-development reflects the growing recognition of lifelong learning as a critical component of teaching in a rapidly evolving educational landscape (Tejada Fernández, 2013; Hilty et al., 2019; Vallera & Sadat, 2021). By investing in their professional growth, lecturers develop their technological and pedagogical skills and a reflective practice that enables them to critically assess and adapt to the challenges posed by ET integration.

The quantitative data highlights the positive relationship between targeted PD and successful ET integration. However, the qualitative insights provide a deeper understanding of what participants perceive as critical for effective PD. PD programmes are most successful when they are relevant to current teaching practices, flexible in delivery, and aligned with lecturers' professional goals. Participants emphasised the importance of structured experimentation within PD, not just as trial-and-error but as a process that allows for exploring new ET tools and pedagogical methods. This highlights the need for PD to include opportunities for safe experimentation, supported by institutional resources, where lecturers can evaluate new strategies in their teaching context and reflect on the outcomes. Interviews also revealed barriers to effective PD (for example, lack of support and time constraints) and enablers (peer mentoring and access to resources). These insights can inform the design of PD programmes responsive to lecturers' specific needs and contexts.

The lessons from *BrightSparks* align with both the CHAT and TPACK frameworks. TPACK emphasises the importance of developing technological, pedagogical, and content knowledge in a balanced manner to create integrated teaching practices. Similarly, from a CHAT perspective, PD addresses contradictions in ET integration by equipping lecturers with the tools and strategies to navigate challenges collaboratively (Section 6.3.3.1). The qualitative insights emphasise the significance of community and collaboration in overcoming barriers to PD engagement, such as time constraints and lack of institutional support (Section 6.3.3.2). These findings underscore the importance of fostering a collaborative PD environment, encouraging peer learning and collective problem-solving. These peer-mentoring interactions resemble a nascent CoP, suggesting that formalising CoP structures could amplify technology-integration gains across the faculty (Wenger, 1998).

Therefore, effective PD should foster a CoP, encourage experimentation and reflection, and be flexible enough to meet diverse needs. Institutional support, including financial resources, time allocation for PD participation, and access to technological infrastructure, is essential in creating an environment conducive to sustained professional growth. Without adequate institutional backing, even the most well-designed PD programmes may struggle to achieve their full impact (Brown et al., 2010; Hanover Research, 2014).

7.3.4.1 PD Importance and ET Influence

The quantitative data shows that the valorisation of PD (Section 5.2.4) is a key factor in designing effective PD frameworks that support ET integration. The data reveals a statistically significant correlation between *BrightSparks*' valuation of PD and the influence of ET in their teaching practices. This highlights an important insight from the earlier analysis: Participants prioritising PD are more likely to recognise ET's transformative potential in their teaching. Desimone's (2009) and Lawless and Pellegrino's (2007) findings support this, showing that lecturers who value PD highly are likelier to engage in continuous learning and adopt innovative practices, including ET. This, in turn, suggests that lecturers who recognise the importance of PD are more inclined to use ET in ways that enhance teaching and learning outcomes. For institutions, this underlines the need to create a culture that promotes the value of PD as integral to PD. By fostering an environment where PD is highly valued, lecturers are more likely to see ET as a powerful tool to innovate and improve their teaching practices.

7.3.4.2 Barriers to ET

The quantitative data showed that PD frameworks should promote ET integration and address the barriers lecturers face in implementing technology (Section 5.2.6). The correlation between the importance of PD and the barriers they experience suggests a nuanced relationship. *BrightSparks*, which attach significant value to PD, are more engaged with the complexities of ET integration, making them more aware of obstacles. According to Bećirović (2023) and Mercader (2020), findings corroborate that PD helps lecturers identify external barriers (lack of resources) and internal barriers (attitudes toward technology).

This deeper engagement likely reflects lecturers' understanding of these challenges, suggesting that highly engaged lecturers may face more barriers and are more motivated to seek practical solutions. Therefore, PD frameworks should focus on providing problem-solving strategies and barrier-reduction techniques, equipping lecturers with the tools they need to overcome ET integration's technical and pedagogical challenges. By addressing specific barriers, whether through resource allocation, collaborative support, or attitudinal shifts, PD can empower lecturers to implement ET more effectively.

7.3.4.4 Collaborative Approaches and Peer Mentoring

The interview data highlights that peer influence is critical in the broader adoption of ET. While some lecturers are enthusiastic about integrating technology, others resist due to scepticism or a lack of understanding of ET's benefits (Graf-Vlachy et al., 2018; Section 6.3.2.1). These findings underscore the importance of fostering collaborative environments where lecturers can share experiences and encourage one another to explore the potential of ET integration (Section 6.3.3.2). Promoting collaboration and peer mentoring within departments can help address this resistance. Tenenbaum et al. (2020) suggest that peer interaction fosters a supportive environment that encourages ET adoption by providing opportunities for lecturers to share experiences and strategies. When lecturers see their peers succeed with ET, they are more likely to feel confident in integrating it effectively.

One of the key lessons from *BrightSparks* is the importance of collaboration and peer support in fostering ET adoption. PD programmes that incorporate peer mentoring and collaborative learning can help create a culture of shared responsibility for ET integration. Structured opportunities such as technology-focused communities of practice, peer observations, and co-teaching can provide practical ways for lecturers to exchange ideas, discuss challenges, and share success stories. By creating working groups where lecturers can collaborate, institutions can increase buy-in from hesitant colleagues and foster a culture of continuous professional growth and innovation in ET.

7.3.4.5 ET Impact on Workload and Resistance from Students

Qualitative data reveals that *BrightSparks* are concerned about the additional workload associated with ET integration and potential resistance from students accustomed to traditional teaching methods (Section 6.3.2.1 and 6.3.2.2), particularly when institutional support is insufficient (National Research Council, 2012). Student resistance, often manifested in non-participation or negative evaluations when introducing new teaching methods, exacerbates difficult conditions (Tharayil et al., 2018; Section 6.3.2.2) and can discourage lecturers from adopting ET, particularly in the absence of clear strategies to engage students in the transition.

Finelli et al. (2020) found that lecturers can mitigate student resistance to new teaching methods, such as ET, through careful facilitation and communication. *BrightSparks*, for example, successfully addressed student resistance by involving students in the process and communicating the benefits of new technologies. By gradually adopting ET and ensuring students understand how these tools enhance their learning experience, lecturers can foster a smoother transition. PD programmes should integrate these strategies, helping lecturers manage the increased workload and potential student pushback.

To address these challenges, PD frameworks should draw lessons from *BrightSparks*, focusing on collaborative approaches, peer support, and practical strategies to reduce workload and student resistance. Institutional support is crucial for enabling this process, including providing the necessary time, resources, and incentives for lecturers to engage in continuous PD. Policies that allow for phased ET adoption, additional preparation time, and formal recognition of PD efforts are key to ensuring long-term engagement and successful ET integration.

7.3.4.6 Theme D - Summary

Quantitative data revealed that *BrightSparks*, which valorised PD, were likelier to report positive outcomes from ET use, indicating that attitudes towards PD play a critical role in its success. However, participants highlighted time constraints, high workloads and lack of institutional support as barriers to meaningful engagement in PD activities.

Insights from qualitative data elaborated on these barriers. Several participants emphasised the need for institutional policies that better support PD participation. Participants noted the lack of time, multiple lecturers saying, “I don’t have time to ...” when referring to PD activities. However, as Lecturer_GNE said, “If it counted towards promotion ... then people would do it”. However, departments and divisions do

encourage lecturers to attend PD. Despite these challenges, many participants desired more collaborative PD opportunities, emphasising peer mentoring and sharing best practices for ET integration. Future PD frameworks, therefore, need to integrate peer support, foster collaboration to enhance engagement and facilitate practical solutions to common ET challenges.

The implications for future PD frameworks are clear. Institutions must address both the logistical and motivational barriers to PD participation. Providing lecturers with dedicated time, sufficient resources, and formal recognition for PD engagement will be essential to promoting sustained participation. Additionally, PD programmes should focus on encouraging peer collaboration and the exchange of best practices, as these have proven effective in promoting ET integration across diverse teaching contexts.

The connections to CHAT and TPACK are evident in these findings. The lessons from *BrightSparks* align with TPACK by highlighting the need for PD to develop technological, pedagogical, and content knowledge simultaneously. Effective PD should equip lecturers to integrate these domains seamlessly into their teaching. From a CHAT perspective, PD plays a crucial role in addressing contradictions within the activity system of ET integration, providing the tools and collaborative support needed to navigate challenges. The qualitative insights underscore the role of community and collaboration in overcoming barriers to PD engagement, further reinforcing the importance of peer-driven learning in future PD designs.

7.3.5 Themes A – D: Combined Findings

The combined findings across all themes provide a multifaceted understanding of ET integration and the role of PD. Holistically, ET integration requires both the development of specific competencies (TPACK) and the navigation of broader social and cultural contexts (CHAT). These findings, viewed through the theoretical lenses of CHAT and TPACK, offer critical insights into designing a PD framework that facilitates effective technology transformation in teaching. The findings also address the research question, "Drawing on the theoretical perspective of CHAT, how does *BrightSparks*' application of technological pedagogical content knowledge inform the advancement of a PD framework for technology transformation using ET?" PD addresses both aspects by providing the necessary skills and fostering a supportive community and institutional culture. The findings highlight that ET integration is a dynamic process influenced by individual, institutional, and systemic factors. Effective PD must be adaptable, contextually relevant, and sensitive to these diverse influences to support sustainable integration. Theoretically, using CHAT and TPACK frameworks provides a comprehensive lens for understanding the complexities of ET integration. TPACK focuses on individual competencies, while CHAT highlights the sociocultural dynamics, offering a more

nuanced view of how and why ET is adopted in teaching practices. Practically, these insights suggest that institutions should design PD programmes that are continuous, collaborative, and aligned with both technological advancements and pedagogical needs. Moreover, addressing the identified contradictions within the CHAT framework (Section 6.3.2.1 and 6.3.3.1) can help resolve systemic barriers and promote a culture of innovation and experimentation in ET use. The six points below describe the practices observed among *BrightSparks*, which serve as principles of the framework to help design PD to support other lecturers. These principles are derived from the data and illustrate effective PD and ET integration, which mirrors *BrightSparks*' ability to integrate successfully.

- 1) Developing TPACK competencies through PD - *BrightSparks* demonstrate that sustained and meaningful engagement with PD is essential for developing TPACK competencies. They leverage PD opportunities to refine their ability to integrate ET effectively. Quantitative data reveals strong correlations between PD participation and enhanced TPACK knowledge, with *BrightSparks* exemplifying how regular engagement in PD contributes to their technological, pedagogical, and content knowledge. Qualitative insights further reveal that they prioritise relevant, practical, and tailored PD to their needs, often seeking opportunities that align with their teaching contexts. Additionally, their practices underscore the importance of fostering positive beliefs and attitudes toward ET integration and the necessity of a supportive institutional environment that enables continuous and purposeful PD.
- 2) Navigating social and institutional dynamics - *BrightSparks* illustrates how lecturers can effectively navigate the systemic and sociocultural factors influencing ET integration. The CHAT framework highlights how *BrightSparks* manages contradictions from institutional norms, peer influences, and cultural resistance. It further reveals the importance of addressing social and institutional dynamics to enable systemic innovation and support for lecturers. For example, *BrightSparks* overcomes limited resources and time barriers through creative problem-solving, collaboration with peers, and leveraging their agency to influence change. Quantitative data reveals that lecturer agency and institutional barriers shape ET adoption, and the qualitative findings underscore the importance of community support, collegial collaboration, and addressing resistance from students and colleagues. *BrightSparks* model strategies for overcoming these challenges, showing how navigating sociocultural and institutional dynamics is integral to successful ET integration. These practices can inform PD frameworks that help other lecturers develop similar capacities for navigating complex activity systems.
- 3) Addressing barriers to PD participation and ET integration: *BrightSparks* demonstrate how lecturers can overcome obstacles to PD participation and ET integration, offering valuable insights for

institutional frameworks. Despite facing the everyday challenges of time constraints, workload pressures, and insufficient institutional support, they actively seek out opportunities for professional growth through informal learning, self-directed exploration, and peer collaboration. Qualitative findings reveal that *BrightSparks* creatively navigate these barriers by leveraging their intrinsic motivation and resourcefulness, often initiating PD activities when institutional support is lacking. While quantitative data shows that the perceived importance of PD remains consistent across the variables of teaching experience and qualifications, *BrightSparks* highlight the critical need for institutional policies that provide dedicated time, resources, and formal recognition of PD efforts. These practices suggest that a successful PD framework should address logistical challenges while fostering a supportive environment that enables lecturers to replicate *BrightSparks'* proactive approach to PD and ET integration.

- 4) Fostering collaboration and peer mentoring: *BrightSparks* exemplifies the critical role of collaboration and peer mentoring in successful ET integration. These lecturers actively engage with colleagues to share best practices, explore innovative technologies, and reflect on their teaching experiences. They often serve as informal mentors, encouraging others to adopt ET by demonstrating its practical benefits and supporting their peers' experimentation. Qualitative insights highlight that fostering a collaborative PD environment reduces resistance to ET integration and creates a sense of shared responsibility for technological transformation. Quantitative data reinforces this by showing a significant positive correlation between student-centred motivations for attending PD and ET usage, a relationship exemplified by *BrightSparks'* commitment to improving student success. These findings suggest that designing PD frameworks which encourage peer mentoring and collaboration can contribute to scaling *BrightSparks'* practices across broader academic communities.
- 5) Balancing technical, pedagogical, and content knowledge: *BrightSparks* demonstrate the effectiveness of a balanced approach to TPACK, seamlessly integrating technological, pedagogical, and content knowledge to transform their teaching practices. These lecturers exemplify how targeted PD can cultivate this balance, enabling them to adopt ET in ways that enhance student engagement and learning outcomes. Quantitative findings support the notion that PD focusing on all three domains, technology, pedagogy, and content, is essential for effective ET integration, with *BrightSparks* serving as proof of this principle. Qualitative data highlights that lecturers value PD activities that address these domains in an integrated and practical manner. The practices of *BrightSparks* underscore the importance of ongoing, relevant PD tailored to support the holistic development of TPACK competencies, illustrating how balanced knowledge domains enable innovative and student-centred teaching.

- 6) Resolving systemic contradictions and supporting innovation (CHAT): *BrightSparks* provides valuable insights into how systemic contradictions within the activity system of ET integration can be effectively addressed. When designed with CHAT principles, these lecturers demonstrate how PD equips them with the tools and strategies to navigate institutional, cultural, and logistical challenges (Section 6.3.2.1 and 6.3.3.1). For instance, qualitative findings reveal that lecturers who actively involved students in the process and communicated the benefits of ET adoption were more successful in overcoming resistance (Section 6.3.2.1). *BrightSparks* illustrates the potential of PD to resolve contradictions, such as tensions between institutional rules and the practical realities of teaching with technology, by fostering a culture of experimentation and innovation. Additionally, the findings highlight that *BrightSparks* with higher qualifications - NQF10 - exhibit higher agency scores, reflecting their greater confidence and autonomy in implementing innovative teaching practices. This reinforces the importance of PD in empowering lecturers to navigate challenges and transform their teaching through ET integration.

7.4 Institutional Implications for Technology Adoption

To address the study's central question, how BrightSparks' TPACK practice can inform a PD framework for technology transformation within a CHAT perspective, the faculty must translate individual insights into organisational redesign while remaining sensitive to the South African context. In line with the context-sensitive, lecturer-driven learning findings, the institution can adopt supportive structures, for example, readiness-mapping tools, workload incentives or peer-mentoring fellowships, that remove systemic barriers. Before new ETs are purchased or PD is advertised, a Teaching-Change Framework audit should diagnose gaps in infrastructure, staff confidence and pedagogical alignment (Sachs et al., 2011; Tarling & Ng'ambi, 2016). Such audits are critical in resource-constrained settings where bandwidth, device access and specialist support vary widely (Frehywot et al., 2013).

Leadership can also encourage sustained uptake by providing time, long-term support, reliable infrastructure and credit for technology-enhanced curriculum work (Trowler, 2015; Gibson et al., 2023). Adjusting workload and valuing innovative teaching in promotion policies signals that iterative experimentation and reflection are core academic activities, not add-ons (Durff & Carter, 2019; University of Johannesburg, 2019). This directly addresses the Subject–Tool contradiction identified in the CHAT analysis.

A bottom-up CoP or an institutional ETs teaching fellowship programme would accelerate adoption (Trowler, 2015). Funded release time would enable BrightSparks to mentor peers and lead small-scale,

discipline-specific pilots, redistributing agency and building bottom-up communities of practice, an approach effective in both South African universities and high-income systems, using informal peer networks to build digital capability alongside formal PD (Trowler, 2015; Leibowitz et al., 2017). These middle-leadership roles relieve pressure on central support units and address Subject–Community tensions.

From an institutional perspective, given enough resources, it must be done. Two examples are establishing an institutional or faculty advisory board with equity mandates. Allowing a standing group of instructional designers, learning technologists and academic champions to vet purchases, coordinate low-bandwidth/blended solutions for rural clinical sites, and ensure policy alignment, all steps that mitigate Tool–Rule contradictions and reflect low and middle-income countries' equity concerns (Frehywot et al., 2013; Tarling et al., 2016; Leibowitz et al., 2017). The second example is that PD analytics can be embedded in quality assurance dashboards to monitor uptake. Tracking participation, resource uptake, and classroom impact in real time enables evidence-informed iteration and satisfies external accountability requirements (Sachs et al., 2011; McCusker, 2017; Gibson et al., 2023). Data visibility also strengthens leadership commitment and resource allocation.

Collectively, these adaptations confront the Subject-Tool, Tool-Rule, and Community–Division-of-Labour contradictions highlighted by the CHAT analysis while honouring the equity and resource realities of South Africa and other low-income contexts, thereby embedding sustainable, context-responsive technology transformation in day-to-day academic practice.

7.5 Summary of Chapter

This research synthesises the dynamic interplay between lecturers' PD, their use of ET, and their sense of agency within the FHS. By integrating quantitative results with qualitative insights, a deeper understanding emerges of the interconnected ecosystem in which lecturers' engagement with ET and PD contributes to developing TPACK competencies and a more student-centred pedagogy.

Key findings reveal significant correlations between academic qualifications, a sense of agency, and the integration of ET. Lecturers with higher academic qualifications, particularly those holding a PhD, demonstrate a stronger sense of autonomy and empowerment in their teaching practices than those with a master's degree. While years of teaching experience correlate positively with agency scores, the influence of academic qualifications is more pronounced. Additionally, the perceived value of PD is universally

acknowledged, regardless of demographic factors such as teaching experience or course load, underscoring its recognised importance across the academic spectrum.

The qualitative data further elucidates the underlying processes and contextual factors influencing the development of TPACK competencies. Insights from the CHAT framework reveal the social and cultural dynamics affecting the adoption and integration of ET. They emphasise the importance of interpreting beliefs, attitudes, and practices that are not easily captured through quantitative measures. Moreover, the insights gained from *BrightSparks* reinforce the chapter's initial aim to develop a framework for PD. BrightSparks' experiences illustrate how diverse formal/informal and self-led/instructor-led learning pathways can be harnessed to enhance teaching practice through ET integration by highlighting effective strategies alongside the contradictions and barriers that lecturers face.

Correlation analysis complements the descriptive insights, indicating that lecturers who highly value PD perceive a significant influence of ET in their teaching. Engagement in PD activities enhances lecturers' awareness and appreciation of ET. Insights from the correlation between PD activity importance and barrier scores reveal a nuanced relationship where lecturers who value PD are also more aware of, or often more affected by, the barriers to implementing ET. This aligns with the contradictions within the TPACK-CHAT ecosystem, where lecturers navigate these barriers in their PD.

Finally, the study highlights that translating BrightSparks' insights into practice requires institution-level restructuring, workload recognition, peer-led fellowships, equity-focused advisory governance, and data-driven dashboards to resolve the CHAT-identified contradictions and embed sustainable technology adoption across the faculty.

The next chapter will introduce a KF4TT building on the six key insights gained from *BrightSparks*' namely, (1) developing TPACK competencies through targeted PD, (2) applying the CHAT framework to navigate social and institutional dynamics, (3) addressing barriers to PD participation and ET integration, (4) fostering collaboration and peer mentoring, (5) balancing technological, pedagogical, and content knowledge for seamless ET usage, and (6) resolving systemic contradictions to support innovation.

Chapter 8 – Developing a Framework for PD

8.1 Overview

In the previous chapter, I examined the complex interrelations among the PD of lecturers, their use of ET, and their sense of agency within a health sciences context. Key findings underscored the impact of academic qualifications and agency on the integration of ET, alongside a demonstrated need for contextualised PD that addresses barriers to ET adoption. These insights, informed by the theoretical perspectives of CHAT and TPACK, highlighted the need for a PD framework that supports lecturers' professional growth while acknowledging the sociocultural and systemic factors shaping their practices.

Building upon these insights, this chapter further explores a KF4TT, a structured yet flexible conceptual guide that integrates theoretical underpinnings with practical design principles to inform PD planning, implementation, and evaluation. (Section 2.3). Specifically, in this context, the KF4TT is designed as a scaffolding framework that shapes and supports lecturers' growth to facilitate transformative shifts in lecturers' teaching by holistically enhancing their competencies through PD, as well as fostering innovative, technology-oriented pedagogical strategies (Xianhan et al., 2022; Geertsema, 2021).

8.2 Context

The KF4TT, delimited by CHAT and TPACK, aims to address the specific teaching needs of health sciences lecturers by drawing upon the principles embodied by *BrightSparks* and contributing to broader PD for integrating ET to foster sustainable and transformative practices. It is constructed from examining BrightSparks' context-specific adaptations and how they leverage informal, self-directed learning experiences and formal PD structures, such as workshops and courses (Xianhan et al., 2022; McMahon et al., 2015). The result is a KF4TT that is adaptable, context-sensitive, and aligned with evolving needs. Frameworks such as the Networked Learning Framework (Ostashewski & Reid, 2017), the cMOOC model (Gupta, 1992), and the UK Professional Standards Framework (Advance HE, 2023) emphasise the value of community-driven, peer-supported learning environments and scalable, flexible PD initiatives (Cochrane & Narayan, 2017). The KF4TT goes further, encapsulating key aspects of innovative practices, aligning with broader PD concepts, and integrating ET to foster sustainable and transformative teaching practices in the FHS.

As a reminder (Section 2.7.3), I discuss what transformative teaching practices entail. They are defined as those extending beyond traditional pedagogical approaches by embedding ET in ways that reshape teaching

and learning environments. These practices require lecturers to integrate technology and to do so in a manner that aligns with cultural, historical, and institutional contexts, fostering shifts in epistemology and student engagement (Tarling, 2018). Transformation is thus not merely a matter of adding ET to existing teaching models; it involves rethinking pedagogies to create less restrictive teaching and learning spaces that empower students to engage actively and develop critical thinking skills. Tarling and Ng'ambi (2016) emphasise that lecturers described as "Reproducers of Change" leverage transformative ET integration to foster a more profound consciousness in students, moving beyond rote knowledge acquisition toward reflective and participatory learning experiences. This transformative integration supports a shift from lecturer-centred to student-centred pedagogies, creating a collaborative context that aligns individual motivations with institutional goals to enhance learning outcomes (Desimone, 2009; Lawless & Pellegrino, 2007). By prioritising PD that promotes these integrative practices, PD programmes can facilitate continuous learning among lecturers, ensuring that the adoption of ET is not superficial but profoundly affects how knowledge is constructed and disseminated.

In developing my framework, I considered other PD frameworks and models' strengths, limitations, and unique aspects, particularly in considering the key components of PD, content knowledge, pedagogical skills, digital literacy, reflective practice, and collaborative learning (Section 2.3 and 2.4). I identified commonalities among the frameworks, such as reflective practice and integrating collaborative learning within the educational context. This knowledge informed the design of my PD framework, allowing me to adopt best practices and address gaps identified in the literature.

Contexts present distinct challenges and opportunities influencing PD programmes' design, implementation, and effectiveness. Recognising the unique needs of HE, particularly health sciences, PD should be tailored to enhance lecturer skills and competencies (Uerz et al., 2021). Addressing challenges related to resource constraints, technology integration, and alignment with industry standards requires strategic planning and collaboration, providing a foundation for understanding the context-specific nuances of PD frameworks (Brown et al., 2010; Tack et al., 2018).

Technology is pivotal in PD frameworks, significantly enhancing teaching and learning by integrating digital tools, online platforms, and virtual communities. These technologies make PD accessible, flexible, and practical, offering lecturers opportunities for continuous, collaborative, and context-specific learning (Gachago et al., 2017; Hartshorne et al., 2020). Therefore, how PD frameworks incorporate technology to

improve educational outcomes is important. As Nasri and Rahmatullah (2024) discussed, it is important to highlight both the benefits and challenges of technology integration within PD.

The influence of cultural and contextual factors on PD's design, implementation, and outcomes is also considered. These factors, such as organisational culture, institutional policies, and local educational contexts, shape how PD is perceived, valued, and practised in different settings (Rienties et al., 2023). CHAT provides a deeper understanding of PD as a culturally situated activity, underscoring the importance of context in shaping PD practices. By drawing on CHAT, I demonstrate how PD in the health sciences can be developed to be responsive to the diverse needs of different educational environments, ensuring that PD remains relevant, effective, and sustainable in improving teaching and learning outcomes (Belland, 2009).

8.3 Interpreting Findings with Literature and CHAT/TPACK

The themes identified in Section 7.3 identify the key areas where pedagogical practices, technological integration, and collaborative engagement could be enhanced. The discussion in Section 7.3.5 has led to creating a context-sensitive and transformative framework, KF4TT, addressing the unique needs of health sciences lecturers.

8.3.1 Theme A: Implications for Developing a PD KF4TT from Findings (TPACK)

Goal: PD should demonstrate how ET can enhance student learning and engagement. Making the relevance of ET clear motivates lecturers to adopt new technologies by showing tangible benefits for their teaching practices. How:

- Integrating skills and pedagogy: Effective PD programmes must balance technical skills development with pedagogical strategies. Lecturers need the ability to use ET and a clear understanding of meaningfully integrating it into their teaching methods, alongside their disciplinary knowledge in health sciences.
- Community of practice: PD should be ongoing, providing lecturers with continuous mentoring and opportunities to practice and reflect on ET use in a manner relevant to their particular discipline. A collaborative PD environment encourages peer support, allowing lecturers to share experiences, including the good and the challenging ones, and to feel empowered by building confidence over time.
- Addressing barriers: PD programmes must address internal barriers, such as lack of confidence and digital literacy, external barriers, institutional constraints, and limited resources. Tailored PD

programmes that provide practical strategies to overcome such challenges are essential for effective ET integration.

- Using TPACK as a foundation: The TPACK framework should guide PD design, ensuring that programmes develop lecturers' technological and pedagogical skills that can be integrated with their content knowledge. This integrated approach enables lecturers to enhance content delivery and pedagogy through ET integration.

8.3.2 Theme B: Institutional Contradictions and Sociocultural Influences (CHAT)

Goal: PD programmes need to consider the institutional and cultural contexts of lecturers. This means aligning PD content with institutional policies, peer norms, and the sociocultural challenges lecturers face. PD can promote more effective ET integration by helping lecturers navigate contradictions between institutional expectations and personal teaching practices. How:

- Dealing with contradictions: CHAT reveals that contradictions between institutional policies, tools, and teaching methods can hinder ET adoption (Hanover Research, 2014; Durff & Carter, 2019). PD informed by CHAT should explicitly address these contradictions, offering strategies to resolve tensions between traditional teaching methods and modern technological demands, particularly in resource-constrained contexts such as the South African educational and health systems.
- Being student-centred: Findings show that lecturers motivated by student-centred goals are more likely to integrate ET. Therefore, PD should empower lecturers by demonstrating the benefits of ET for student outcomes, fostering a sense of agency in adopting and adapting technology to their specific teaching contexts.
- Addressing barriers: PD programmes must raise awareness of internal barriers - resistance to change, lack of confidence – and external barriers such as resource constraints and lack of support. Practical strategies to overcome these barriers are crucial for fostering engagement with ET (Mercader, 2020; Bhat, 2023; Chugh et al., 2023b).
- Integrating CHAT and TPACK: While TPACK focuses on technological, pedagogical, and content knowledge, CHAT adds a sociocultural dimension. PD programmes should integrate both frameworks, enabling lecturers to develop competencies and navigate the systemic influences that shape ET integration.

8.3.3 Theme C: Personalising PD and Promoting Self-Directed Learning

Goal: To promote the long-term benefits of PD for both professional growth and ET integration, which fosters positive attitudes toward continuous development. Lifelong learning remains integral to PD in the health sciences. How:

- Consider the context (needs): PD programmes should be flexible and context-specific, addressing lecturers' unique technological and pedagogical challenges. Recognising that PD occurs along a continuum (Jacob et al., 2015; Behari-Leak et al., 2018) from formal, institution-led activities to self-directed, exploratory learning ensures all lecturers receive relevant support.
- Promoting self-directed learning: Encouraging self-directed learning and reflective practice empowers lecturers to take ownership of their PD journeys, much like *BrightSparks*, who exemplify agency and self-initiated approaches to ET integration.
- Address barriers: Institutions should provide adequate time, resources, and formal recognition to enable lecturers to engage in PD without adding undue pressure to their workloads.
- Encourage peer collaboration: Collaborative learning and peer mentoring within PD programmes can create supportive communities of practice, enhancing lecturers' confidence and competence with ET (Pololi et al., 2002; Ramani, 2006).
- Balance knowledge domains (TPACK): PD programmes must address technological, pedagogical, and content knowledge, enabling lecturers to integrate ET in transformative ways and adapt to evolving educational demands.

8.3.4 Theme D: Contextualising PD and Institutional Support

Goal: PD programmes should be modular and flexible, accommodating different levels of digital proficiency. Recognising the continuum of PD, from more structured, institution-led support to self-directed learning, ensures that both novice and technologically adept lecturers (including those akin to *BrightSparks*) can benefit (McMahon et al., 2015). How:

- Institutional support: Institutions must allocate time, resources, and formal recognition for PD engagement to overcome common barriers. Providing clear support mechanisms across this PD continuum enables all lecturers to participate fully in capacity-building initiatives.
- Foster collaboration: Encouraging professional learning communities, peer mentoring, and shared responsibility for ET integration promotes collaboration and collective growth among lecturers (Tenenbaum et al., 2020).

- Encourage experimentation and reflection: PD should support low-risk experimentation with ET while fostering a culture of reflective practice. This approach helps lecturers progress along the continuum at their own pace, blending structured opportunities with self-initiated exploration.
- Encourage student-centredness: PD should emphasise strategies that enhance student engagement and outcomes through more effective ET integration, reinforcing the ultimate goal of improving teaching and learning experiences.
- Integrating CHAT and TPACK: Grounding PD in theoretical models that address systemic challenges (CHAT) and comprehensive knowledge integration (TPACK) offers a holistic framework to support lecturers' diverse needs and varying points on the PD continuum.

8.4 Knowledge Framework for Technology Transformation

The findings from this study emphasise that ET integration requires the development of individual competencies while navigating institutional and social systems, such as rules, community, institutional support, and contradictions. The KF4TT blends individual competencies from TPACK, addressing the integration of technological, pedagogical, and content knowledge, with the systemic elements from CHAT, which contextualise these competencies within institutional structures and social activity systems. This synthesis highlights the dynamic interplay between individual development and broader external factors, such as institutional culture and community practices.

By grounding KF4TT in CHAT and TPACK, I extend their application within the context of health sciences by showing how individual lecturer development needs to be embedded within and responsive to the institutional activity system. Thus, KF4TT is a holistic and adaptive framework emphasising the joint influence of individual agency and systemic support. Refining and extending the theoretical boundaries of CHAT and TPACK demonstrates how both can be integrated to create context-sensitive, transformative PD in an evolving landscape of ET and HE.

8.4.1 Development Based on Key Themes

The TPACK and CHAT frameworks provide a holistic view of how PD operates on both the individual and systemic levels. The KF4TT allows mapping these interactions, reflecting how PD for ET integration unfolds in real-world contexts and is grounded in the themes identified.

- Theme A, developing TPACK competencies, emphasises how PD plays a direct role in developing the TPACK domains (technological, pedagogical, and content knowledge). While PD can enhance lecturers' competencies, external barriers - time constraints and limited institutional support- can

impede this process (Hanover Research, 2014; Bećirović, 2023). By integrating CHAT, the framework accounts for how systemic factors influence the development of these competencies.

- Theme B, the role of CHAT in ET integration, highlights the importance of external factors, institutional policies, peer collaboration, and systemic barriers in shaping ET adoption (Van den Beemt & Diepstraten, 2016). The CHAT component of the framework provides a structure for addressing these sociocultural and institutional dynamics, helping to resolve contradictions between traditional teaching practices and modern technology use.
- Theme C, the role of PD in ET Integration, shows that well-designed PD significantly impacts lecturers' ability to integrate ET (Horn & Staker, 2015; Bragg et al., 2021). However, institutional challenges relating to a lack of support or insufficient collaborative learning environments are also critical (Barton & Dexter, 2020). The KF4TT integrates these external factors, showing how they interact with individual competence development.
- Theme D, lessons from *BrightSparks*, highlights that successful ET integration depends on individual skill-building and the broader institutional environment (Adeoye et al., 2013; Dintoe, 2019). This framework uses CHAT to represent how community, rules, and collaboration interact with TPACK knowledge domains, providing a real-world, holistic structure for PD.

8.4.2 Key Features of the Knowledge Framework for Technology Transformation

The KF4TT is designed to guide PD by scaling the effective, innovative practices demonstrated by *BrightSparks*. While they developed their expertise primarily through self-directed, informal learning, the KF4TT translates these insights into a structured framework, enabling broader lecturer cohorts to adopt similar strategies with institutional support.

This research investigated how *BrightSparks* navigate PD, examining what they do, how they do it, and why it is effective. It has enabled the construction of the KF4TT, illustrating how *BrightSparks* develop TPACK competencies while managing sociocultural and institutional dynamics within a CHAT framework (Figure 8.1). The central integration point, represented by the “KF4TT integration zone” (labelled “c” in Figure 8.1), demonstrates how effective ET integration occurs at the convergence of PD and ET activity systems. Unlike a descriptive model of *BrightSparks*' practices, the KF4TT provides replicable principles and structured pathways (“d” and “e” in Figure 8.1), offering institutionalised support, resources, and guided professional learning. Thus, it ensures lecturers at all experience levels can engage meaningfully in transformative teaching practices.

Core Components of the KF4TT (Figure 8.1):

1. TPACK domains and competency development (“a”). Enhancing lecturers’ technological, pedagogical, and content expertise through structured PD.
2. CHAT elements and contextual dynamics (“b”). Addressing sociocultural and institutional factors shaping ET adoption.
3. Integration of CHAT and TPACK (“c”). Merging individual skill development with systemic awareness produces a holistic approach, visualised as the integration zone.
4. Application and adaptation (“d” and “e”). Structured and informal PD strategies form professional learning communities, guiding lecturers progressively toward transformative ET practices.

This integrated CHAT-TPACK approach ensures lecturers lacking *BrightSparks*’ self-directed learning capabilities can effectively navigate institutional constraints and cultural norms through structured PD pathways. By leveraging *BrightSparks*’ strategies, the KF4TT provides institutions with a practical roadmap for embedding transformative technology integration into mainstream HE teaching practices.

8.4.2.1 Theoretical Foundations of KF4TT

The KF4TT is grounded in CHAT and TPACK, reflecting how *BrightSparks* balance individual technology competencies (TPACK) with broader sociocultural and institutional influences (CHAT). As illustrated in Figure 8.1, the framework offers concrete pathways for lecturers to:

- Overcome institutional barriers to ET integration.
- Develop technological, pedagogical, and content expertise in a structured way.
- Adapt PD strategies to context-specific challenges and opportunities.

Figure 8.1 represents how two activity systems, PD and ET, intersect at the KF4TT integration zone (“c”) where TPACK competencies are developed. *BrightSparks* successfully navigate these overlapping systems by effectively integrating technology, pedagogy, and content knowledge, simultaneously addressing institutional and cultural constraints.

Within the CHAT framework, the two activity systems comprise:

- Subject: The lecturer engaging with PD and ET
- Tools: Technological resources, pedagogical strategies, ET tools, PD activities.
- Rules: Institutional policies, curriculum standards, and evaluation criteria.
- Community: Peers, students, administrative and technical support staff.

- Division of Labour: Roles and responsibilities of lecturers, students and support staff.
- Contradictions: Institutional and resource barriers, PD constraints and cultural norms affecting ET use.

BrightSparks fluidly navigate these CHAT-defined systems, effectively managing tensions and contradictions to achieve successful ET integration aligned with their teaching goals.

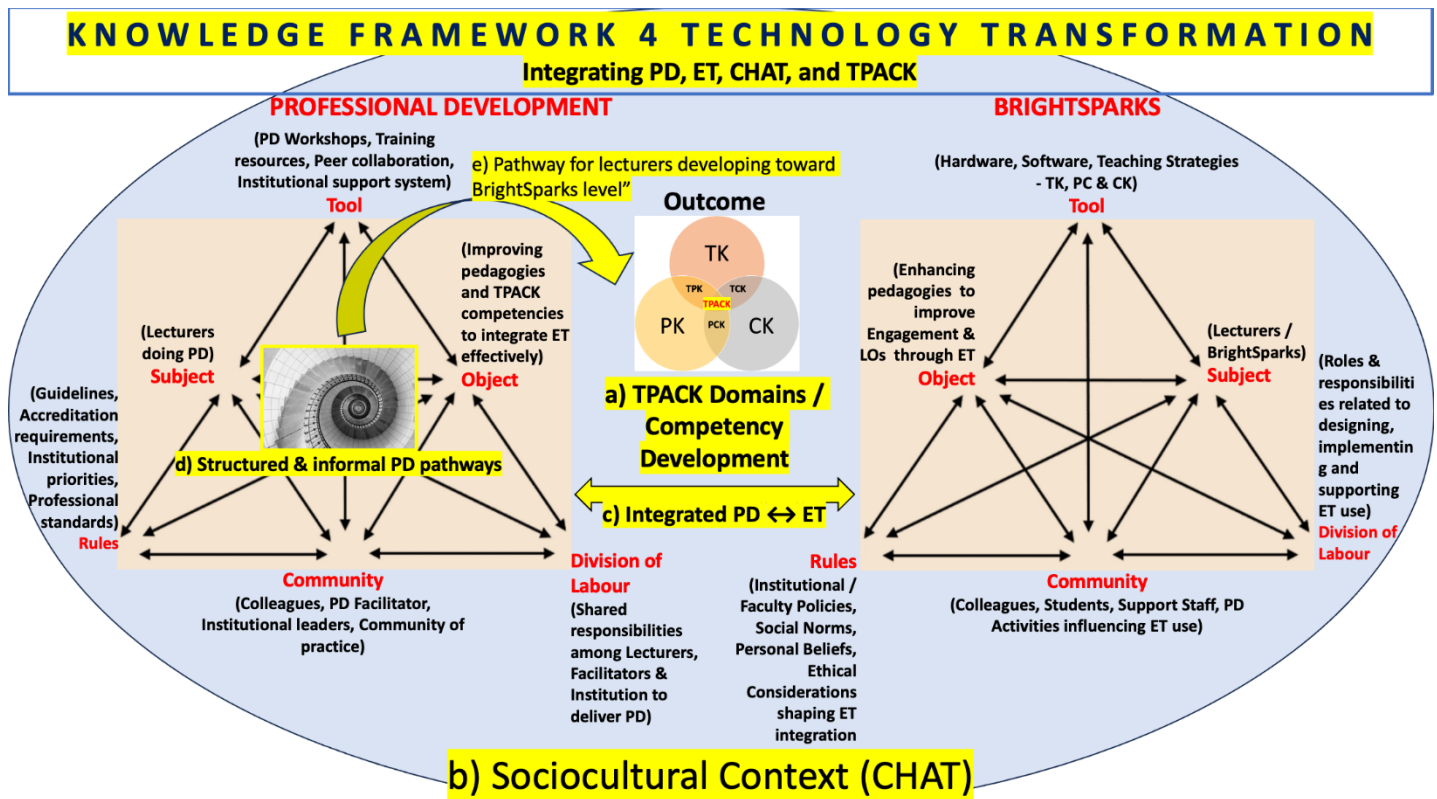


Figure 8.1: The Five Components of KF4TT

The following components represented in Figure 8.1 are mapped as follows:

- TPACK domains (competency development):
Lecturers develop technological (T), pedagogical (P), and content (C) knowledge through structured PD, explicitly represented in the KF4TT integration zone.
- CHAT elements (sociocultural context):
Institutional and cultural factors, such as policies, norms, resource constraints and community expectations, surround the integrated PD and ET systems, shaping how lecturers develop their TPACK competencies.
- Integration of CHAT and TPACK:
Successful ET integration occurs explicitly at the integration zone ("c"), representing the structured merging of PD and ET systems, resolving contradictions, and aligning ET with pedagogical and content goals.

d) Application and adaptation (structured and informal PD pathways):

KF4TT offers structured pathways for PD, enabling lecturers to progressively build professional learning communities, adopt transformative practices, and sustainably integrate ET.

e) Pathway for lecturers developing toward BrightSparks' level:

For lecturers yet to achieve BrightSparks' self-directed expertise, the KF4TT outlines structured PD pathways to develop TPACK competencies while progressively navigating sociocultural and institutional influences.

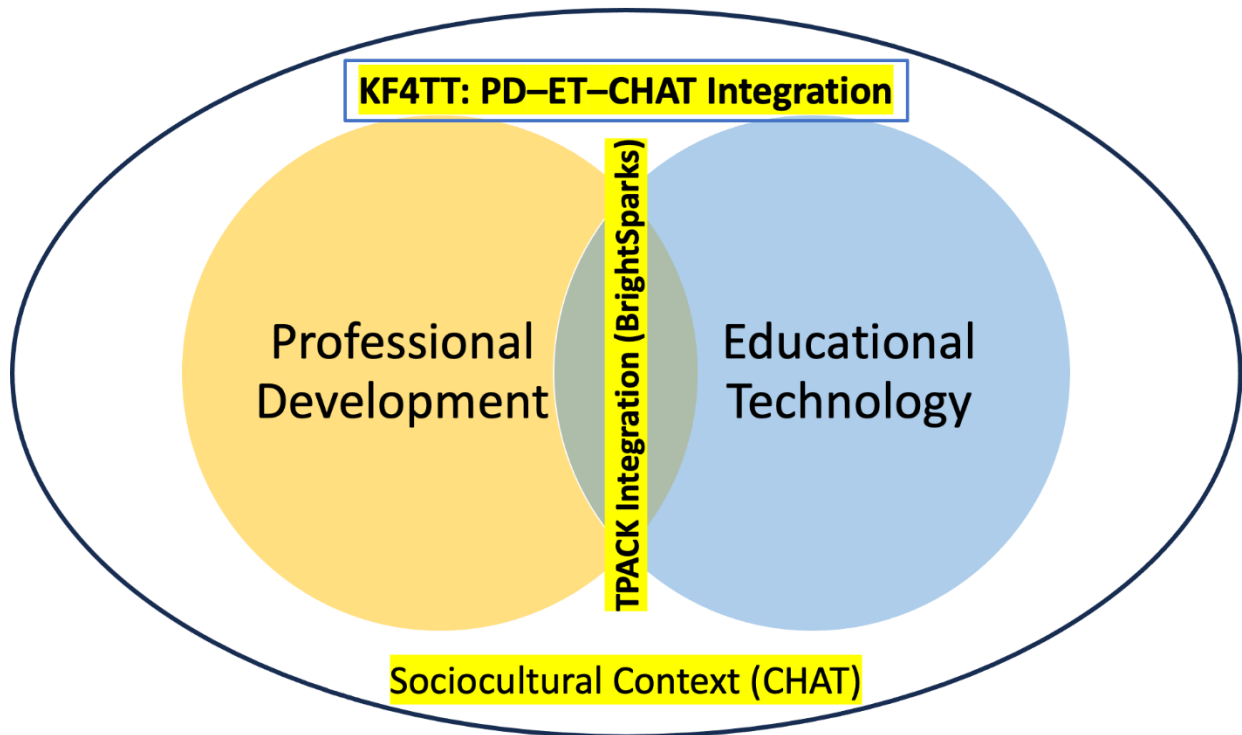


Figure 8.2: Simplified version of the KF4TT

Figure 8.2 simplifies the detailed KF4TT represented in Figure 8.1, highlighting its core conceptual elements for ease of reference and communication. It visually captures the integration of PD and ET, with TPACK integration, exemplified by *BrightSparks* practices, situated at the intersection of the two. This overlap illustrates the point at which lecturers successfully merge pedagogical, technological, and content knowledge. The entire model is encapsulated within the broader sociocultural context (CHAT), which underscores the influence of institutional, cultural, and systemic factors on both PD and ET practices. This diagram is not intended to replace the whole framework. However, it serves as a conceptual shorthand for understanding how KF4TT operates through the coordinated interaction of these domains within their contextual realities.

8.4.2.2 Developing Equilibrium across TPACK Domains

BrightSparks are distinguished by their ability to balance TPACK within the intersecting PD and ET activity systems. Instead of prioritising technology or content in isolation, they continuously adapt their practices in response to institutional rules, student needs, and resource availability while maintaining pedagogical innovation. The KF4TT aims to help lecturers develop a similar balance through structured PD strategies. By conceptualising the integration of TPACK within the intersection (“c”) of two CHAT activity systems, PD and ET, KF4TT illustrates that effective ET integration goes beyond technical skill acquisition. Instead, it emphasises understanding how sociocultural factors influence technological, pedagogical and content integration within an authentic teaching context. Through structured and informal PD pathways (“d”), KF4TT empowers lecturers to replicate *BrightSparks*’ capability for dynamic ET integration, fostering sustained, transformative technology use within HE. In essence, Figure 8.1 demonstrates this CHAT-TPACK approach:

- TPACK Competencies (“a”): Represent lecturers’ development across technological, pedagogical, and content domains, achieved through structured PD situated explicitly at the integration point between PD and ET activity systems.
- CHAT Sociocultural Context (“b”): Institutional rules, resource constraints, community expectations, and cultural norms that surround and shape how lecturers develop and apply their TPACK competencies.
- KF4TT Integration Zone (“c”): Represents the practical merging of PD and ET activity systems, where lecturers effectively address contradictions and dynamically align ET use with pedagogical and content goals.

In this revised alignment, the KF4TT is presented clearly and consistently as a framework that explicitly integrates individual lecturer development (TPACK) within the broader systemic context (CHAT), promoting sustained, transformative technology integration across teaching practices.

8.4.2.3 KF4TT as a Sustainable PD Framework

The KF4TT equips lecturers with structured pathways to replicate *BrightSparks*’ ET integration strategies, ensuring PD is:

- Sustainable - supporting continuous learning and adaptation.
- Context-specific - addressing real-world institutional and sociocultural barriers.
- Scalable - adaptable across disciplines and experience levels.
- Collaborative - encouraging peer mentoring and sharing best practices.

By embedding *BrightSparks'* self-directed learning strategies within an institutionally supported framework, KF4TT enables a dynamic, adaptable approach to PD that fosters long-term innovation in ET integration.

Its non-linear, evolving nature distinguishes the KF4TT from traditional PD frameworks that follow fixed stages. Instead, it reflects how lecturers' TPACK development is shaped by continuous interaction with the institutional environment. Competence in ET integration is not achieved in isolation but emerges through navigating contradictions, lack of time, limited tools and policy misalignments, within broader sociocultural systems. This flexibility makes the framework responsive to both institutional change and technological advancements. Drawing from CHAT elements, Community, Rules, and Division of Labour, the framework engages with common barriers to PD (Steinert, 2005; Becker et al., 2019). Through its embedded feedback and transformation mechanisms, the framework evolves alongside institutional priorities, ensuring long-term relevance (Brown et al., 2010; Tack et al., 2018).

The KF4TT thus promotes a holistic model, merging TPACK (individual competencies) with CHAT (systemic dynamics), to equip lecturers for sustained digital transformation. Rather than viewing PD as a one-off, instructor-led process, it positions collaborative and self-directed learning as core drivers of professional growth and pedagogical innovation.

8.4.2.4 Structural and Conceptual Pillars of KF4TT

The KF4TT is built on three defining features that underpin its structure and application:

1. **System:** PD is conceptualised as development is dynamically shaped by lectures' participation in overlapping activity systems mediated by CHAT.
2. **Systemic:** External influences such as institutional policies, collaborative practices, and resource conditions are core to PD effectiveness. The KF4TT integrates these contextual factors to scaffold technology integration sustainably.
3. **Practical:** Grounded in real-world application, the KF4TT addresses challenges lecturers face, ranging from institutional constraints, resistance to change, and collaboration gaps. Its adaptability ensures relevance across diverse teaching contexts, particularly within health sciences.

This systematic, systemic, and practical design ensures that the KF4TT is not merely theoretical but a functioning, adaptable framework guiding lecturers through the complexities of technology-enhanced teaching.

8.5 Framework Development Based on Findings

The KF4TT incorporates the following key characteristics, which, in combination, are the operational attributes that ensure the framework remains dynamic, context-sensitive, and aligned with *BrightSparks'* transformative teaching practices, as well as making the KF4TT effective and relevant to a diverse audience:

- Integrating TPACK, CHAT, and *BrightSparks'* insights: The framework merges TPACK's focus on individual competency development with CHAT's sociocultural perspective while drawing on *BrightSparks'* self-directed, innovative practices. This ensures the framework captures multiple PD constructs, formal/informal, self-led/instructor-led, and self-initiated/institution-initiated, reflecting the fluid ways lecturers learn and integrate ET in real-world contexts.
- Holistic, dynamic, and practical: By addressing internal factors (individual competencies, agency, self-efficacy) and external factors (institutional support, social collaboration), the framework is informed by *BrightSparks'* ability to blend formal and informal PD. KF4TT fosters sustainable PD rather than static, one-off interventions by emphasising ongoing experimentation, reflective practice, and peer support.
- Alignment with data and lecturer diversity: The framework directly aligns with the data, emphasising institutional support, peer collaboration, and reducing barriers to PD. It incorporates lessons from *BrightSparks'* self-initiated and peer-driven approaches, ensuring it caters to a diverse range of lecturers, from those reliant on formal PD to those who, like *BrightSparks*, engage fluidly across the PD continuum.
- PD as an evolving system: The framework offers an innovative perspective on ET in HE by viewing PD as a multi-dimensional, interactive system rather than a linear process. Lessons from *BrightSparks*, self-reflection, proactive experimentation, and informal mentoring illustrate how lecturers can progress from institution-led PD to more autonomous, transformative practices. This highlights the need for flexible, evolving PD frameworks that adapt to modern teaching complexities.

The adoption of KF4TT provides a practical, research-based framework for PD that draws on established theories while addressing the real-world challenges lecturers face in integrating ET into their teaching (Van Rijmenam, 2023).

8.5.1 Mini-Case Study: Dr M's Journey

Dr M is a mid-career lecturer who initially attended several institution-led ET workshops. However, she felt unsure how to apply these tools meaningfully in her discipline. Observing a *BrightSparks* colleague using interactive simulations inspired Dr M to explore additional self-directed learning opportunities, watching

tutorials, engaging in online communities, and experimenting independently. Over time, she combined informal learning with formal workshops and peer feedback, navigating structures and self-initiated PD pathways. She demonstrates how a lecturer can move between and integrate multiple PD constructs (formal/informal, self-led/instructor-led, self-initiated/institution-initiated), reflecting the core integration zone of the KF4TT. Dr M's story highlights the empowering influence of *BrightSparks*, whose innovative practices serve as both the motivator and scaffold for her transformative use of ET.

8.5.1.1 Assessment of Current Competencies and Context

Assess TPACK competencies: Evaluate lecturers' TPACK to identify strengths and gaps.

- Dr M completed an online TPACK self-assessment and found that while her content and pedagogical knowledge were strong, her technological knowledge required further development.

Analyse sociocultural dynamics (CHAT): Map institutional and contextual factors, including rules, tools, and community support, shaping PD and ET integration.

- Dr M While her department supports ET in principle, limited software licenses and administrative hurdles restrict timely adoption.

Identify barriers and contradictions: Pinpoint tensions in institutional policies, time availability, or digital confidence that impede integration..

- Scheduling PD was difficult for Dr M due to competing responsibilities. However, she overcame this by joining a peer network that shared resources and strategies.

8.5.1.2 Design of PD Programmes and Institutional Support

Targeted PD pathways: Create PD strategies supporting foundational TPACK development and peer-informed adaptation.

- After identifying her needs, Dr M enrolled in a workshop focused on digital tools relevant to health sciences and continued her informal exploration.

Align with sociocultural context (CHAT): Align PD with institutional dynamics, norms and collaboration opportunities.

- A small institutional grant enabled Dr M and her *BrightSparks* mentor to co-develop interactive simulations supporting distributed learning.

Facilitate institutional support: Simplify administrative procedures and resource allocation to improve access to digital resources, reduce barriers and foster sustained PD.

- The faculty simplified the software approval process and secured additional licenses, allowing Dr M to scale up her use of simulation tools.

8.5.1.3 Implementation and Monitoring

Phased implementation: Roll out PD activities and institutional interventions incrementally, allowing room for experimentation and adaptation.

- She introduced simulations in one module, gathered student feedback, refined her approach, and then expanded it to other courses.

Monitor impact and engagement: Track outcomes through student feedback, usage analytics and peer evaluation to assess effectiveness.

- Student feedback indicated increased engagement and a deeper understanding of complex concepts. Colleagues invited Dr M to present her approach.

8.5.1.4 Continuous Evaluation and Adaptation

Ongoing iterative evaluation: Build feedback loops for real-time responsiveness and refine programmes based on evolving lecturer needs.

- Through follow-up surveys and ongoing mentorship from her *BrightSparks* colleague, Dr M continually refined her simulation design and instructional use.

Adapt to emerging needs: Modify approaches as technologies, policies, and pedagogical challenges evolve.

- When a simulation tool was upgraded, Dr M collaborated with IT support to adapt her materials and mentor others.

8.5.1.5 Holistic Approach to PD and ET Integration

KF4TT provides a comprehensive, context-sensitive roadmap for embedding ET in HE. This framework guides effective PD programmes, institutional policies, and research initiatives by addressing individual competencies (TPACK) and broader sociocultural and institutional influences (CHAT).

Key implications of applying this framework, as illustrated by Dr M's journey, include:

- Sustained support for balancing technological, pedagogical, and content knowledge through structured and informal learning.
- Leveraging *BrightSparks*' influence to foster peer mentoring, creating an environment that supports low-risk experimentation and reflective practice.
- Flexible and adaptive PD structures that evolve with lecturers' changing needs mirror the real-world complexities and continually encourage transformation in teaching and learning practices.

8.6 Summary of Chapter

This chapter described the KF4TT, a comprehensive framework integrating CHAT and TPACK to support ET integration through PD in HE. Drawing on lessons from *BrightSparks* practices, the KF4TT offers a multi-layered approach that addresses both individual lecturer competencies and the broader sociocultural and institutional dynamics shaping technology adoption. It reflects the varied pathways of PD, from self-led, informal learning to formal, institution-led initiatives, and is conceptually underpinned by three defining features (System, Systemic, and Practical; see Section 8.4.2.4) derived from six core principles identified in *BrightSparks* practices (Section 7.3.5). By operationalising these insights, the KF4TT provides a comprehensive and adaptable system for supporting lecturers in effective technology integration while offering a practical solution for empowering educators, fostering innovation, and promoting student-centred pedagogical practices in HE.

Section 8.5 outlines the key characteristics of the KF4TT, detailing how it operates in practice. The framework builds on the TPACK and CHAT integration zone, remains holistic and dynamic, aligns with diverse lecturer needs, and positions PD as an evolving process rather than a linear one. By integrating theoretical insights with real-world lessons from *BrightSparks*, the KF4TT provides a robust, context-sensitive approach to supporting sustainable technology integration in HE.

This chapter also explained how findings from the study, including themes such as institutional support, peer collaboration, and contradictions within the activity system, directly informed the framework's design. These insights underscore the need for PD programmes that recognise multiple PD constructs (for example, formal vs informal, self-initiated vs institution-initiated, and self-led vs instructor-led) and consider the institutional and systemic factors that impact lecturers' ability to integrate ET effectively. It also describes the practical application of the framework, demonstrating how it can be implemented through a series of steps, including assessing current competencies and context, designing targeted PD programmes, phased implementation

with ongoing monitoring, and continuous evaluation and adaptation. This process ensures that PD remains responsive to lecturers' varied entry points and the evolving technological landscape.

The KF4TT offers a dynamic, holistic framework for PD that positions ET integration as a complex, interactive process. It emphasises aligning individual skill development with institutional support and leveraging formal and informal learning opportunities. In doing so, it provides a flexible and adaptive solution to the challenges lecturers face in HE. By applying this framework, institutions can facilitate PD in an environment that promotes innovation, collaboration, and sustained engagement with ET, ensuring that PD remains practical, relevant, and inclusive in a rapidly evolving educational landscape.

Chapter 9 – Conclusion

9.1 Overview

The previous chapter presented the integration of research data into a framework for understanding and improving ET integration via PD. The KF4T highlighted the importance of individual competencies (TPACK) and sociocultural factors (CHAT) in shaping how *BrightSparks* navigated ET integration in their teaching practice. This chapter ties together key insights, highlighting implications for PD, lecturers who want to develop into *BrightSparks*, and the institutional context in which they find themselves. In addition, the limitations of this research are discussed, as well as practical recommendations and future research directions. Finally, the overall contribution of this research and how it advances the body of scholarly knowledge is outlined.

9.2 Review of Research Question

This study sought to investigate lecturers in health sciences, *BrightSparks*, who effectively integrate ET in their pedagogies by drawing on the theoretical perspectives of CHAT and TPACK. The research question is: Drawing on the theoretical perspective of CHAT, how does *BrightSparks'* application of technological, pedagogical, and content knowledge inform the advancement of a PD framework for technology transformation using ET?

Sub-questions further probed:

1. How do lecturers develop TPACK competencies to integrate technologies to facilitate learning?
2. How was *BrightSparks'* integrative use of ET developed and influenced by CHAT?
3. How has the blend of structured and self-directed PD activities influenced *BrightSparks'* ability to integrate ET into their teaching?
4. What can be learned from *BrightSparks* to inform the design and implementation of a PD framework for technology transformation that enables FHS lecturers to integrate ET?

The findings discussed in previous chapters show that the KF4TT was developed by combining CHAT's emphasis on sociocultural and institutional factors with TPACK's focus on individual competence. This synthesis underpins the dynamic interplay between *BrightSparks'* personal development and the external systems, Rules, Community, and Division of Labour, that shape how they integrate ET.

9.3 Practical Implications

The practical implications of this study are multifaceted at the individual and institutional levels. In developing the KF4TT, the study demonstrated that effective PD requires simultaneous attention to individual competencies and the broader sociocultural context. The framework's components highlight several areas of practical significance.

9.3.1 Implications for Professional Development

- **Balanced competency and contextual development:** The KF4TT integrates TPACK domains with CHAT elements to emphasise that lecturers' development of technological, pedagogical, and content knowledge must occur alongside their ability to navigate institutional structure, social norms and cultural contexts. As illustrated in Chapter 8, PD should offer structured pathways that draw on *BrightSparks*' transformative practices while addressing key constraints, particular time limitations, and inconsistent institutional support.
- **Structured, adaptive and inclusive PD strategies:** The framework situates individual PD activities, such as those in Dr M's case study (Section 8.5.1), within a broader systemic context. PD should promote formal and informal learning opportunities, enabling lecturers at various stages of digital competence to engage meaningfully. Institution-led initiatives should include targeted workshops, peer mentoring, collaborative CoP and supportive policies that actively reduce practical and structural barriers identified in the findings.
- **Sustainability and flexibility.** The KF4TT conceptualises PD as a dynamic, evolving system (Section 8.4.3) rather than a linear sequence. This has significant implications for sustaining lecturer PD, which must allow for iterative reflection, continuous evaluation, responsiveness to ET, and shifting institutional priorities. Such flexibility ensures that digital integration remains relevant, scalable and aligned with lecturers' real-world teaching contexts.

9.3.2 Implications for Lecturers (Educators)

The KF4TT offers direct implications for lecturers by outlining how they can:

- **Develop and balance competencies:** The framework shows that integrating CHAT and TPACK could enable lecturers to develop the necessary skills while being aware of and responsive to institutional barriers. This balance, illustrated by the experiences of *BrightSparks*, empowers lecturers to enhance their ET integration through self-directed and structured PD.
- **Leverage peer collaboration and self-directed learning:** Insights from Chapter 8 (Section 8.5) demonstrate that blending informal, self-initiated learning with formal support can significantly

improve teaching practices. Lecturers are encouraged to engage in CoP and reflective sessions that build on their inherent strengths while addressing external constraints.

9.3.3 Implications for Policymakers (Institutional Leaders)

The KF4TT provides a clear and actionable roadmap for policymakers and institutional leaders:

- Institutional alignment and resource allocation: The CHAT dimensions of KF4TT foreground the institutional systems, policies, rules, infrastructure, and division of labour that shape lecturers' capacity to engage in meaningful PD. Policymakers should revise procedures such as procurement processes, software approvals and access to digital tools while ensuring adequate infrastructure and reliable support systems are in place to sustain ongoing PD.
- Fostering collaborative and context-sensitive PD: KF4TT emphasises the value of community-driven learning. Institutional leaders can play a key role in fostering peer collaboration and cross-disciplinary mentorship through initiatives such as small grants, teaching fellowships, and structured CoP. These mechanisms redistribute agency, strengthen social learning networks, and help resolve contradictions within the institutional activity system (e.g. Subject-Community or Tool-Rule tensions).
- Enabling adaptive and evolving PD strategies: As a non-linear framework, KF4TT encourages PD that adapts to changing technologies, staff needs, and contextual demands. Institutional policies should therefore allow for flexible scheduling, interactive programme design, and long-term evaluation cycles. This adaptability positions institutions better to support digital transformation in diverse and dynamic HE environments..

9.3.4 Feasibility and Transferability

The KF4TT blends TPACK competency building with CHAT-informed contextual awareness, making it inherently adaptable across disciplines and levels of technological maturity. Institutions can foreground "Application and adaptation" in resource-constrained or low-maturity environments by starting with an informal CoP and experimenting with low-bandwidth tools while using CHAT to surface local constraints. As infrastructure and skills grow, the same institutions can incrementally introduce more advanced PD formats and wider organisational dialogues without altering the framework's logic.

Conversely, faculties operating in high-maturity settings can deploy the complete framework immediately, pairing structured, discipline-specific PD with CHAT-informed policy discussions to address systemic contradictions. Since ET is treated as one mediating artefact among many, the framework accommodates a variety of discipline-specific tools, virtual studios in the arts, digital archives in the humanities, and simulation

labs in engineering without modification to its core. Therefore, pilot studies in non-health disciplines can replicate the four-component cycle: strengthen individual TPACK, read the sociocultural context through CHAT, integrate insights, and adapt PD strategies iteratively. Such cross-disciplinary pilots will both test and refine KF4TT's generalisability.

9.4 Limitations and Future Directions in Practical Implications

The practical recommendations are offered with a recognition of the study's limitations. The limited sample size, reliance on self-reported data, and the inherent challenges in operationalising CHAT and TPACK suggest that while the KF4TT is promising, its application needs to be continuously evaluated. Future research should focus on expanding the sample, employing mixed methods to validate and refine the framework, and implementing pilot studies that test the effectiveness of structured PD interventions informed by the KF4TT. Additionally, long-term outcomes need to be monitored to understand better how the integration of individual competencies and systemic factors evolves.

9.5 Theoretical Implications and Contributions

This study advances theoretical understanding in ET integration by critically engaging with and extending two established frameworks, CHAT and TPACK. Through the development of the KF4TT, the research offers a novel perspective on how individual lecturer competencies and systemic institutional dynamics interact to shape PD and ET adoption. This section discusses the broader theoretical implications by outlining how the KF4TT advances current theory, appraising its limitations, identifying areas for future scholarly development, and synthesising the overall theoretical contribution.

9.5.1 Advancing the Body of Knowledge

The development of the KF4TT makes a meaningful theoretical contribution by demonstrating how the limitations of CHAT and TPACK, when used independently, can be overcome through their purposeful integration. As detailed in Chapter 8:

- **Bridging theoretical gaps:** The framework advances the application of both frameworks by showing that effective ET integration in HE requires the development of individual competencies (as emphasised in TPACK) and a deep understanding of the sociocultural and institutional structures, foregrounded by CHAT. This integration reflects the complex realities of teaching in resource-constrained, policy-intensive environments like health sciences.
- **Holistic and adaptive:** Rather than treating TPACK subdomains (TK, PK and CK) as isolated activity systems embedded in sociocultural contexts. This shift reflects a more holistic view of PD as a dynamic, context-sensitive process. The framework thus contributes to theory by offering a scalable,

adaptive model for understanding how lecturers evolve their teaching practices through ongoing interaction with institutional systems, peer networks, and technological change.

9.5.2 Theoretical Limitations and Future Scholarly Directions

The study acknowledges its theoretical limitations. As the research reveals, operational challenges include quantifying the interactions between TPACK and CHAT components. The difficulties in measuring TPACK competencies and the nuanced nature of sociocultural influences underscore areas where further theoretical refinement is needed. Future research should focus on developing robust measurement tools and innovative methodologies that capture the complexity of PD as an evolving system. Longitudinal studies, in particular, will be instrumental in tracing the dynamic interplay between individual development and institutional factors over time.

9.5.3 Overall Contribution of the Thesis

This thesis contributes to theory and practice in several areas by developing the KF4TT. By integrating CHAT and TPACK, the KF4TT offers a comprehensive, context-sensitive framework for PD that is both practically applicable and theoretically robust. It provides structured pathways for lecturers to develop competencies while navigating institutional challenges and advancing the understanding of PD dynamics. The study advances the discourse on PD by demonstrating that effective ET integration requires individual skill enhancement, systematic support, and community collaboration. Additionally, it contributes suggestions for future practice and research. The framework's emphasis on adaptability, sustainability, and the dynamic balance between individual and systemic factors sets the stage for future research. It highlights the need for ongoing empirical validation and adaptation, ensuring that PD initiatives can evolve alongside technological and institutional shifts.

In conclusion, this thesis has developed and presented a Professional Development Knowledge Framework for Technology Transformation that integrates the strengths of the Technological Pedagogical Content Knowledge framework and Cultural-Historical Activity Theory. By bridging individual competency development with systemic and sociocultural influences, the KF4TT effectively addresses the complex challenges of ET integration in health sciences. The framework underscores the necessity for flexible, context-sensitive PD pathways that foster lecturer agency, collaborative learning, and reflective practice, encompassing formal, informal, self-directed, and institution-led approaches. Moreover, the framework offers clear implications for lecturers and institutional policymakers by delineating structured strategies for overcoming practical barriers and aligning institutional support with individual development. Hence, the research advances the theoretical understanding of PD by demonstrating the interdependence of personal

and systemic factors in shaping ET use, and it provides a practical, adaptable foundation for transforming PD practices. This work thus serves as a basis for future research and practice, inviting ongoing refinement and adaptation to meet the dynamic needs of lecturers and institutions in a rapidly evolving technological landscape.

References

- Abou Said, S., & Abdallah, W. (2024). Enhancing lifelong learning and professional growth: Exploring the role of self-directed learning for university educators. *Journal of Adult and Continuing Education*, 30(3), 14779714241236282. <https://doi.org/10.1177/14779714241236282>
- Adeoye, Y. M., Oluwole, A. F., & Blessing, L. A. (2013). Appraising the role of information communication technology (ICT) as a change agent for higher education in Nigeria. *International Journal of Educational Administration and Policy Studies*, 5(8), 177–183. <https://doi.org/10.5897/IJEAPS12.027>
- Adipat, S. (2021). Developing technological pedagogical content knowledge (TPACK) through technology-enhanced content and language-integrated learning (T-CLIL) instruction. *Education and Information Technologies*, 26(5), 6461–6477. <https://doi.org/10.1007/s10639-021-10488-5>
- Advance HE. (2023). *Professional Standards Framework (PSF, 2023)*. Retrieved from <https://www.advance-he.ac.uk/teaching-and-learning/psf>
- Afshari, M., Abu Bakar, K., Luan, W. S., Samah, B. A., & Fooi, F. S. (2009). Factors affecting teachers' use of information and communication technology. *International Journal of Instruction*, 2(1), 77–104.
- Ahmad Zaky El Islami, R., Anantanukulwong, R., & Faikhamta, C. (2022). Trends of teacher professional development strategies: A systematic review. *Shanlax International Journal of Education*, 10(2), 1–8.
- Aiello, J., & Nero, S. J. (2019). Discursive dances: Narratives of insider/outsider researcher tensions. *Journal of Language, Identity & Education*, 18(4), 251–265. <https://doi.org/10.1080/15348458.2019.1623035>
- Ait Ali, D., El Meniari, A., & El Filali, S. (2023). Empirical research on the technological pedagogical content knowledge (TPACK) framework in health professions education: A literature review. *Medical Science Educator*, 33, 791–803.
- Al-Ali, S. (2020). Activity systems analysis: A maze worth exploring. *Technology-Enhanced Learning*, 1(1), 39–52. <https://doi.org/10.21428/8c225f6e.39ed7528>
- Al-Eraky, M. M., & McLean, M. (2012). The Compass Model to plan faculty development programs. *Medical Education Development*, 2(1). <https://doi.org/10.5350/MED2012299>
- Ali, N. L., & Hamid, M. O. (2018). English-medium instruction and teacher agency in higher education: A case study. In De Gruyter (Ed.), *Un(intended) language planning in a globalising world: Multiple levels of players at work* (pp. 234–250). <https://doi.org/10.1515/9781501510429-011>

- Almerich, G., Orellana, N., Suárez-Rodríguez, J., & Díaz-García, I. (2016). Teachers' information and communication technology competencies: A structural approach. *Computers & Education*, 100, 110–125. <https://doi.org/10.1016/j.compedu.2016.05.002>
- Al-Omary, H., Soltani, A., Stewart, D. et al. Implementing learning into practice from continuous professional development activities: a scoping review of health professionals' views and experiences. *BMC Med Educ* 24, 1031 (2024). <https://doi.org/10.1186/s12909-024-06016-7>
- Alon, I., & McIntyre, J. R. (2005). *Business and management education in China: Transition, pedagogy, and training*. World Scientific, 2005.
- Alwadei, A. (2023). Utilising evaluation and development frameworks to engineer a college-wide evaluation and reform of an undergraduate dental curriculum. *Advances in Medical Education and Practice*, 14, 145–156.
- Angeli, C., & Valanides, N. (2009). Epistemological and methodological issues for the conceptualisation and development of ICT-TPCK. *Computers & Education*, 52(1), 154–168. <https://doi.org/10.1016/j.compedu.2008.07.006>
- Anorue, H. C., Ekuma, J. E., Olinya, T. O., & Nwandu, L. O. (2023). Empowering vocational educators' instructional delivery through university information and communication technology training. *Journal of Education and Learning (EduLearn)*, 17(4), 555–565.
- Anorue, M. C., Okon, F., & Uwaegbu, P. C. (2023). Diarrhea disease among children under five years: Critical assessment of causes and effects. *World Scientific News*, 187, 1–11.
- Archambault, L. M., & Barnett, J. H. (2010). Revisiting technological pedagogical content knowledge: Exploring the TPACK framework. *Computers & Education*, 55(4), 1656–1662. <https://doi.org/10.1016/j.compedu.2010.07.009>
- Archer, M. S. (1988). *Culture and Agency: The Place of Culture in Social Theory* (1st ed.). Cambridge University Press.
- Archer, M. S. (1995). *Realist social theory: The morphogenetic approach*. Cambridge University Press.
- Archer, M. S. (2000). *Being human: The problem of agency*. Cambridge University Press.
- Aronin, L. (2019). Challenges of multilingual education: Streamlining affordances through dominant language constellations. *Stellenbosch Papers in Linguistics Plus*, 58(1), 235–256. <https://doi.org/10.5842/58.1>
- Arruzza, E., & Chau, M. (2021). The effectiveness of cultural competence education in enhancing knowledge acquisition, performance, attitudes, and student satisfaction among undergraduate health science students: A scoping review. *Journal of Educational Evaluation for Health Professions*, 18(3), 1-11

- Aslam, H., Rehman, S. U., & Imran, M. (2022). *Assessment of groundwater quality using multivariate statistical analysis: A case study from Pakistan*. *Environmental Monitoring and Assessment*, 194(4), 281.
- Atabek, A. (2019). Equity and access in education. *Journal of Education Policy*, 34(2), 203–223. <https://doi.org/10.1080/02680939.2018.1459867>
- Avancena, R. B. O., Cabeza, C. M., Bordario, C. M., & Lopez, I. M. (2023). The integration of ICT for dynamic and proactive learning in basic education.
- Avidov-Ungar, O., & Herscu, O. (2020). Formal professional development as perceived by teachers in different professional life periods. *Professional Development in Education*, 46(5), 833–844. <https://doi.org/10.1080/19415257.2019.1643399>
- Avsec, S., & Jerman, J. (2020). Self-efficacy, creativity and proactive behaviour for innovative science and technology education. *World Transactions on Engineering and Technology Education*, 18(4), 369–374.
- Ayub, I., Hamann, D., Hamann, C. R., & Davis, M. J. (2023). Exploring the potential and limitations of Chat Generative Pre-trained Transformer (ChatGPT) in generating board-style dermatology questions: A qualitative analysis. *Cureus*, 15(8).
- Azungah, T. (2018). Qualitative research: Deductive and inductive approaches to data analysis. *Qualitative Research Journal*, 18(4), 383–400. <https://doi.org/10.1108/QRJ-D-18-00035>
- Baboolal-Frank, R. (2021). Emergency remote learning during the pandemic from a South African perspective. *International Journal for Educational Integrity*, 17(22).
- Barton, E. A., & Dexter, S. (2020). Sources of teachers' self-efficacy for technology integration from formal, informal, and independent professional learning. *Educational Technology Research and Development*, 68(1), 89–108. <https://doi.org/10.1007/s11423-019-09671-1>
- Beatty, I. D., & Feldman, A. (2012). Viewing teacher transformation through the lens of cultural-historical activity theory (CHAT). *Education as Change*, 16(2), 283–300.
- Bećirović, S. (2023). Challenges and barriers for effective integration of technologies into teaching and learning. In *Springer briefs in education* (pp. 123–133). https://doi.org/10.1007/978-981-99-0444-0_10
- Becker, K., Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2019). Teacher professional development in the digital age: A systematic literature review. *Educational Technology Research and Development*, 67(3), 655–679. <https://doi.org/10.1007/s11423-019-09695-7>
- Behari-Leak, K., Vorster, J., Chitanand, N., Ganas, R., Padayachee, K., Merckel, V., & Masehela, L. (2018). How to be or not to be? A critical dialogue on the limitations and opportunities of academic

development in the current higher education context. *South African Journal of Higher Education*, 32(6), 401–421. <https://doi.org/10.20853/32-6-2993>.

- Belland, B. R. (2009). Using the theory of habitus to move beyond the study of barriers to technology integration. *Computers & Education*, 52(2), 353–364. <https://doi.org/10.1016/j.compedu.2008.09.004>.
- Benor, D. E. (2000). Faculty development, teacher training and teacher accreditation in medical education: Twenty years from now. *Medical Teacher*, 22(5), 503–512. <https://doi.org/10.1080/01421590050110803>.
- Beri, N., & Sharma, L. (2021). Development of TPACK for teacher-educators: A technological pedagogical content knowledge scale. *Linguistics and Culture Review*, 5(S1), 1397–1418. <https://doi.org/10.21744/lingcure.v5nS1.1646>.
- Berry, B., & Airhart, K. (2016). Digital badges and micro-credentials: Digital age classroom practices, design strategies, and issues. In B. Fedock, M. Kebritchi, R. Sanders, & A. Holland (Eds.), *Foundation of Digital Badges and Micro-Credentials* (pp. 273-286). Springer International Publishing.
- Bhat, R. (2023). The impact of technology integration on student learning outcomes: A comparative study. *International Journal of Social Science, Educational, Economics, Agriculture Research and Technology (IJSET)*, 2(9).
- Biondi, G. (2024). New technology diffusion in vertical and longitudinal market segments [Doctoral dissertation, Politecnico Di Torino].
- Bluvas, E. (2021). Peer mentorship is key to achieving equity in higher education leadership. *Mentoring & Tutoring: Partnership in Learning*. <https://doi.org/10.1080/13611267.2021.1986795>
- Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020a). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International Journal of Educational Technology in Higher Education*, 17(2). <https://doi.org/10.1186/s41239-019-0176-8>
- Bond, M., Marín, V. I., Dolch, C., Bedenlier, S., & Zawacki-Richter, O. (2020b). Digital transformation in German higher education: Student and teacher perceptions and usage of digital media. *International Journal of Educational Technology in Higher Education*, 17(48). <https://doi.org/10.1186/s41239-020-00236-3>
- Bozalek V., Gachago, D., Alexander, L., Watters, K., Wood, D., & Ivala, E. (2013a). The use of emerging technologies for authentic learning: A South African study in higher education. *British Journal of Educational Technology*, 44(4), 629–638. <https://doi.org/10.1111/bjet.12057>

- Bozalek, V., Ng'ambi, D., & Gachago, D. (2013b). Transforming teaching with emerging technologies: Implications for higher education institutions. *South African Journal of Higher Education*, 27(2), 419–436. <https://doi.org/10.20853/27-2-242>
- Bozalek, V., Ng'ambi, D., Wood, D., Herrington, J., Hardman, J., & Amory, A. (Eds.). (2015). *Activity theory, authentic learning and emerging technologies: Towards a transformative higher education pedagogy*. Routledge.
- Bragg, L. A., Walsh, C., & Heyeres, M. (2021). Successful design and delivery of online professional development for teachers: A systematic review of the literature. *Computers & Education*, 166, 104158. <https://doi.org/10.1016/j.compedu.2021.104158>
- Brasca, C., Krishnan, C., Marya, V., Owen, K., Sirois, J., & Ziade, S. (2022). How technology is shaping learning in higher education. McKinsey & Company. <https://www.mckinsey.com>
- Brodie, K. (2019). Teacher agency in professional learning communities. *Professional Development in Education*. <https://doi.org/10.1080/19415257.2019.1689523>
- Brown, J. S., & Duguid, P. (1991). Organisational learning and communities-of-practice: Toward a unified view of working, learning and innovation. *Organization Science*, 2(1), 40–57. <https://doi.org/10.1287/orsc.2.1.40>
- Brown, N., Bower, M., Skalicky, J., Wood, L., Donovan, D., Loch, B., Bloom, W., & Joshi, N. (2010). A professional development framework for teaching in higher education. *Research and Development in Higher Education*, 33, 132–143.
- Bruce, B. C., & Hogan, M. P. (2019). The disappearance of technology: Toward an ecological model of literacy. In *Handbook of research on new literacies* (pp. 375–390). Routledge.
- Buabeng-Andoh, C. (2012). An exploration of teachers' skills, perceptions and practices of ICT in teaching and learning in Ghanaian second-cycle schools. *Contemporary Educational Technology*, 3(1), 36–49.
- Burns, A. (2009). Action research. In J. Heigham & R. A. Croker (Eds.), *Qualitative research in applied linguistics* (pp. 112–134). Palgrave Macmillan.
- Cameron, M. W., Crowther, L. N., & Huang, G. C. (2023). Faculty development and infrastructure to support educational scholarship: A scoping review on author development. *Academic Medicine*, 98(1), 112–122.
- Campbell, C., Gibson, W., Hall, A., Richards, D., & Callery, P. (2019a). Kirkpatrick's evaluation of simulation and debriefing in healthcare education. *Medical Teacher*, 41(2), 118–124.
- Campbell, N., Wozniak, H., Philip, R. L., & Damarell, R. A. (2019b). Peer-supported faculty development and workplace teaching: An integrative review. *Medical Education*, 53, 978–988.

- Carnell, S., De Siqueira, A. G., & Miles, A. (2022). Informing and evaluating educational applications with the Kirkpatrick model in virtual environments: Using a virtual human scenario to measure communication skills behaviour change. *Frontiers in Virtual Reality*, 3
- Carvin, A. (1999). The role of education in building an information society. *The Futurist*, 33(1), 45–50.
- Centre for Innovation in Learning and Teaching (CILT). (2020, March 30). UCT formal online education project. <http://www.cilt.uct.ac.za/cilt/ufo-ed>
- Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A review of technological pedagogical content knowledge. *Educational Technology & Society*, 16(2), 31-51.
- Chen, C. H. (2008). Why do teachers not practice what they believe regarding technology integration? *The Journal of Educational Research*, 102(1), 65–75. <https://doi.org/10.3200/JOER.102.1.65-75>
- Chen, X., Zou, D., Cheng, G., & Xie, H. (2020). Detecting latent topics and trends in educational technologies over four decades using structural topic modelling: A retrospective of all volumes of *Computers and Education*. *Computers and Education*, 151.
- Chen, Y., Peng, Y., & Rojas, J. P. (2022). *Exploring the influence of gamification on intrinsic motivation and learning outcomes in an online education context*. *International Journal of Human-Computer Interaction*, 38(13), 1227-1241.
- Chetty, M. Y., Mokwele, M. T., & Starr, M. N. (2023). Roles, responsibilities and the value of professional bodies in the context of the South African National Qualifications Framework (NQF). *SAQA Bulletin*, 4.
- Chugh, R., Turnbull, D., & Luck, J. (2023a). Implementing educational technology in higher education institutions: A review of technologies, stakeholder perceptions, frameworks and metrics. *Education and Information Technologies*, 28(1), 1–27. <https://doi.org/10.1007/s10639-023-12223-4>
- Chugh, R., Turnbull, D., Cowling, M. A., Vanderburg, R., & Vanderburg, M. A. (2023b). Implementing educational technology in higher education institutions: A review of technologies, stakeholder perceptions, frameworks and metrics. *Education and Information Technologies*, 28, 16403–16429.
- Cidral, W. A., Oliveira, T., Felice, M. D., & Aparicio, M. (2018). E-learning success determinants: Brazilian empirical study. *Computers and Education*, 122, 273–299. <https://doi.org/10.1016/j.compedu.2017.12.001>
- Cilliers, F. J., & Herman, N. (2010). Impact of an educational development programme on teaching practice of academics at a research-intensive university. *International Journal for Academic Development*, 15(3), 253–267.
- Cioca, I., & Gifford, J. (2022). *Performance feedback: An evidence review. Practice summary and recommendations*. Chartered Institute of Personnel and Development.

- Cleland, J. A. (2017). The qualitative orientation in medical education research. *Korean journal of medical education*, 29(2), 61.
- Cochrane, T., & Narayan, V. (2017). *CMALT cMOOC: Developing a scalable lecturer professional development framework*. Ascilite. University of Southern Queensland.
- Coenders, F., & Verhoef, N. (2019). Lesson study: Professional development (PD) for beginning and experienced teachers. *Professional Development in Education*, 45(2), 217–230. <https://doi.org/10.1080/19415257.2018.1430050>
- Cohen, D., & Crabtree, B. (2006). *Qualitative research guidelines project*. Robert Wood Johnson Foundation. <http://www.qualres.org/>
- Cole, M., & Engeström, Y. (1993). A cultural-historical approach to distributed cognition. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations* (pp. 1–46). Cambridge University Press.
- Cooley, J., Frederick, K. D., & Larson, S. (2023). Promoting continuing professional development (CPD) through a novel CPD advanced pharmacy practice experience. *Currents in Pharmacy Teaching and Learning*, 15(1), 85–90.
- Corder, G. W., & Foreman, D. I. (2014). *Nonparametric statistics for non-statisticians: A step-by-step approach*. Wiley.
- Cox, M. D. (2004). Introduction to faculty learning communities. In M. D. Cox & L. Richlin (Eds.), *Building faculty learning communities: New directions for teaching and learning*, Number 97 (pp. 5–23). Jossey-Bass.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Sage.
- Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, 39(3), 124–130. https://doi.org/10.1207/s15430421tip3903_2
- Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- Cui, Z., Ng, O. L., & Jong, M. S. Y. (2023). Integration of computational thinking with mathematical problem-based learning. *Educational Technology & Society*, 26(2), 131–146.
- Curwood, J. S. (2013). Applying the design framework to technology professional development. *Journal of Digital Learning in Teacher Education*, 29(3), 89–95.
- Czerniewicz, L., Agherdien, N., Badenhorst, J., Belluigi, D. Z., Chambers, T., Chili, M., de Villiers, M., Felix, A., Gachago, D., Gokhale, C., Ivala, E., Kramm, N., Madiba, M., Mistri, G., Mgwashu, E., Pallitt, N., Prinsloo, P., Solomon, K., Strydom, S., Swanepoel, M., Waghid, F., & W. (2020). A wake-up call:

Equity, inequality and Covid-19 emergency remote teaching and learning. *Postdigital Science and Education*, 2(3), 946-967. <https://doi.org/10.1007/s42438-020-00187-4>

- Czerniewicz, L., Trotter, H., & Haupt, G. (2019). Online teaching in response to student protests and campus shutdowns: Academics' perspectives. *International Journal of Educational Technology in Higher Education*, 16(43). <https://doi.org/10.1186/s41239-019-0170-1>
- Dalal, M., Archambault, L., & Shelton, C. (2021). Fostering the growth of TPACK among international teachers of developing nations through a cultural exchange program. *Australasian Journal of Educational Technology*, 37(1), 43–56.
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.
- Davis, M. H., Karunathilake, I., & Harden, R. M. (2005). AMEE education guide No. 28: The development and role of departments of medical education. *Medical Teacher*, 27(8), 665–675. <https://doi.org/10.1080/01421590500398788>
- Day, C. (1999). *Developing teachers: The challenges of lifelong learning*. Falmer Press.
- De Villiers, M., Conradie, H., & Van Schalkwyk, S. (2018). Teaching medical students in a new rural longitudinal clerkship: Opportunities and constraints. *Annals of Global Health*, 84(1), 58–65. <https://doi.org/10.29024/aogh.17>
- de Vos, A. S., Strydom, H., Fouché, C. B., & Delport, C. S. L. (2005). *Research at grass roots: For the social sciences and human service professions* (3rd ed.). Van Schaik Publishers.
- DeLuca, C., Bolden, B., & Chan, J. (2017). Systematic professional learning through collaborative inquiry: Examining teachers' perspectives. *Teaching and Teacher Education*, 67, 67–78. <https://doi.org/10.1016/j.tate.2017.05.014>
- Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualisations and measures. *Educational Researcher*, 38(3), 181–199.
- DeVane, B., & Squire, K. (2012). Activity theory in the learning technologies. In D. Jonassen & S. Land (Eds.), *Theoretical foundations of learning environments* (2nd ed., pp. 242–268). Routledge.
- DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). SAGE Publications.
- DHET (2017). Department of Higher Education and Training. (2017). *Articulation policy for the post-school education and training system of South Africa*. Department of Higher Education and Training, Republic of South Africa. Retrieved from <https://www.sun.ac.za/english/learning-teaching/learning-teaching-enhancement/APQ/Documents/Higher%20Education%20Legislative%20Frameworks/DHET/DHET%20Policies/DHET%20Articulation%20policy%20Final%2013%20Jan%202017.pdf>

- DHET (2019). Department of Higher Education and Training. *National framework for enhancing academics as university teachers*. Retrieved from https://heltasa.org.za/wp-content/uploads/2020/08/National-Framework-for-Enhancing-Academics-as-University-Teachers_signed.pdf
- Dille, K. B., & Røkenes, F. M. (2021). Teachers' professional development in formal online communities: A scoping review. *Teaching and Teacher Education*, 105, 103431.
- Dintoe, S. S. (2019). Technology innovation diffusion at the University of Botswana: A comparative literature survey. *International Journal of Education and Development Using Information and Communication Technology*, 15(1), 1.
- Dlamini, R., & Nkambule, F. (2020). Information and communication technologies' pedagogical affordances in education. In *Encyclopedia of education and information technologies* (pp. 918-931). Cham: Springer International Publishing.
- Dowelani, M., & Dowelani, F. (2020). Curriculum development in South Africa: The role of professional bodies. In *6th International Conference on Higher Education Advances (HEAd'20)* (pp. 1017–1025). Editorial Universitat Politècnica de València.
- DuFour, R., DuFour, R., Eaker, R., & Many, T. (2010). *Learning by doing: A handbook for professional learning communities at work*. Solution Tree Press.
- Duran, M. (2021). The education system of the United States of America: ICT and digitalisation. In *The education systems of the Americas* (pp. 1071–1104). Springer.
- Duran, M. (2022). Technology integration. In *Learning Technologies*. Springer, Cham.
- Durff, L., & Carter, M. (2019). Overcoming second-order barriers to technology integration in K–5 schools. *Journal of Educational Research and Practice*, 9(1), 246–260.
- Edwards, A. (2015). Recognising and realising teachers' professional agency. *Teachers and Teaching*, 21(6), 779–784.
- Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, 103(4), 962–1023.
- Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Orienta-Konsultit.
- Engeström, Y. (1993). Developmental studies of work as a testbench of activity theory: The case of primary care medical practice. In S. Chaiklin & J. Lave (Eds.), *Understanding practice: Perspectives on activity and context* (pp. 64–103). Cambridge University Press.
- Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualisation. *Journal of Education and Work*, 14(4), 133–156. <https://doi.org/10.1080/13639080020028747>

- Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings, and future challenges. *Educational Research Review*, 5(1), 1–24.
- Erlich, R., Arcavi, A., & Ben-Zvi, D. (2020). Developing teachers' professional knowledge through a design-based approach. *Journal of Mathematics Teacher Education*, 23(1), 5–25.
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, 59(2), 423–435.
- Eteläpelto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2013). What is agency? Conceptualising professional agency at work. *Educational Research Review*, 10(1), 45–65.
- Fang, B., & Dvorak, J. (2013). Using technology to increase quality time on task. EDUCAUSE Review Online.
- Fawns, T. (2019). Postdigital education in design and practice. *Postdigital science and education*, 1(1), 132–145.
- Fernández-Batanero, J. M., Román-Graván, P., Reyes-Rebollo, M. M., & Montenegro-Rueda, M. (2021). Impact of educational technology on teacher stress and anxiety: A literature review. *International Journal of Environmental Research and Public Health*, 18(2), 548. <https://doi.org/10.3390/ijerph18020548>
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). Sage.
- Flewelling, A. (2024, February 20). Support K–12 technology integration with professional development. *Technology Solutions That Drive Education*. <https://edtechmagazine.com/k12/article/2024/02/support-k-12-technology-integration-professional-development>
- Flyvbjerg, B. (2011). Case study. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (4th ed., pp. 301–316). Sage.
- Foot, K. A. (2014). Cultural-historical activity theory: Exploring a theory to inform practice and research. *Journal of Human Behaviour in the Social Environment*, 24(3), 329–347. <https://doi.org/10.1080/10911359.2014.764581>
- Frenk, J., Chen, L., Bhutta, Z. A., Cohen, J., Crisp, N., Evans, T., Fineberg, H., Garcia, P., Ke, Y., Kelley, P., Kistnasamy, B., Meleis, A., Naylor, D., Pablos-Mendez, A., Reddy, S., Scrimshaw, S., Sepulveda, J., Serwadda, D., & Zurayk, H. (2010). Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world. *The Lancet*, 376(9756), 1923–1958. [https://doi.org/10.1016/S0140-6736\(10\)61854-5](https://doi.org/10.1016/S0140-6736(10)61854-5)

- Gachago, D., Ivala, E., Backhouse, J., Bosman, J. P., & Bozalek, V. (2013). Towards a shared understanding of emerging technologies: Experiences in a collaborative research project in South Africa. *The African Journal of Information Systems*, 5(3), 94–105.
- Gachago, D., Morkel, J., Hitge, Y., van Zyl, I., & Ivala, E. (2017). Designing eLearning champions: A design thinking approach. *International Journal of Educational Technology in Higher Education*, 14, Article 30. <https://doi.org/10.1186/s41239-017-0076-8>
- Gachago, D., Jones, B., Esambe, E. E., Jongile, S., & Ivala, E. (2021). Engaging knowledge and the knower: Design considerations for emerging modes of academic staff development. *Critical Studies in Teaching and Learning*, 9(SI).
- Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13, Article 117. <https://doi.org/10.1186/1471-2288-13-117>
- Gee, J. P. (2008). *Social linguistics and literacies* (3rd ed.). Taylor and Francis.
- Geertsema, J. (2021). Faculty development in the context of a research-intensive university. *Hungarian Educational Research Journal*, 11(3), 230–245. <https://doi.org/10.1556/063.2021.00016>
- Gentry, J. W. (1995). Special session on experiential teaching. In *Developments in business simulation and experiential learning: Proceedings of the annual ABSEL conference* (Vol. 22, pp. 655–657).
- Gibson, S., Carroll, C., & Brown, C. (2023, October). Successful Implementation of Education Technology in Schools and Colleges. In 2023 IEEE Frontiers in Education Conference (FIE) (pp. 1–8). IEEE.
- Gil-Flores, J., Rodríguez-Santero, J., & Torres-Gordillo, J.-J. (2017). Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Computers in Human Behaviour*, 68, 441–449. <https://doi.org/10.1016/j.chb.2016.11.057>
- Goodyear, P., & Retalis, S. (Eds.). (2010). *Technology-enhanced learning: Design patterns and pattern languages*. Sense Publishers.
- Goos, M., & Salomons, A. (2017). Measuring teaching quality in higher education: Assessing selection bias in course evaluations. *Research in Higher Education*, 58, 341–364. <https://doi.org/10.1007/s11162-016-9433-7>
- Gorder, L. M. (2008). A study of teacher perceptions of instructional technology integration in the classroom. *Delta Pi Epsilon Journal*, 50(2), 63–76.
- Graf-Vlachy, L., Buhtz, K., & König, A. (2018). Social influence in technology adoption: Taking stock and moving forward. *Management Review Quarterly*, 68(1), 37–76. <https://doi.org/10.1007/s11301-017-0133-3>

- Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, 57(3), 1953–1960. <https://doi.org/10.1016/j.compedu.2011.04.010>
- Granić, A. (2022). Educational technology adoption: A systematic review. *Education and Information Technologies*, 27(7), 9725–9744. <https://doi.org/10.1007/s10639-022-10903-9>
- Greene, J. C. (2007). *Mixed methods in social inquiry*. Jossey-Bass.
- Grimalt-Álvaro, C., & Ametller, J. (2021). A cultural-historical activity theory approach for the design of a qualitative methodology in science educational research. *International Journal of Qualitative Methods*, 20, Article 16094069211003571. <https://doi.org/10.1177/16094069211003571>
- Gruppen, L. D., Simpson, D., Searle, N. S., Robins, L., Irby, D. M., & Mullan, P. B. (2006). Educational fellowship programs: Common themes and overarching issues. *Academic Medicine*, 81(11), 990–994. <https://doi.org/10.1097/01.ACM.0000249968.98223.4c>
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field methods*, 18(1), 59–82.
- Gulbahar, Y. (2008). ICT usage in higher education: A case study on preservice teachers and instructors. *Online Submission*, 7(1).
- Gumede, P. R., Sithole, M. P., & Gumede, D. (2023). Lecturers' perspectives of pedagogical training initiatives at a university of technology in KwaZulu-Natal, South Africa. *South African Journal of Higher Education*, 3
- Gunn, C., Hearne, S., & Sibthorpe, J. (2011). Right from the start: A rationale for embedding academic literacy skills in university courses. *Journal of University Teaching & Learning Practice*, 8(1), Article 6.
- Gupta, B. L. (1992). A model for staff development. *The Journal of Engineering Education Pune*, 1(4), 30–35.
- Gusic, M. E., Milner, R. J., Tisdell, E. J., Taylor, E. W., Quillen, D. A., & Thorndyke, L. E. (2010). The essential value of projects in faculty development. *Academic Medicine*, 85(9), 1484–1491. <https://doi.org/10.1097/ACM.0b013e3181eacb3a>
- Guskey, T. R. (2000). *Evaluating professional development*. Corwin Press.
- Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theory and Practice*, 8(3/4), 381–391.
- Guskey, T. R. (2003). What makes professional development effective? *Phi Delta Kappan*, 84(10), 748–750.
- Haas, M., Triemstra, J., Tam, M., Neuendorf, K., Reckelhoff, K., Gottlieb-Smith, R., Pedigo, R., McTaggart, S., Vasquez, J., Hundert, E. M., Berkowitz, B., Humphrey, H. J., & Gruppen, L. D. (2023). A

decade of faculty development for health professions educators: Lessons learned from the Macy Faculty Scholars Program. *BMC Medical Education*, 23(1), Article 185. <https://doi.org/10.1186/s12909-023-04009-5>

- Hallinger, P. (2011). Leadership for learning: Lessons from 40 years of empirical research. *Journal of Educational Administration*, 49(2), 125–142. <https://doi.org/10.1108/09578231111116699>
- Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use. *TechTrends*, 60(5), 433–441. <https://doi.org/10.1007/s11528-016-0091-y>
- Hancock, C., & Miller, A. (2017). Using cultural historical activity theory to uncover praxis for inclusive education. *International Journal of Inclusive Education*, 22(1), 1–17. <https://doi.org/10.1080/13603116.2017.1280183>
- Hanover Research. (2014). *Professional development for technology integration*. <https://www.hanoverresearch.com/media/Professional-Development-for-Technology-Integration.pdf>
- Hardman, J. (2005). Activity theory as a potential framework for technology research in an unequal terrain. *South African Journal of Higher Education*, 19(2), 378–392.
- Hardman, J. (2008). Researching pedagogy: An activity theory approach. *Journal of Education*, 45(1), 65–95.
- Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 18(1). <https://doi.org/10.17169/fqs-18.1.2655>
- Hartshorne, R., Baumgartner, E., Kaplan-Rakowski, R., Mouza, C., & Ferdig, R. E. (2020). Special issue editorial: Pre-service and in-service professional development during the COVID-19 pandemic. *Journal of Technology and Teacher Education*, 28(2), 137–147.
- Hettinga, M. (1998). Towards a theoretical foundation of EVOLVE: Report of an inventory of theories relevant for a conceptual model of evolving use of groupware. *Telematica Instituut*.
- Higgs, J., & McAllister, L. (2007). Educating clinical educators: Using a model of the experience of being a clinical educator. *Medical Teacher*, 29(2-3), e51–e57. <https://doi.org/10.1080/01421590601046088>
- Higher Education Academy. (2011). *The U.K. Professional Standards Framework for Teaching and Supporting Learning in Higher Education*. <https://www.heacademy.ac.uk/ukpsf>

- Hill, J., & Dao, A. (2021). Personal pasts become academic presents: Engaging reflexivity and considering dual insider/outsider roles in physical cultural fieldwork. *Qualitative Research in Sport, Exercise and Health*, 13(3), 521–535. <https://doi.org/10.1080/2159676X.2020.1767039>
- Hilty, D. M., Chan, S., Torous, J., Luo, J., Boland, R., & Bauer, A. M. (2019). A framework for competencies for the use of mobile technologies in psychiatry and medicine: Scoping review. *JMIR mHealth and uHealth*, 7(2), e12229. <https://doi.org/10.2196/12229>
- Hilty, D. M., Gentry, M. T., McKean, A. J., Cowan, K. E., Lim, R. F., & Lu, F. G. (2019). Telehealth for rural diverse populations: Telebehavioural and cultural competencies, clinical outcomes and administrative approaches. *mHealth*, 6, 1–15. <https://doi.org/10.21037/mhealth.2019.10.04>
- Höfrová, A., Moore de Peralta, A., Rosopa, P. J., Small, M. A., Steele Payne, K., & Rymešová, P. (2021). Faculty perception of the contribution of start-up packages to professional development. *Innovative Higher Education*, 46(4), 481–497. <https://doi.org/10.1007/s10755-021-09546-3>
- Hökkä, P., Vähäsantanen, K., & Mahlakaarto, S. (2017). Teacher educators' collective professional agency and identity – Transforming marginality to strength. *Teaching and Teacher Education*, 63, 36–46. <https://doi.org/10.1016/j.tate.2016.12.001>
- Horn, M. B., & Staker, H. (2015). *Blended: Using disruptive innovation to improve schools*. Jossey-Bass.
- Health Professions Council of South Africa. (2021). Standards for education and training. HPCSA. Retrieved from
https://www.hpcsa.co.za/Uploads/professional_practice/ethics/Booklet_1_Guidelines_for_Good_Practice_vDec_2021.pdf
- Inamorato dos Santos, A., Gaušas, S., Mackevičiūtė, R., Jotautytė, A., & Martinaitis, Ž. (2019). *Innovating professional development in higher education: Case studies (EUR 29669 EN)*. Publications Office of the European Union. <https://doi.org/10.2760/712385>
- Irby, D. M., & O'Sullivan, P. S. (2018). Developing and rewarding teachers as educators and scholars: Remarkable progress and daunting challenges. *Medical Education*, 52(1), 58–67. <https://doi.org/10.1111/medu.13463>
- Islami, R. A. Z., Anantanukulwong, R., & Faikhamta, C. (2022). Trends of teacher professional development strategies: A systematic review. *Shanlax International Journal of Education*, 10(2), 1–8.
- Jacob, W. J., Xiong, W., & Ye, H. (2015). Professional development programmes at world-class universities. *Palgrave Communications*, 1, Article 15002. <https://doi.org/10.1057/palcomms.2015.2>
- Jandrić, P., Knox, J., Besley, T., Ryberg, T., Suoranta, J., & Hayes, S. (2018). Postdigital science and education. *Educational philosophy and theory*, 50(10), 893-899.

- Janghorban, R., Latifnejad Roudsari, R., & Taghipour, A. (2014). Skype interviewing: The new generation of online synchronous interview in qualitative research. *International Journal of Qualitative Studies on Health and Well-being*, 9, Article 24152. <https://doi.org/10.3402/qhw.v9.24152>
- Johnson, M., & Majewska, D. (2022). Formal, non-formal, and informal learning: What are they, and how can we research them? *Research Report*. Cambridge University Press & Assessment.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14–26. <https://doi.org/10.3102/0013189X033007014>
- Johnson, R. B., & Turner, L. A. (2003). Data collection strategies in mixed methods research. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social & Behavioural Research* (pp. 297–319). SAGE Publications.
- Jones, M., & Charteris, J. (2017). Transformative professional learning: An ecological approach to agency through reflection. *Reflective Practice*, 18(4), 496–513. <https://doi.org/10.1080/14623943.2017.1307729>
- Jones, M., & Dexter, S. (2018). Teacher perspectives on technology integration professional development: Formal, informal, and independent learning activities. *Journal of Educational Multimedia and Hypermedia*, 27(1), 83–102.
- Kadakia, K. T., & Krumholz, H. M. (2022). Designing Cures 2.0, From corridors to cornerstones. *The New England Journal of Medicine*, 386(18), 1677–1679. <https://doi.org/10.1056/NEJMp2200203>
- Kadioğlu-Akbulut, C., Çetin-Dindar, A., Küçük, S., & Acar-Şeşen, B. (2020). Development and validation of the ICT-TPACK-Science Scale. *Journal of Science Education and Technology*, 29, 355–368. <https://doi.org/10.1007/s10956-020-09828-8>
- Kaliisa, R., & Picard, M. (2017). A systematic review on mobile learning in higher education: The African perspective. *Turkish Online Journal of Educational Technology-TOJET*, 16(1), 1–18.
- Kaufman, R., Oakley-Browne, H., Watkins, R., & Leigh, D. (2003). *Strategic planning for success: Aligning people, performance, and payoffs*. Jossey-Bass/Pfeiffer.
- Kauppinen, M., Kainulainen, J., Hökkä, P., & Vähäsantanen, K. (2020). Professional agency and its features in supporting teachers' learning during an in-service education programme. *European Journal of Teacher Education*, 43(3), 384–404. <https://doi.org/10.1080/02619768.2019.1708628>
- Kelchtermans, G. (2004). CPD for professional renewal: Moving beyond knowledge for practice. In C. Day & J. Sachs (Eds.), *International Handbook on the Continuing Professional Development of Teachers* (pp. 217–237). Open University Press.

- Khanna, P., Roberts, C., & Lane, A. (2021). Designing health professional education curricula using systems thinking perspectives. *BMC Medical Education*, 21(1), Article 20. <https://doi.org/10.1186/s12909-020-02391-4>
- King, R., Taylor, B., Talpur, A., Jackson, C., Manley, K., Ashby, N., & Robertson, S. (2021). Factors that optimise the impact of continuing professional development in nursing: A rapid evidence review. *Nurse Education Today*, 98, Article 104652. <https://doi.org/10.1016/j.nedt.2020.104652>
- Kirkpatrick, D. L. (1994). *Evaluating training programs: The four levels*. San Francisco: Berrett-Koehler Publishers.
- Kirkpatrick, D. L., & Kirkpatrick, J. D. (2015). *Evaluating training programs: The four levels* (3rd ed.). Berrett-Koehler Publishers.
- Kirschner, P. A., & van Merriënboer, J. J. (2013). Do learners really know best? Urban legends in education. *Educational psychologist*, 48(3), 169-183.
- Klein, E. J., & Riordan, M. (2009). Putting professional development into practice: A framework for how teachers in expeditionary learning schools implement professional development. *Teacher Education Quarterly*, 36(1), 61–79.
- Knight, P., Tait, J., & Yorke, M. (2007). The professional learning of teachers in higher education. *Studies in Higher Education*, 31(3), 319–339. <https://doi.org/10.1080/03075070701261101>
- Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education*, 193(3), 13–19.
- Koehler, M. J., Mishra, P., Akcaoglu, M., Rosenberg, J. M. (2013) The Technological Pedagogical Content Knowledge Framework for Teachers and Teacher Educators. Department of Counselling, Educational Psychology and Special Education, Michigan State University. https://www.matt-koehler.com/publications/Koehler_et_al_2013.pdf
- Koehler, M. J., Mishra, P., Bouck, E. C., DeSchryver, M., Kereluik, K., Shin, T. S., & Wolf, L. G. (2011). Deep play: Developing TPACK for 21st century teachers. *International Journal of Learning Technology*, 6(2), 146–163.
- Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60–70.
- Koh, J. H. L. (2013). A rubric for assessing teachers' lesson activities with respect to TPACK for meaningful learning with ICT. *Australasian Journal of Educational Technology*, 29(6).
- Kohan, M., Changiz, T., & Yamani, N. (2023). A systematic review of faculty development programs based on the Harden teacher's role framework model. *BMC Medical Education*, 23, Article 910. <https://doi.org/10.1186/s12909-023-04863-4>

- Kärkkö, M., Kyrö-Ämmälä, O., & Turunen, T. (2022). Mentoring as a tool for professional development in higher education: A case study. *Journal of University Teaching & Learning Practice*, 19(3), Article 5. <https://doi.org/10.53761/1.19.3.5>
- Kozina, E. (2011). *Analysis of the DCAD survey: Highest and lowest ranking areas of interest for professional development in regard to current work interest (teaching and research)*. Technical Report. Higher Education Research Centre. Dublin City University.
- Kvale, S., & Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing* (2nd ed.). Thousand Oaks, CA: SAGE Publications.
- Langa, M., Ndelu, S., Edwin, Y., & Vilakazi, M. (2017). *#Hashtag: An analysis of the #FeesMustFall movement at South African universities*. Centre for the Study of Violence and Reconciliation.
- Larsen, K., Bengtson, S., & Pedersen, A. (2017). Exploring the sociocultural dynamics of higher education: A CHAT perspective. *Journal of Educational Change*, 18(3), 345-362. <https://doi.org/10.1007/s10833-017-9301-2>
- Lawless
- , K. A., & Pellegrino, J. W. (2007). Professional Development in Integrating Technology into Teaching and Learning: Knowns, Unknowns, and Ways to Pursue Better Questions and Answers. *Review of Educational Research*, 77(4), 575–614. <http://www.jstor.org/stable/4624911>
- Lea, M. R., & Street, B. V. (1998). Student writing in higher education: An academic literacies approach. *Studies in Higher Education*, 23(2), 157–172. <https://doi.org/10.1080/03075079812331380364>
- Learning Forward. (2011). *Standards for Professional Learning*. Learning Forward. [Standards for Professional Learning - Standards 2022](#)
- Lee, H., Chung, C., & Wei, G. (2022). Research on Technological Pedagogical and Content Knowledge: A bibliometric analysis from 2011 to 2020. *Frontiers in Education*, 7, 765233. <https://doi.org/10.3389/feduc.2022.765233>
- Leibowitz, B., Bozalek, V., Garraway, J., Herman, N., Jawitz, J., Muhuro, P., ... & Winberg, C. (2017). Learning to teach in higher education in South Africa.
- Leslie, H. J. (2020). Trifecta of student engagement: A framework for an online teaching professional development course for faculty in higher education. *Journal of Research in Innovative Teaching & Learning*, 13(2), 149–173. <https://doi.org/10.1108/JRIT-10-2019-0072>
- Liao, S.-C., & Hsu, S.-Y. (2019). Evaluating a continuing medical education program: New World Kirkpatrick model approach. *International Journal of Management, Economics and Social Sciences*, 8(4), 266–279.

- Lotti, A. (2020). Faculty development: Brief history at international and national levels. *Scuola democratica*, 11(3), 545–559.
- Luo, L., & Zou, D. (2022). Integrating TPACK in a pre-service teachers' EFL course: Impacts on teaching practices and student learning outcomes. *Asia Pacific Education Review*, 23(3), 345–358. <https://doi.org/10.1007/s12564-021-09723-4>
- Mafunda, J., Ndambakuwa, R. C. Y., Samkange, C., Sigola, L., & Vengesa, P. (2007). Challenges in training the ideal doctor for Africa: Lessons learned from Zimbabwe. *Medical Teacher*, 29(9), 878–881. <https://doi.org/10.1080/01421590701813007>
- Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: guided by information power. *Qualitative health research*, 26(13), 1753-1760.
- Mansvelt, J., Suddaby, G., & O'Hara, D. (2008). Learning how to e-teach? Staff perspectives on formal and informal professional development activity. In *Hello! Where are you in the landscape of educational technology?* Proceedings ASCILITE Melbourne 2008. <https://ascilite.org/conferences/melbourne08/procs/mansvelt.pdf>
- Maphosa, C., Mudzielwana, N. P., & Netshifhefhe, L. (2014). Curriculum development in South African higher education institutions: Key considerations. *Mediterranean Journal of Social Sciences*, 5(3), 323–331.
- Mashau, P., & Nyawo, J. (2021). The use of an online learning platform: A step towards e-learning. *South African Journal of Higher Education*, 35(2), 123–143. <https://doi.org/10.20853/35-2-4126>
- Mässing, C. (2017). Success factors and challenges for e-learning technologies in the Namibian higher education system: A case study of the University of Namibia. *University of Skövde*.
- McKimm, J., & Jones, P. K. (2017). Twelve tips for applying change models to curriculum design, development and delivery. *Medical Teacher*, 40(5), 520–526. <https://doi.org/10.1080/0142159X.2017.1391377>
- McLaren, S (2008). Learning for Engagement - lose the ring-fencing. In H Middleton & M Pavlova (eds), 5th Biennial International Conference on Technology: World Organisation of Councils of Technology Education, Hanover, Germany Sept 2000.
- McLean, M., Cilliers, F., & Van Wyk, J. M. (2008). Faculty development: Yesterday, today and tomorrow. *Medical Teacher*, 30(6), 555–584. <https://doi.org/10.1080/01421590802109834>
- McMahon, M., Forde, C., & Dickson, B. (2015). Reshaping teacher education through the professional continuum. *Educational Review*, 67(2), 158–178. <https://doi.org/10.1080/00131911.2014.979570>

- Mercader, C. (2020). Explanatory model of barriers to the integration of digital technologies in higher education institutions. *Education and Information Technologies*, 25, 5133–5147. <https://doi.org/10.1007/s10639-020-10147-5>.
- Mercer, N. (2007). *Dialogue and the development of children's thinking: A sociocultural approach*. Routledge.
- Mermelstein, A. D. (2018). Reflective teaching as a form of professional development. *MEXTESOL Journal*, 42(4), 1–14. https://www.mextesol.net/journal/index.php?page=journal&id_article=2692
- Mezirow, J. (2009). Transformative learning theory. In J. Mezirow & E. W. Taylor (Eds.), *Transformative learning in practice: Insights from community, workplace, and higher education* (pp. 18–31). Jossey-Bass.
- MHET. (2018). *New academics, new higher education contexts: A critical perspective on staff development*. Ministry of Higher Education and Training.
- Mills, G. (2000). *Action research: A guide for the teacher researcher*. Merrill/Prentice-Hall.
- Minott, M. A. (2012). Reflective teaching as self-directed professional development: Building practical or work-related knowledge. In T. Bates, A. Swennen & K. Jones (Eds.), *The Professional Development of Teacher Educators* (pp. 322–334). Routledge.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive statistics and normality tests for statistical data. *Annals of Cardiac Anaesthesia*, 22(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18
- Mlambo, M., Silén, C. & McGrath, C. Lifelong learning and nurses' continuing professional development, a metasynthesis of the literature. *BMC Nurs* 20, 62 (2021). <https://doi.org/10.1186/s12912-021-00579-2>
- Mohammad Nezhad, P., & Stolz, S. A. (2024). Unveiling teachers' professional agency and decision-making in professional learning: The illusion of choice. *Professional Development in Education*. <https://doi.org/10.1080/19415257.2024.2349058>
- Moolman, B., & Essop, R. (2008). School climate is an enabling factor in an effective peer education programme. *South African Journal of Education*, 28(3), 365–380. <https://doi.org/10.15700/saje.v28n3a184>

- Mukute, M., & Lotz-Sisitka, H. (2012). Working with cultural-historical activity theory and critical realism to investigate and expand farmer learning in Southern Africa. *Mind, Culture, and Activity*, 19(4), 342–367. <https://doi.org/10.1080/10749039.2012.710245>
- Murthy, S., Warriem, J. M., & Iyer, S. (2017). Technology integration for student-centred learning: A model for teacher professional development programs. In S.C. Kong, T.L. Wong, M. Yang, C.F. Chow, & K. Ho Tse (Eds.), *Emerging Practices in Scholarship of Learning and Teaching in a Digital Era* (pp. 55–74). Springer. https://doi.org/10.1007/978-981-10-3344-5_4
- Mwanza, D. (2001). Where theory meets practice: A case for an activity theory-based methodology to guide computer system design. In M. Hirose (Ed.), *Proceedings of INTERACT 2001: Eighth IFIP TC 13 Conference on Human–Computer Interaction* (pp. 9–13). Tokyo, Japan: IOS Press.
- Mwanza, D. (2002). *Towards an activity-oriented design method for HCI research and practice* (PhD thesis). The Open University.
- Nachtigall, V., Shaffer, D. W., & Rummel, N. (2022). Stirring a secret sauce: A literature review on the conditions and effects of authentic learning. *Educational Psychology Review*, 34(3), 1479–1516. <https://doi.org/10.1007/s10648-021-09621-3>
- Nasri, U., & Rahmatullah, A. M. S. (2024). Integration of digital technology in Islamic education: A case study of SMA Negeri 1 Wanasaba in 2023. *Al Hikmah: Journal Of Education*, 5(1), 1–12.
- Nasser, R. M., & Karraker, H. (2018). Lifelong learning through a higher education lens. *Journal of Educational Leadership in Action*, 5(2).
- National Forum for the Enhancement of Teaching and Learning in Higher Education. (n.d.). *Structure of the professional development framework*. Retrieved from <https://www.teachingandlearning.ie/our-priorities/structure-of-the-professional-development-framework/>
- National Research Council. (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. Washington, DC: The National Academies Press.
- Nel, C., & Brink, S. (2019). Contradictions within an activity of second language reading literacy. *South African Journal of Childhood Education*, 9(1), 1–11. <https://doi.org/10.4102/sajce.v9i1.722>
- Neyland, E. (2011). Integrating online learning in higher education: The effect of technology on learner interactions. *International Journal of Educational Technology in Higher Education*, 8(1), 13–24.
- Ng’ambi, D. (2013). Effective and ineffective uses of emerging technologies: Towards a transformative pedagogical model. *British Journal of Educational Technology*, 44(4), 652–661. <https://doi.org/10.1111/bjet.12060>

- Ng'ambi, D., Gachago, D., Ivala, E., Bozalek, V., & Watters, K. (2012). Emerging technologies in South African higher education institutions: Towards a teaching and learning practice framework. In *Proceedings of the International Conference on e-Learning* (pp. 354–362). Kidmore End, UK.
- Ng'ambi, D., Brown, C., Bozalek, V., Gachago, D., & Wood, D. (2016). Technology-enhanced teaching and learning in South African higher education—A rearview of a 20-year journey. *British Journal of Educational Technology*, 47(5), 843–858.
- Nguyen, T. T. L. (2020). Teacher-research: Agency of practical knowledge and professional development. *Journal of Language & Education*, 6(2), 75–85. <https://doi.org/10.17323/jle.2020.9969>
- Niemczyk, E. K. (2018). Developing globally competent researchers: An international perspective. *South African Journal of Higher Education*, 32(4), 171–185. <https://doi.org/10.20853/32-4-1602>
- Nowell, L. (2022). Beyond tradition: Innovative mentorship models for higher education. *Papers on Postsecondary Learning and Teaching*, 5, 1–12.
- O'Doherty, D., Dromey, M., Loughheed, J., Hannigan, A., Last, J., & McGrath, D. (2018). Barriers and solutions to online learning in medical education: A review of the literature. *BMC Medical Education*, 18(1), 1–11. <https://doi.org/10.1186/s12909-018-1240-0>.
- O'Sullivan, P. S., & Irby, D. M. (2011). Reframing research on faculty development: A framework for improving professional development. *Academic Medicine*, 86(4), 421–428. <https://doi.org/10.1097/ACM.0b013e31820dc058>
- OECD. (2024). *Guidance and regulatory frameworks for digital education*. Retrieved from <https://www.oecd-ilibrary.org>
- Ostashevski, N., & Reid, D. (2017). Networked teacher professional development: Applying the networked learning framework to online teacher professional development. *Journal of Digital Learning in Teacher Education*, 33(2), 89–98. <https://doi.org/10.1080/21532974.2017.1281653>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372. <http://dx.doi.org/10.1136/bmj.n71>
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed-method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42, 533–544. <https://doi.org/10.1007/s10488-013-0528-y>
- Park, S. H., & Son, J. B. (2009). Implementing computer-assisted language learning in the EFL classroom: Teachers' perceptions and perspectives. *International Journal of Pedagogies and Learning*, 5(2), 80–101.

- Patfield, S., Gore, J., & Harris, J. (2023). Shifting the focus of research on effective professional development: Insights from a case study of implementation. *Journal of Educational Change*, 24(4), 345–363.
- Patry, J.-L., Reichman, R. G., & Linortner, L. (2017). Values and knowledge education (VaKE) for lifelong learning in applied fields: Principles and general issues.
- Patton, K., & Parker, M. (2017). Teacher education communities of practice: More than a culture of collaboration. *Teaching and Teacher Education*, 67, 351–360.
- Penuel, W. R., & Gallagher, D. J. (2017). *Creating research-practice partnerships in education*. Harvard Education Press.
- Perez, A. (2023). *Practical recommendations for mixed methods sampling in psychological intervention research: A mixed methods case study* (Doctoral dissertation, The University of Nebraska-Lincoln).
- Perlman, R., Christner, J., Ross, P., & Lypson, M. (2014). A successful faculty development program for implementing a sociocultural ePortfolio assessment tool. *Academic Medicine*, 89(2), 257–261.
- Pervin, N., & Mokhtar, M. (2022). The interpretivist research paradigm: A subjective notion of a social context. *International Journal of Academic Research in Progressive Education and Development*, 11(2), 419-428.
- Philipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouck, S., & Zhu, C. (2019). Improving teacher professional development for online and blended learning: A systematic meta-aggregative review. *Educational Technology Research and Development*, 67(5), 1145–1174.
- Pierson, M. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of Research on Technology in Education*, 33(4), 413–430.
- Poitras, ME., Vaillancourt, V.T., Beaupré, P. et al. Impacts of an online asynchronous continuing professional development toolkit supporting primary care nurses to engage in shared decision-making: a single-group pre-post study. *BMC Nurs* 24, 407 (2025). <https://doi.org/10.1186/s12912-025-03014-y>
- Pololi, L. H., Knight, S. M., Dennis, K., & Frankel, R. M. (2002). Helping medical school faculty realise their dreams: An innovative, collaborative mentoring program. *Academic Medicine*, 77(5), 377–384.
- Pramjeeth, S., Nupen, D. M., & Jagernath, J. (2023). Challenges impacting higher education leaders in achieving the sustainable development goal of quality education in South Africa. *African Journal of Inter/Multidisciplinary Studies*, 5(1), 1–13.

- Prebble, T., Hargraves, H., Leach, L., Naidoo, K., Suddaby, G., & Zepke, N. (2004). *Impact of student support services and academic development programmes on student outcomes in undergraduate tertiary study: A synthesis of the research*. Ministry of Education, New Zealand.
- Puentedura, R. R. (2012). *The SAMR model: Background and exemplars*. Hippasus. [The SAMR Model: Background and Exemplars – Ruben R. Puentedura's Blog](#)
- Punch, S., & Rogers, A. (2022). Building, not burning bridges in research: Insider/outsider dilemmas and engaging with the bridge community. *Journal of Leisure Research*, 53(2), 272-289. <https://doi.org/10.1080/00222216.2021.1887782>
- Qureshi, S. P. (2021). Cultural historical activity theory for studying practice-based learning and change in medical education. *Advances in Medical Education and Practice*, 12, 923–935.
- Ramani, S. (2006). Twelve tips to promote excellence in medical teaching. *Medical Teacher*, 28(1), 19–23.
- Rambe, P. (2012). Activity theory and technology-mediated interaction: Cognitive scaffolding using question-based consultation on Facebook. *Australasian Journal of Educational Technology*, 28(8). <https://doi.org/10.14742/ajet.775>
- Rambe, P., & Bere, A. (2014). Conclusion: Towards a transformative higher education pedagogy. In V. Bozalek, D. Ng'ambi, D. Wood, J. Herrington, J. Hardman, & A. Amory (Eds.), *Activity Theory, Authentic Learning and Emerging Technologies* (pp. 234–241). Routledge.
- Razali, N. M., & Wah, Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors, and Anderson-Darling tests. *Journal of Statistical Modelling and Analytics*, 2(1), 21-33.
- Richlin, L., & Cox, M. D. (Eds.). (2004). Developing scholarly teaching and the scholarship of teaching and learning through faculty learning communities. In *Building faculty learning communities* (pp. 127–135). Jossey-Bass.
- Richter, D., Kunter, M., Klusmann, U., Lüdtke, O., & Baumert, J. (2011). Professional development across the teaching career: Teachers' uptake of formal and informal learning opportunities. *Teaching and Teacher Education*, 27(1), 116–126.
- Rienties, B., Divjak, B., Eichhorn, M., Iniesto, F., Saunders-Smiths, G., Svetec, B., Tillmann, A., & Zizak, M. (2023). Online professional development across institutions and borders. *International Journal of Educational Technology in Higher Education*, 20, Article 30. <https://doi.org/10.1186/s41239-023-00399-1>
- Rinfret, S. R., Young, S., & McDonald, B. D. (2023). *Street-level public servants: Case studies for a new generation of public administration*. Routledge.

- Roberts, G., & Bregazzi, R. (2023). How to evaluate and improve a medical education programme. *South Sudan Medical Journal*, 16(3), 106–109.
- Rogers, E. M. (1962). *Diffusion of innovations*. The Free Press.
- Rosales, L. (2021). Technology integration: Implications for teachers' professional development. In *The Southeast Asian Conference on Education 2021. Official Conference Proceedings*.
- Rosenberg, J. M., & Koehler, M. J. (2015). Context and Technological Pedagogical Content Knowledge (TPACK): A systematic review. *Journal of Research on Technology in Education*, 47(3), 186–210.
- Sachs, J., Mansfield, N., Kosman, B., Deane, E., Sachs, J., Mansfield, N., Towers, S., Spence, S., Leitch, S., Webb, G., Candy, P., & Castle, R. (2011). Teaching Standards Framework Project – Final Report. In Australian Learning and Teaching Council [Report]. <https://ltr.edu.au/resources/TSF%20Final%20Report%20www%20version%2018%20Apr%202011.pdf>
- Sadiq, S., Ahmed, S., & Imran, M. (2019). Effective characteristics of professional development programs for teachers in Pakistan: A case study. *Professional Development in Education*, 45(4), 639–655.
- Salajegheh, M., Gandomkar, R., Mirzazadeh, A., & Sandars, J. (2020). Identification of capacity development indicators for faculty development programs: A nominal group technique study. *BMC Medical Education*, 20, 1–8.
- Salmon, G. (2005). *E-tivities: The key to active online learning*. Routledge.
- Sancar, R., Atal, D., & Deryakulu, D. (2021). A new framework for teachers' professional development. *Teaching and Teacher Education*, 101, Article 103305.
- Sannino, A., & Engeström, Y. (2018). Cultural-historical activity theory: Founding insights and new challenges. *Cultural-Historical Psychology*, 14(3), 43-56.
- Schildkamp, K., Hopster-den Otter, D., Beek, M., Uerz, D., & Horvers, A. (2021). Building blocks for effective lecturer professional development in higher education aimed at educational innovation with IT (Version 2.0).
- Schiller, J. (2003). Working with ICT: Perceptions of Australian principals. *Journal of Educational Administration*, 41(2), 171–185.
- Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education*, 42(2), 123–149.
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.

- Schwalbach, E. M. (2003). *Value and validity in action research: A guidebook for reflective practitioners*. Scarecrow Press.
- Schwandt, T. A., Lincoln, Y. S., & Guba, E. G. (2007). Judging interpretations: But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New directions for evaluation*, 2007(114).
- Selwyn, N. (2016). Digital downsides: Exploring university students' negative engagements with digital technology. *Teaching in Higher Education*, 21(8), 1006-1021.
- Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality (complete samples). *Biometrika*, 52(3/4), 591–611. <https://doi.org/10.2307/2333709>
- Shea, C. M. (2021). A conceptual model to guide research on the activities and effects of innovation champions. *Implementation Research and Practice*. DOI: [10.1177/2633489521990443](https://doi.org/10.1177/2633489521990443)
- Shelton, C. (2017). Giving up technology and social media: Why university lecturers stop using technology in teaching. *Technology, Pedagogy and Education*, 26(3), 303–321.
- Shi, J., Mo, X., & Sun, Z. (2012). Content validity index in scale development. *Journal of Central South University. Medical Sciences*, 37(2), 152-155. <https://doi.org/10.3969/j.issn.1672-7347.2012.02.007>.
- Siegel, S., & Castellan, N. J. (1988). *Nonparametric statistics for the behavioural sciences* (2nd ed.). McGraw-Hill.
- Siemens, G., & Long, P. (2011). Penetrating the fog: Analytics in learning and education. *EDUCAUSE Review*, 46(5), 30–40.
- Sims, S., & Fletcher-Wood, H. (2021). Identifying the characteristics of effective teacher professional development: A critical review. *School Effectiveness and School Improvement*, 32(1), 47–63.
- Singh, R. J. (2015). Current trends and challenges in South African higher education: Part 1. *South African Journal of Higher Education*, 29(3), 1–7.
- Skeff, K. M., Stratos, G. A., & Bergen, M. R. (1997). Evaluation of a medical faculty development program: A comparison of traditional pre/post and retrospective pre/post self-assessment ratings. *Evaluation & the Health Professions*, 20(4), 487–503.
- South African Department of Education. (2004). *White paper on e-education: Transforming learning and teaching through information and communication technologies (ICTs)*. Department of Education.
- Steinert, Y. (2005). Faculty development in the new millennium: Key challenges and future directions. *Medical Teacher*, 27(1), 74–79.
- Steinert, Y. (2013). Faculty development: Core concepts and principles. In Y. Steinert (Ed.), *Faculty development in the health professions. Innovation and change in professional education* (Vol. 11). Springer.
- Street, B. V. (1984). *Literacy in theory and practice*. Cambridge University Press.

- Stringer, E. T. (2007). *Action research* (3rd ed.). Sage.
- Stufflebeam, D. L. (2003). The CIPP model for evaluation. In T. Kellaghan & D. L. Stufflebeam (Eds.), *International handbook of educational evaluation* (pp. 31–62). Kluwer Academic Publishers.
- Suárez-Rodríguez, J., Almerich, G., Orellana, N., & Díaz-García, I. (2018). A basic model of integration of ICT by teachers: Competence and use. *Educational Technology Research and Development*, 66(5), 1165–1187.
- Suri, H. (2020). Ethical considerations of conducting systematic reviews in educational research. In O. Zawacki-Richter, M. Kerres, S. Bedenlier, M. Bond, & K. Buntins (Eds.), *Systematic reviews in educational research: Methodology, perspectives and application* (pp. 41-54). Springer. https://doi.org/10.1007/978-3-658-27602-7_3.
- Tack, H., Valcke, M., Rots, I., Struyven, K., & Vanderlinde, R. (2018). Uncovering a hidden professional agenda for teacher educators: A mixed-method study on Flemish teacher educators and their professional development. *European Journal of Teacher Education*, 41(1), 86–104.
- Tapal, A., Oren, E., Dar, R., & Eitam, B. (2017). The sense of agency scale: A measure of consciously perceived control over one's mind, body, and the immediate environment. *Frontiers in Psychology*, 8, Article 1552. <https://doi.org/10.3389/fpsyg.2017.01552>.
- Tarling, I. (2018a). Transformative pedagogies for teacher education. *Journal of Education for Teaching*, 44(4), 516–519.
- Tarling, I. (2018b). *Transforming teaching through the transformative integration of emerging technologies in the ePlay MakerSpace: A critical, sociocultural design-based study* (Doctoral dissertation, University of Cape Town).
- Tarling, I., & Ng'ambi, D. (2021). Technology professional development for teacher educators: A literature review and proposal for further research. *SN Social Sciences*, 1(1), Article 1. <https://doi.org/10.1007/s43545-020-00001-2>
- Tavakol, M., & Sandars, J. (2014). Quantitative and qualitative methods in medical education research: AMEE Guide No. 90: Part I. *Medical Teacher*, 36(9), 746–756.
- Tavangarian, D., Leopold, M. E., Nölting, K., Röser, M., & Voigt, D. (2004). Is e-learning the solution for individual learning? *Electronic Journal of e-Learning*, pp. 273–280.
- Teddlie, C., & Tashakkori, A. (2006). A general typology of research designs featuring mixed methods. *Research in the Schools*, 13(1), 12–28.
- Teddlie, C., & Tashakkori, A. (2010). Overview of contemporary issues in mixed methods research. *Sage handbook of mixed methods in social and behavioral research*, 2, 1-44.

- Tejada Fernández, J. (2013). Teaching professionalisation in the university: implications from training. *International Journal of Educational Technology in Higher Education*, 10, 345-358.
- Tenenbaum, H. R., Winstone, N. E., Leman, P. J., & Avery, R. E. (2020). How effective is peer interaction in facilitating learning? A meta-analysis. *Journal of Educational Psychology*, 112(7), 1303–1319. <https://www.apa.org/pubs/journals/features/edu-edu0000436.pdf>
- Tharayil, S., Borrego, M., Prince, M., Nguyen, K. A., Shekhar, P., Finelli, C. J., & Waters, C. (2018). Strategies to mitigate student resistance to active learning. *International Journal of STEM Education*, 5, Article 7.
- Thornhill-Miller, B., Camarda, A., Mercier, M., Burkhardt, J.-M., Morisseau, T., Bourgeois-Bougrine, S., Vinchon, F., El Hayek, S., Augereau-Landais, M., Mourey, F., Feybesse, C., Sundquist, D., & Lubart, T. (2023). Creativity, critical thinking, communication, and collaboration: Assessment, certification, and promotion of 21st-century skills for the future of work and education. *Journal of Intelligence*, 11(3), Article 54. <https://doi.org/10.3390/jintelligence11030054>
- Timothy, A. (2016). How technology benefits learning. Retrieved from <https://elearningindustry.com/technology-benefits-learning>
- Timothy, D. (2016). Enhancing learning through technology. *Journal of Educational Technology Systems*, 44(2), 187–196.
- Timperley, H. (2011). *Realising the power of professional learning*. McGraw-Hill Education.
- Tomasino, A. P., & Fedorowicz, J. (2014). Fad-like technology adoption as a social activity. *International Journal of Information Systems and Management*, 1(1–2), 37–59.
- Tomei, L. A. (2005). *Taxonomy for the technology domain*. Information Science Publishing. DOI: 10.4018/978-1-59140-524-5.ch005
- Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, 65(3), 555–575.
- Trowler, P. (2015). Change thinking, change practices. Lancaster. https://www.academia.edu/10275967/Change_Thinking_Change_Practices
- Tuma, F. (2021). The use of educational technology for interactive teaching in lectures. *Annals of Medicine and Surgery*, 62, 231–235.
- Uerz, D. C., Kral, M. H., Gorissen, P. J. B., Van der Neut, I., Van Zanten, M., Tondeur, J., Nackaerts, U., & Howard, S. (2021). A framework for digital competences of lecturers. *iXperium*. University of Cape Town. (2016). *UCT 2015 teaching and learning report*.

http://www.uct.ac.za/usr/news/downloads/2016/UCT_2015_Teaching_Learning_Report_November2016.pdf

- University of Cape Town. (2018). *Teaching and learning report*. Senate meeting, 28 September 2018. Available:
http://www.uct.ac.za/sites/default/files/image_tool/images/328/teaching/2017_TL_Report_For_Senate_28Sept2018.pdf. Retrieved 30 March 2020.
- University of Cape Town. (2021). *UCT Vision 2030: Digitally Enabled Education*. Retrieved from <https://cilt.uct.ac.za/teaching-resources/uct-framework-teaching-and-learning>,
- University of Cape Town. (2022). Teaching & learning report 2021 (pp. 122–124). Centre for Higher Education Development. Retrieved from <https://ched.uct.ac.za/teaching-learning>. 30 April 2025
- University of Cape Town. (2024). University of Cape Town Rankings. Retrieved from <https://edurank.org/uni/university-of-cape-town/rankings/>
- University of Johannesburg's "Academic Workload Model: Principles and Guidelines" (2019) from <https://www.uj.ac.za/wp-content/uploads/2021/12/senate-approved-academic-workload-model-2019.pdf>. Accessed 2 May 2025.
- Uzorka, A., & Olaniyan, A. O. (2023). Leadership role and professional development of technology. *Education and Information Technologies*, 28(1), 713–723.
- Uzorka, A., Namara, S., & Olaniyan, A. O. (2023). Modern technology adoption and professional development of lecturers. *Education and Information Technologies*, 28(11), 14693–14719. <https://doi.org/10.1007/s10639-023-11790-w>
- Vallera, F. L., & Sadat, B. (2021). Using design thinking practices to create technology-driven adult professional development programs. In *Research anthology on adult education and the development of lifelong learners* (pp. 1086-1100). IGI Global.
- Van den Beemt, A., & Diepstraten, I. (2016). Teacher perspectives on ICT: A learning ecology approach. *Computers & Education*, 92–93, 161–170.
- Van der Merwe, H.A. (2015). Activity Theory, Authentic Learning and Emerging Technologies: Towards a Transformative Higher Education Pedagogy, Bozalek, V., Ng'ambi, D., Wood, D., Herrington, J., Hardman, J. & Amory, A.(Eds.): book review. *Critical Studies in Teaching and Learning (CriSTaL)*, 3(1), 89-93.
- Van Heerden, A., Tomlinson, M., Leppänen, J., Rotheram-Borus, M. J., Worthman, C. M., Kohrt, B. A., Skeen, S., Giese, S., Hughes, R., & Bohmer, L. (2020). Emerging opportunities provided by technology to advance research in child health globally. *Global Paediatric Health*, 7, 1–10.

- Van Rijmenam , M. (2023, June 14). Empowering digital natives: Education speaker on the future of learning. Dr Mark Van Rijmenam, CSP | Strategic Futurist Speaker. <https://www.thedigitalspeaker.com/digital-natives-education-speaker/>
- Van Wyk, C., & Van Zyl, G. J. (2023). The roles of the academic in health sciences: Where to start from a faculty development perspective. *Professional Development in Education*, 49(2), 387–397.
- Vansteenkiste, M., Ryan, R. M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation and Emotion*, 44, 1–31.
- Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge—A review of the literature. *Journal of Computer Assisted Learning*, 29(2), 109–121.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- W.K. Kellogg Foundation. (2004). *Logic Model Development Guide*. W.K. Kellogg Foundation.
- Wang, A. Y. (2022). Understanding levels of technology integration: A TPACK scale for EFL teachers to promote 21st-century learning. *Education and Information Technologies*, 27, 9935–9952.
- Weimer, M., & Lenze, L. F. (1997). Instructional interventions: A review of the literature on efforts to improve instruction. In R. P. Perry & J. C. Smart (Eds.), *Effective teaching in higher education: Research and practice* (pp. 205–240). Agathon Press.
- Wenger-Trayner, E., & Wenger-Trayner, B. (2015). Introduction to communities of practice: A brief overview of the concept and its uses. <https://Introduction to communities of practice - wenger-trayner>
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.
- White, J. T., & Myers, S. D. (2001). You can teach an old dog new tricks: The faculty's role in technology implementation. *Business Communication Quarterly*, 64(3), 95–101.
- Wilkerson, L., & Irby, D. M. (1998). Strategies for improving teaching practices: A comprehensive approach to faculty development. *Academic Medicine*, 73(4), 387–396.
- Wills, J., & Rudolph, M. (2010). Health promotion capacity building in South Africa. *Global Health Promotion*, 17(3), 29–34. <https://doi.org/10.1177/1757975910375167>
- Worth, J., & Van den Brande, J. (2020). Teacher autonomy: How does it relate to job satisfaction and retention? *National Foundation for Educational Research*. Retrieved from <https://files.eric.ed.gov/fulltext/ED604418.pdf>

- Wu, B., Lee, S., Chang, H., & Liang, J. (2016). Current status, opportunities, and challenges of augmented reality in education. *Computers & Education*, 62, 41–49.
- Xianhan, H., Chun, L., Mingyao, S., & Caixia, S. (2022). Associations of different types of informal teacher learning with teachers' technology integration intention. *Computers & Education*, 190, 104604.
- Yadav, A., Hambrusch, S., Korb, T., & Gretter, S. (2014). Professional development for C.S. teachers: A framework and its implementation. Paper presented at the *Future of C.S. Education Summit*, Orlando, FL.
- Yehya, F. M. (2021). Promising Digital Schools: An Essential Need for an Educational Revolution. *Pedagogical Research*, 6(3).
- Yurtseven, N., Akkaş Baysal, E., & Ocak, G. (2020). Analysis of the relationship between primary school students' decision-making skills and problem-solving skills. *International Online Journal of Education and Teaching*, 8(3), 2117–2130.
- Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *Education in Medicine Journal*, 11(2), 49-54. DOI:[10.21315/eimj2019.11.2.6](https://doi.org/10.21315/eimj2019.11.2.6)
- Zhang, W. (2022). The role of technology-based education and teacher professional development in English as a foreign language classes. *Frontiers in Psychology*, 13, 910315.
- Zhou, X., Shu, L., Xu, Z., & Padrón, Y. (2023). The effect of professional development on in-service STEM teachers' self-efficacy: A meta-analysis of experimental studies. *International Journal of STEM Education*, 372(10).
- Zimmerman, J., McAllister, K. S., & Ruggill, J. E. (2019). The overhead projector: Visuality and materiality. In M. Wolf (Ed.) *The Routledge Companion to Media Technology and Obsolescence* (pp. 90-102). Routledge.
- Zyphur, M. J., & Pierides, D. C. (2017). Is quantitative research ethical? Tools for ethically practicing, evaluating, and using quantitative research. *Journal of Business Ethics*, 143(1), 1-16.

Appendix A – Survey

**Respondent
pseudonym:**

University of Cape Town: School of Education

Self-administered structured questionnaire

Title of the study: An Activity Systems inquiry exploring the factors that shape lecturers' uptake and integration of educational technologies into pedagogical practices.

Investigator: Gregory Doyle (PhD candidate)

Supervisor: Prof. D. Ng'ambi

The questionnaire aims to investigate the use of technology, self-determination, and professional (staff) development and how it affects your teaching practice.

Information:

The proposed study has ethics approval (HREC REF267/2021). You have been identified as a lecturer who is using / have used computer and internet-based tools in teaching.

Thank you for contributing your time and thoughtful responses to this questionnaire, which should take about 10 minutes. Completion hereof acknowledges that you have already consented to partake in this study. Your responses are confidential, and you will not be identified in any publication or report which arises from this research.

Your participation in this research will help shape the design of staff development activities on how to transform teaching using technology.

1. I hereby acknowledge that I have given consent for my participation in this research which will help shape the design of professional (staff) development activities on how to transform teaching using technology.
 - a. Yes
 - b. No
2. Name and Surname

Section A: Professional Development Activities

3. Which of the following professional development activities have you attended, and if so, how many in the last year? Also, how important would you rate it (1 = low or no importance, 5 = high importance)

Activity	Approximately how many times have you attended this activity in the last 12 months (0 = not attended)	How important would you rate attending this activity (1 – 5)
i) Workshops, seminars, conferences within UCT		
i) Workshops, seminars, conferences outside UCT		
i) Short (non-formal) courses		
i) Participating in a journal club		
i) Mentoring or coaching other lecturers (informal)		
i) Observing another lecturer's classroom teaching (informal)		
i) Participating in research with other lecturers		
i) Professional development activity organized by colleagues		
i) Other, please specify		

3. How important is professional development to you? Please rate each of the following reasons for why you would attend a professional development activity.

Professional development activities:	Very important	Important	Not important	Not applicable	Not considered
k) Assist me to achieve the course(s) learning outcomes which I teach					
k) Enhance collaboration and collegial support					
k) To help me gain a certificate (certification)					
k) Improve my teaching motivation and confidence					
k) A departmental or unit requirement					
k) A professional body I belong to requires/d me to participate (CPD points)					
k) Support my professional needs and goals					
k) Update and improve my teaching skills					
k) Update and improve my disciplinary content knowledge					
k) To help me assess better.					
k) To support colleagues in unit / department					
Other reason(s) why you attend professional development activities					

5. Which of the following item statements influenced the educational technologies (ET) you use in your practice? ET is defined as computer and internet-based tools used to serve education-related purposes (Ng'ambi et al., 2012)

	Never	Sometimes	Often	Always	N/A
j) As a result of a unit or departmental decision					
j) As a result of engaging in collaborative learning design with other colleagues					
j) Based on course feedback from students					
j) An excitement of new technologies to foster learning					
j) From online reports or articles including websites, blogs, podcasts etc.					
j) Through discussions with my colleagues in informal conversations					
j) Through discussions with colleagues from a teaching support or similar unit (e.g., CILT)					
j) h) From attending a webinar, conference, or similar meeting.					
j) As a result of changes brought about by the COVID-19 pandemic					
j) From observing a colleague using educational technology					
Other, please specify:					

4. What changes to curriculum which involved the uptake or integration of educational technology (of any kind or magnitude) have you been implementing in your practice over the past 24 months (i.e., because of the COVID-19 pandemic but also before that)?

--

5. What barriers have you experienced when wanting to implement changes related to the educational technology you are / or would have liked to use in your practice over the last 12 months?

Item statements	Never	Sometimes	Often	Always	N/A
k) Insufficient understanding about how to implement a technology					
k) Not enough technological knowledge and skills					
k) Not enough support to implement or use the technology					
k) Lack of relevant professional development opportunities related to educational technology					
k) Tension / discouragement / pressure from other lecturers					
k) Time limitations					
k) Lack of support from my department and/or faculty					
k) h) Lack of support from colleagues					
k) Insufficient financial support					
k) Student lack of engagement					
k) Other, please specify:					

6. Rate the following statements as they relate specifically to your teaching. (*Tapal et al., 2017*)

Item	Strongly Disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
a) I author most of the content I teach.							

b) What I teach is largely within my control.							
c) I am responsible for how I teach (pedagogies I use).							

Section B: Demographics

7. How many years have you been teaching in the faculty?

8. What is your highest formal qualification?

9. Do you have a formal teaching qualification, if so, please list it below?

10. Which undergraduate course(s) do you teach?

Thank you for your time!

Appendix B – Consent

University of Cape Town: School of Education

CONSENT FORM FOR PARTICIPANTS

Title of the study: An Activity Systems inquiry exploring the factors that shape lecturers' uptake and integration of educational technologies into pedagogical practices.

Please read the information sheet then answer the following statements and tick the "Yes" or "No" option.

Declaration	Yes	No
I have read through the information sheet and understand what is expected of me.		
I understand that my consent is required.		
I understand that there are no risks or benefits for me if I choose to participate in the study.		
I understand that participation is voluntary, and I can withhold my consent without any consequences to myself.		
I understand that I can withdraw from the study at any time		
I understand that any information I provide will be kept confidential and that my identity will not be revealed.		
I consent to complete a questionnaire as part of this study.		
I consent to participate in an interview if I am asked to.		
I understand that the interviews might be audio-recorded and transcribed. I will have an opportunity to check the transcripts of the interviews for verification. I also understand I can refuse to be audio recorded in which case written notes will be made during the interview.		
I consent to make documents related to my teaching such as the learning objectives, lesson plans and course outlines available		
I understand that all interview data will be stored in password protected files and destroyed within five years after the completion of the research.		

The data collected from my participation will be used for a doctoral thesis, and I consent for it to be used in that manner.		
The data collected from my participation may be used for conference papers and/or publications in scholarly journals, and I consent for it to be used in that manner.		
I would like a summary of findings of this research forwarded to me at the conclusion of the research.		

I, _____ hereby consent / do not consent (cross out as need be) to participate in this study.

Signature:

Date: _____

Appendix C – Quantitative Data Extract

Raw data from the Survey, specifically Question 3 results.

Activity	Approx the times you attended this activity in the last 12 months (0 = not attended)	How important would you rate attending this activity (1 – 5)
a) Workshops, seminars, conferences within UCT		
b) Workshops, seminars, conferences outside UCT		
c) Short (non-formal) courses		
d) Participating in a journal club		
e) Mentoring or coaching other lecturers (informal)		
f) Observing another lecturer's classroom teaching (informal)		
g) Participating in research with other lecturers		
h) Professional development activity organized by colleagues		
i) Other, please specify		

	Q3a	Q3a	Q3b	Q3b	Q3c	Q3c		Q3d				Q3f				
Le	_Tim	_Rati	_Time	_Rati	Time	Ratin	Q3d_	Ratin	Q3e_	Q3e_	Q3f_	Ratin	Q3g_	Q3g_	Q3h_	Q3h_
ct	es	ng	s	ng	s	g	Times	g	Times	Rating	Times	g	Times	Rating	Times	Rating
ER																
I	2.00	5.00	1.00	4.00	1.00	4.00	1.00	1.00	1.00	5.00	2.00	5.00	2.00	5.00	1.00	2.00
A																
G																
N	5.00	4.00	3.00	4.00	2.00	4.00	4.00	4.00	2.00	1.00	2.00	4.00	1.00	5.00	2.00	4.00
LLI	3.00	4.00	11.00	4.00	1.00	2.00	7.00	3.00	1.00	4.00	1.00	3.00	1.00	2.00	3.00	4.00
M																
A																
N	2.00	4.00	1.00		1.00		1.00	5.00	12.00	5.00	6.00	4.00	7.00	5.00	1.00	
RE																
D	5.00	5.00	2.00	5.00	1.00		12.00	2.00	1.00		1.00		3.00		1.00	

N A M	8.00	5.00	1.00	5.00	1.00	3.00	2.00	5.00	4.00	5.00	1.00	2.00	2.00	3.00	7.00	4.00
EZ N	3.00	4.00	1.00	4.00	1.00	3.00	1.00	3.00	4.00	5.00	4.00	4.00	4.00	5.00	3.00	5.00
B O C	6.00	3.00	12.00	4.00	2.00	4.00	12.00	3.00	5.00	4.00	6.00	3.00	2.00	4.00	2.00	4.00
N O D	2.00	4.00	4.00	5.00	1.00		1.00		6.00	5.00	4.00	3.00	1.00	5.00	1.00	5.00
G R E	6.00	4.00	6.00	5.00	1.00	2.00	1.00	1.00	3.00	5.00	1.00	3.00	5.00	4.00	1.00	4.00
N O T	1.00		3.00	5.00	1.00		2.00	4.00	1.00		2.00	4.00	4.00	5.00	2.00	5.00
EI S	1.00		2.00	3.00	1.00	1.00	9.00	3.00	4.00	4.00	1.00		2.00	3.00	2.00	3.00
SE I	6.00	4.00	11.00	4.00	1.00	1.00	1.00	1.00	5.00	5.00	3.00	4.00	1.00	2.00	2.00	4.00
AZ O	12.00	5.00	8.00	5.00	2.00	4.00	1.00	2.00	1.00	2.00	2.00	4.00	1.00	3.00	1.00	2.00
EV R	6.00	5.00	6.00	5.00	1.00	3.00	1.00	4.00	2.00	3.00	1.00	3.00	1.00	2.00	2.00	5.00
EN W	12.00	3.00	12.00	3.00	1.00		1.00		1.00		1.00		12.00	3.00	1.00	
YA D	6.00	4.00	4.00	4.00	1.00	3.00	1.00	3.00	7.00	5.00	3.00	5.00	4.00	4.00	2.00	5.00
N GE	5.00	5.00	2.00	5.00	1.00		1.00		2.00	5.00	1.00		2.00	4.00	1.00	
ES U	4.00	4.00	1.00						5.00	4.00	12.00	5.00	12.00	5.00	8.00	5.00

N																
OS	8.00	4.00	5.00	5.00	2.00	5.00	1.00	4.00	4.00	5.00	1.00	3.00	3.00	5.00	1.00	4.00
IE																
N	4.00	4.00	1.00	3.00	1.00	3.00	1.00	3.00	1.00	3.00	1.00	3.00	4.00	5.00	5.00	3.00
RA																
M	11.00	4.00	3.00	5.00	1.00	1.00	1.00	1.00	6.00	4.00	1.00	1.00	5.00	5.00	6.00	4.00
ID																
A	1.00	4.00	1.00	4.00	1.00	1.00	12.00	5.00	9.00	5.00	1.00	4.00	3.00		1.00	3.00
RE																
G	5.00	3.00	4.00	5.00	1.00	2.00	1.00	2.00	4.00	3.00	1.00	2.00	4.00	3.00	1.00	3.00
LL																
E2	6.00	4.00	11.00	4.00	1.00	4.00	12.00	5.00	11.00	5.00	4.00	5.00	12.00	5.00	3.00	5.00
LL																
E	4.00	3.00	7.00	5.00	1.00	4.00	1.00	1.00	3.00	3.00	1.00	1.00	12.00	5.00	12.00	5.00
TR																
A		3.00		4.00		2.00		1.00		3.00		2.00		3.00		4.00
NE																
S	12.00	5.00	6.00	5.00	4.00	5.00	1.00	1.00	5.00	5.00	3.00	4.00	3.00	5.00	6.00	3.00
N																
A																
N	12.00	5.00	12.00	5.00	1.00	3.00	1.00	5.00	12.00	5.00	1.00	5.00	7.00	5.00	3.00	5.00

Appendix D1 – Qualitative Data Extract – PD

	Subject	Object (desired	Tools (mediating	Rules
	-lecturers discussing their views on professional development): -How do they describe their role in professional development? -What emotions or sentiments do they express towards professional development?	outcomes of professional development): -What outcomes or objectives do they explicitly state they aim for with their professional development? -Are there any implied or inferred goals based on their discussions?	artefacts / a pedagogical method or e-learning theory): -What tools, resources, or methodologies do they use to facilitate professional development? -Are there any tools they wish they had access to or any they found particularly beneficial or challenging? Any tool, sign, or symbol the lecturers mention using or interacting with pursuing their objectives. Look for mentions of specific resources, platforms, theories, or methods. (Top 3 from questionnaire)	(regulations, norms, conventions): -Do they mention any formal guidelines, standards, or expectations they must adhere to? -Are there unwritten norms or pressures they feel regarding professional development?
Interviewee				
Lecturer_YAD	The lecturer describes their attitude and feelings towards professional development, expressing sentiments like "How hard can it be" and discussing their role and	"Learn from what others do" and "Want staff to do it themselves" are direct outcomes or goals of PD.	"Presented at a conference, collaborated with Denmark, and preferring interactive forms of PD" are tools or	Mentioning that "ET is not part of the strategic plan" and the need for "buy-in from colleagues" speaks to both

	identity in relation to professional development.		methodologies they've used.	formal and informal rules and expectations.
Lecturer_NEI	These responses do seem to centre around the lecturer's views on professional development, their role in it, and their sentiments towards it.	They pertain to the desired outcomes of professional development and the lecturer's objectives for their growth.	There are a few points that might better align with other definitions. For example, "The division will support PD..." might be more apt for "Division of Labour" or "Rules".	Not all of them directly relate to regulations, norms, or conventions. For example, "Using ET is a lot of work..." might be more aligned with the "Object" or "Tools".
Lecturer_EZN	Have done student training. Had to teach them. PD is about wanting to improve yourself, or the dept says you need those skills. It can be personal or organisation, and both benefited me. I felt supported, and they perceived me as optimistic.	To help students with disabilities. To make the curriculum accessible to students. I could not leave students behind, so I had to learn. There are new ways of doing things better. Improve practice, better student graduates, and better for society. Also, to see what is new - happening?	Webinars, conferences. Online webinars. Colleagues don't have time; unsure it will help their practices. They need to put extra time into the schedule. They see themselves as technologically disabled.	Went to DVC and pitched four presentations to the T&L committee to act as champion. Ended up creating a MOOC.

Appendix D2 – Qualitative Data Extract – ET

Interviewee	Subject (Lecturer Role, describe their position, experiences, responsibilities using ET for teaching).	Object: Identify the goals or objectives the lecturer aims to achieve through educational technology. Look for statements about why and how they use technology in their teaching	Tools (Used in Teaching) What. How they use it. Usefulness. Issues with tech. a pedagogical method or e-learning theory. Any tool, sign, or symbol the lecturers mention using or interacting with pursuing their objectives. Look for mentions of specific resources, platforms, theories, or methods.	Rules (Governing Tech Use) Rules. Institutional policies, societal norms, personal beliefs, ethics
Lecturer_YI AD	I started using technology at a young age. I even read manuals. I am using LMS tools, blogs, and polls. I have a "How hard can it be" attitude. I investigate. I embrace tech. I have an affiliation with gadgets. Failure does not discourage me.	ET is used to support or enhance current ways of teaching. I have always been interested in current ways of teaching. I use digital gadgets and trying to figure things out for myself. My attitude is, "How hard can it be?" to figure things out. With the pandemic, I had myself. ET is not part of my teaching. I try to integrate ET into courses, but ET is often not part of the outcomes of the curriculum. It is incorporated based on individual needs and interests. I use digital	ET is integrated into the curriculum or LMS. It supports or enhances curriculum. I learn from others. Do it yourself attitude. stories, Blogs, Forums, Polls and Zoom. I tend to do. I embrace technology. ET should be part of the strategic plan. The curriculum is not taught in silos. Knowledge is a scaffold; we build on each other's work. Need to get	How hard can it be? Outcomes of the curriculum. I learn from others. Do it yourself attitude. Experience is in the doing. I embrace technology. ET should be part of the strategic plan. The curriculum is not taught in silos. Knowledge is a scaffold; we build on each other's work. Need to get

	individual lecturer needs stories based on what I buy-in from and interests. I want staff saw colleagues at WITS colleagues. to do it for themselves use; they are more Collaborate with since they learn by doing; advanced than ours. others. the experience is in the Presented DS at a doing. I ask myself how I conference and can integrate ET better, collaborated with not just as an add-on. I Denmark colleagues. was exposed to blended Also, have interest from learning and digital colleagues nationally. stories at conferences. I Initially, there was lots started using digital of resistance because of stories - it is not much the way it was extra work. I have an introduced, not part of affiliation with the curriculum, and the technology and have no staff was unprepared. I fear of failing. If I do, it is want the team to do it not a disappointment. I themselves; the will embrace it. ET is not experience is in the for everything; students doing. Sometimes there still have to work with is a reason for them to actual patients. There are complain because how I contextual and introduced ET could environmental have been more challenges which we accessible and not as an cannot ignore but also add-on. Use digital cannot allow to be a stories as part of a staff limitation. We need to presentation. It was get buy-in from impactful. I need to colleagues because the introduce ET more curriculum is not taught easier. ET is not for in a silo. We build on each everything; students other's work. must practice with
--	--

			actual patients. Not everyone buys into ET because it's not part of the strategic plan. Contextual challenges we cannot ignore but cannot be limited by it either. I have an affiliation with technology - I embrace it. Even if it fails, I do not feel discouraged. Getting buy-in from colleagues is difficult because the curriculum is not taught in silos and needs their buy-in. We build on each other's words.	
Lecturer_ NEI	ET is used to engage students. I use Vula / Teams / Zoom/blogs, more than just PPT. Students have to present seminars using tech- they select and choose which ET to use. Covid forced the increased usage of ET. I see the benefit of ET and use it regularly. Before, Covid was difficult to get others to use ET; now,	I use ET in the teaching space to engage students. ET affords participation and engagement for teaching and learning. I used a laptop, Zoom, MS Teams, and the LMS. Students write quizzes, Forums, and Blogs. Students use ET to present their seminars and can give students the responsibility to find which ET to use. The	I used it in my teaching space to engage students and allow participation. I use it for teaching and learning. Give students responsibility to find ET. My limitation should not be imposed on the students. Use ET that is beneficial. I had to adapt because of	To engage students. To allow for participation. For teaching and learning. Give students responsibility to find ET. My limitation should not be imposed on the students. Use ET that is beneficial. I had to adapt because of

it's easier. People were choice is up to them. My students. COVID forced COVID-10. I enjoy stuck in their ways; now, limitations should not us to use more ET. Now learning new things. they are more open. At constrain students. it is easier to get others the start of COVID and COVID forced us to use to use ET. In my having to use new ETs, I more ET in our teaching, division, staff are stuck felt thrown into the and I use it more in their ways, but since deep end - using a regularly. After COVID, COVID, they are more virtual classroom was others are also using it open and using ET more difficult, and I was not more; they are no longer often. I was thrown into ready. I use more ET as set in their ways as the deep end with because of COVID. I am they used to be when it COVID; I was not ready, not tech-savvy, so using comes to ET. Using ET is a and using a virtual ET was complicated. I lot of work, and I have felt classroom was difficult. am new. I became thrown into the deep end I limited the use of ET anxious because of- for example, using a initially to avoid having to use ET. virtual classroom was overwhelming

I learned how to use difficult. I was not ready. I students. ET is Teams and had to adapt often use low-tech ET not complicated; I am new and make changes. This to overwhelm students. I at teaching and need to interview is causing me am not tech-savvy and be ET savvy. I had to to reflect on how I grew became anxious because learn to use Teams. But and learned a lot. Now of ET I had to use. But I knew I had to adapt it's easier; ET saves time. learnt how to use ET and could not Realise there is room for because I knew I had to procrastinate. I learned online teaching using ET, adapt and make the a lot. Using ET is more even now. Barriers change. I've grown a lot in work than face-to-face experienced are using ET, and this teaching, but now it's internet access, load-interview is causing me to easier. ET saves time in shedding, and data. reflect. I find using ET creating content. Even Overcoming barriers - I now is easier. ET saves though we are back to enjoy learning new time creating material. face-to-face, I still use things, doing lots of hard There is room for ET, ET. Internet access and work, and introducing even in our face-to-face loading shedding were

	new things to students teaching interactions. barriers, and students but training them takes Barriers I experienced needed data. I enjoy time. I took courses were internet learning new things. offered at UCT. I do not connectivity and load Lots of work often take time for self-shedding, which made it introducing something development. I sharedifficult for me and the new; you have to be what I learn with students. I share what ET patient and take time to colleagues, and theyI am using, and others in train the students. I share as well, which is the department also take courses UCT offers valuable and helpful.share, which is helpful though time is often a Colleagues are helpful.and valuable. Others constraint. I share tools IT friends introduced meshare notes fromI use, and colleagues do to new apps. I giveattending workshops the same; it's helpful. students thewhich I could not Others are supportive in responsibility to find participate in. Also, ITour division. Friends new things - they can be friends have introduced also introduced me to creative. We should not me to different apps. different apps for my impose our limitations teaching. on students - provide them the freedom to use what is available.	
Lecturer_E ZN	EET is not the solution; Use ET to improve To connect with TO improve the how you use it in teaching and learning. To students 1:1. Allow quality of teaching teaching makes it improve the quality of students to ask and learning. educational, I tried to teaching and learning. questions. To improve Improve the introduce ET to Improve the relationship relationships with relationship with colleagues in the between lecture and students and bring students and department, initially student. Improve costs down costs. Flipped lecturers. Improve against it, then needed and practice. Increase classroom so students accessibility - to accommodate access. To connect with can come to class better increase access. To students with students. ET helps you be prepared, with connect with disabilities, so some flexible. Can give questions. MS Teams & students. To buy-in, then COVID -personalised feedback. Zoom to take teaching accommodate	

more buy-in. Look for appropriate ETs. What is working f2f might not work online. Podcasts and narrated PPTs were pivotal. And WhatsApp. Reasons for using ET - help students with disabilities. I flipped classrooms to help students to replicate f2f and audio to connect online. Do student training to help them with ET usage. The barrier was connection, so I used WhatsApp to teach them. Impact of senior colleagues - enabled them, and they became a catalyst, making other buy-in easier. I attended workshops, webinars, and conferences to familiarise myself with ET. I learned there is no translation from f2f to online teaching - you must change pedagogy and use ET to support pedagogy. They see me as positive, acting as a champion.	Immediate feedback. Allows for 1:1 connection. Tried to replicate f2f teaching and ET to connect with students, and PPT build connection. LMS. Skype. WhatsApp. To help those who are technological disabled. Use podcasts, and audio to connect with students. Incorporate ET to make curriculum accessible to students.	online. Podcasts received good feedback, including voice notes with assignments. Narrated PPT build connection. LMS. Skype. WhatsApp.	students. Learn new ways to do things better. To increase student graduate attributes.
--	--	--	---

Lecturer_ RAM	I have used various engagement tools. There have been difficulties finding copyrighted-free images, but I still use it. Use ET before, during and after the lecture. Try to offset heavy content. I use ET for evaluations and ask students to create videos. Using ET is easier in smaller classes, but using ET effectively is challenging. I remind others in dept of ET options. I started using ET when I started lecturing part-time eight years ago. I want to do more, but there are constraints and large class sizes. I do not want students to get caught up in ET. I try to help struggling students and consolidate their learning. Barriers experienced are time, student comfort with ET: the difficulty of teaching online, and	The use of ET enhances educational practice. It is just a tool and plays a role in learning and solving problems. I use classroom-response engagement tools like systems such as Mentimeter to engage students. I also use images which might have copyright restrictions, but I still use them. I often use ET before, during and after lectures to offset the content-heavy curriculum. Using ET effectively is challenging. Most colleagues use PPT, but I remind them there are other options. I want to do more but time, and class size are constraints. I also did not want students to get caught up in ET. Use it to help struggling students and consolidate their learning. Barriers experienced are time and student comfortability challenged using ET. Online teaching is more complex than face-to-	ET is a tool which affords participation, enhances educational practice and solves problems. Use classroom-response engagement tools like ET to help consolidate learning. For me to be clued up in using ET. I need to set priorities which enhance or improve practice.	Part of educational practice. To engage students without getting students to get caught up in ET. ET to help consolidate learning. For me to be clued up in using ET. I need to set priorities which enhance or improve practice.
---------------	--	---	--	--

teaching in an face-to-face. Students face. Using Forums was integrated course where had to learn new tools, a disaster, so I moved to other lecturers are not and I am teaching an Padlet, Then to Google on board. Other integrated course, and Docs. I have attended lecturers were using some lecturers were not workshops to learn how only PPT. Using online on board. At one stage I to use these. For my forums was a disaster, felt I was the only one role, I feel I need to be but I moved to Padlet using ET. I tried different clues up. Other and, when that did not ETs, e.g. forum was a priorities often mean I work either, to Google disaster, moved to don't have time. I Docs. I looked for Padlet, and then back to shared practices with alternatives. I do not Google Docs. I decide others. I did not have need permission to what to do in my teaching time to do videos. ET choose what to do, the and what ET to use. I use is context support I need, or what attend workshops dependent. workshops to attend. I because I need to be feel I need to be clued up as a lecturer. up for my role. Other priorities Sometimes others sometimes mean I can priorities mean I cannot only participate in some participate in of the workshops I want workshops. I prefer to. I also enhance or workshops to just improve my practice watching videos; I need based on student to be engaged. I feedback. I want to enhance my practice innovate. Budget based on student constraints mean I feedback. There are also cannot implement some budget constraints on technology. I shared what ET I can some of my practices implement. I share some with others. of my practices with colleagues and even at

	other institutions where I have been invited to present.			
--	--	--	--	--

Appendix E – Literature Review Sources per Theme*

Professional Development - Forms - 9	Professional Development - Purpose - 8	Professional Development - Effectiveness - 39
Avidov-Ungar & Herscu, 2020	Benor 2000	Ahmad Zaky El Islami et al., 2022
Barton & Dexter, 2020	Hilty et al., 2019	Berry & Airhart, 2016
Behari-Leak et al., 2018	Prebble et al., 2004	Campbell et al., 2019a
Geertsema, 2021	Richter et al., 2011	Carnell et al., 2022
Jacob et al., 2015	Skeff et al., 1997	Coenders & Verhoef, 2019
Jones & Dexter, 2018	Steinert, 2005	Darling-Hammond et al., 2017
Mansvelt et al., 2008	Tejada Fernández, 2013	Davis et al., 2005
McMahon et al., 2015	Vallera & Sadat, 2021	De Villiers et al., 2018
Xianhan et al., 2022		Desimone, 2009
		DuFour et al., 2010
Professional Development - Challenges - 19	Professional Development - General - 20	Erlich et al., 2020
Adeoye et al., 2013	Behari-Leak et al., 2018	Guskey, 2002
Dintoe 2019	Cox, 2004	Hallinger, 2011
Dintoe, 2019	Day, 1999	Horn & Staker, 2015
Gee, 2008	Dill, 1980	Kaufman et al., 2003
Gunn et al., 2011	Gachago et al., 2017	Kent & Gibbs, 2004
Irby & O'Sullivan, 2018	Guskey, 2000	Kirkpatrick, 1994
Kaliisa & Picard, 2017	Guskey, 2002	Kirkpatrick, 2015
Knight et al., 2007	Guskey, 2003	Knight et al., 2007
Lea & Street, 1998	Hartshorne et al., 2020	Learning Forward, 2011
Mafunda et al., 2007	Hilty et al., 2019	Liao & Hsu, 2019
Mässon, 2017	Jacob et al., 2015	McLean et al., 2008
McLean et al., 2008	Kelchtermans, 2004	Mezirow, 2009
O'Doherty et al., 2018	O'Sullivan & Irby, 2011	Ng'ambi et al., 2012
Perlman et al., 2014	Philipsen et al., 2019	Ng'ambi, 2013
Skeff et al., 1997	Prebble et al., 2004	Patton & Parker, 2017
Steinert, 2005	Richlin & Cox, 2004	Penuel & Gallagher, 2017
Street, 1984	Steinert, 2005	Prebble et al., 2004
White & Myers, 2001	Tejada Fernández, 2013	Puentedura, 2012
Zhang, 2022	Vallera & Sadat, 2021	Rienties et al., 2023
	Wilkerson & Irby, 1998	Roberts & Bregazzi, 2023
		Schön, 1983
		Siemens & Long, 2011
Professional Development - Trends - 30	Professional Development - Rationale - 32	Steinert, 2005
Anorue et al., 2023	Benor, 2000	Stufflebeam, 2003
Benor, 2000	Bluvas, 2021	Timperley, 2011
Bond et al., 2020a	Bozalek et al., 2013b	W.K. Kellogg Foundation, 2004
Buabeng-Andoh, 2012	Brown & Duguid, 1991	Wenger, 1998

Cilliers & Herman, 2010	Cameron et al., 2023	Wenger-Trayner & Wenger-Trayner, 2015
Day, 1999	Campbell et al., 2019b	
De Villiers et al., 2018	De Villiers et al., 2018	Professional Development - Skills Development - 5
DHET, 2017	Gachago et al., 2021	Almerich et al., 2016
Gruppen et al., 2006	Geertsema, 2021	Gachago et al., 2021
Gusic et al., 2010	Gruppen et al. 2006	Koehler et al., 2013
Guskey, 2000	Gruppen et al., 2006	Rosenberg & Koehler, 2015
Guskey, 2003	Gulbahar, 2008	Suarez-Rodriguez et al., 2018
Haas et al., 2023	Gumede et al., 2023	
Higgs & McAllister, 2007	Guskey, 2003	Professional Development - Designing - 10
Hilty et al., 2019	Higgs & McAllister, 2007	Biondi, 2024
Inamorato dos Santos et al., 2019	Irby & O'Sullivan, 2018	Duran, 2022
Kelchtermans, 2004	Körkkö et al., 2022	Guskey, 2002
McLean et al., 2008	Mässing, 2017	Nachtigall et al., 2022
Nasser & Karraker, 2018	McClean et al., 2008	Rogers, 1962
Niemczyk, 2018	MHET, 2018	Sancar et al., 2021
Pramjeeth et al., 2023	Ng'ambi et al., 2012	Shea, 2021
Prebble et al., 2004	Nowell, 2022	Tondeur et al. 2017
Richter et al., 2011	O'Doherty et al., 2018	Vansteenkiste et al., 2020
Singh, 2015	Pololi et al., 2002	Vygotsky, 1978
Steinert, 2005	Prebble et al., 2004	
Tejada Fernández, 2013	Ramani, 2006	Professional Development - Regulatory and Context Driven - 8
Tomei, 2005	Rinfret et al., 2023	Arruzza & Chau, 2021
Vallera & Sadat, 2021	Steinert, 2005	Dowelani & Dowelani, 2020
Van Wyk & Van Zyl, 2023	Van Heerden et al., 2020	Frenk et al., 2010
Wills & Rudolph, 2010	Weimer & Lenze, 1997	HPCSA, 2021
	Wills & Rudolph, 2010	Khanna et al., 2021
	Zhou et al., 2023	Maphosa et al., 2014
		O'Doherty et al., 2018
		McKimm & Jones, 20189
Professional Development - Planning and Implementing - 11	Professional Development - Frameworks and Models - 20	
Al-Eaky & Mclean, 2012	Advance HE, 2023	
Alwadei, 2023	Bragg et al., 2021	
Becker et al., 2019	Brown et al., 2010	
Cioca & Gifford, 2022	Brown et al., 2010, Advance HE, 2023	
Desimone, 2009	Cochrane & Narayan, 2017	
Duran, 2021	Curwood, 2013	
McLean et al., 2008	Gupta, 1992	
Patfield et al., 2023	Guskey, 2003	
Pat et al., 2023	Jacob et al., 2015	

Prebble et al., 2004	Klein & Riordan, 2009	
Sims & Fletcher-Wood, 2021	Kohan et al., 2023	
	Leslie, 2020, Uzorka et al., 2023	
Professional Development - Effective Change - 3	National Forum for the Enhancement of Teaching and Learning in Higher Education, n.d.	
Davis et al., 2005	Ostaszewski & Reid, 2017	
DeLuca et al., 2017	Sancar et al., 2021	
Steinert, 2005	Steinert, 2005	
	Tack et al., 2018	
	Tejada Fernández, 2013	
	Uzorka et al., 2023	
	Yadav et al., 2014	
Educational Technology - Improving Pedagogy - 21	Educational Technologies - General - 14	Educational Technology - BrightSparks - 24
Alon & McIntyre, 2005	Afshari et al., 2009	Avancena et al., 2023
Aronin, 2019	Bond et al., 2020a	Avsec & Jerman, 2020
Aronin, 2019	Brasca et al., 2022	Barton & Dexter, 2020
Bond et al., 2020a	Chen et al., 2020	Biondi, 2024
Bozalek et al., 2013a	Cidral et al., 2018	Bozalek et al., 2013
Bozalek et al., 2013b	Gachago et al., 2013, p101	Campbell et al., 2019b
Bruce & Hogan, 2019	Gachago et al., 2021	Cooley et al., 2023
Chen, 2008	Gentry, 1995	Geertsema, 2021
Cui et al., 2023	Islami et al., 2022	Jones & Dexter, 2018
Dlamini & Nkambule, 2019	Mashau & Nyawo, 2021	King et al., 2021
Fernández-Batanero, et al., 2021	Ng'ambi et al., 2012	Mässing, 2017
Gachago et al., 2021	Richey, 2008	Ng'ambi et al., 2012
Granić, 2022	Thornhill-Miller et al., 2023	Ng'ambi, 2016
Neyland, 2011		Pololi et al., 2002
Ng'ambi et al., 2012		Ramani, 2006
Park & Son, 2009		Rogers, 1962
Schiller, 2003		Shelton, 2017
Tarling, 2018a		Tarling & Ng'ambi, 2016
Tarling, 2018b		Tarling, 2018
Timothy, A., 2016		Tomasino & Fedorowicz, 2014
Zimmerman et al., 2018		Tondeur et al., 2017
		Uzorka et al., 2023
		Witt et al., 2021
		Xianhan et al., 2022
Agency in Education - 4	Agency - Education - 3	Agency - Challenges - 1
Ali & Hamid, 2018	Hokka et al., 2017	Ali & Hamid, 2018
Edwards, 2015	Jones & Charteris, 2017	
Emirbayer & Mische, 1998	Kauppinen et al., 2020	

Etelapelto et al., 2013		
	Agency - Professional Development - 5	
Agency - Theory - 4	Kauppinen et al., 2020	
Archer, 1988	Mermelstein, 2018	
Archer, 1995	Mills, 2000	
Archer, 2000	Nguyen, 2020	
Archer, 2003	Stringer, 2007	

**References and totals adjusted towards end of write-up.*