An Inclusive Business Model Innovation in the Delivery of Blended Undergraduate Medical Education

Dissertation by

Dr Andrew Hibling

(HBLAND001)

Submitted in fulfilment of the requirements for the degree Master of Philosophy in Inclusive Innovation

Graduate School of Business

University of Cape Town

Supervisor: Prof Geoff Bick

February 2018

UNIVERSITY OF CAPE TOWN

GRADUATE SCHOOL OF BUSINESS

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Abstract

The World Health Organization predicts that by 2030 there will be a shortage of 1.1 million medical practitioners in Africa. Establishing medical schools is difficult and expensive. Existing schools, albeit under increasing austerity pressure, need to increase their output of medical practitioners.

This project aims to explore the implementation of an eLearning ecosystem in medical undergraduate education at the University of Cape Town, as a potentially key component in a blended learning curriculum. This could enable medical schools to use their existing infrastructure, and human and learning resources, to deliver effective off-campus teaching and learning; to increase the number of places available on-campus and, therefore potentially the number of graduating medical practitioners.

The project addresses the question of how students would use the eLearning ecosystem, what features they would require, and whether there would be any benefits to students, learning or otherwise.

This project employs a qualitative case study design with questionnaires, focus group observations and semi-structured interviews with multiple respondent types including medical and science students, facilitators, and lecturers. An inductive coding process was used to analyse the collected data.

Teaching and learning can potentially be offered off-campus by using an eLearning ecosystem with appropriate tools – but only if there significant faculty adoption, students are schooled in digital learning practices and have access to their lecturers and the eLearning ecosystem facilitates off-campus learning opportunities.

This project proposes a managed publishing business model innovation to help universities add value by empowering them to deliver a blended learning curriculum.

Glossary of Terms and Abbreviations

Abbreviations	Term
ABET	Adult Basic Education and Training
AMEE	Association for Medical Education in Europe
APA	American Psychological Association
API	Application Programming Interface
BCG	Boston Consulting Group
BLC	Blended Learning Curriculum
bPBL	Blended Problem-Based Learning
BRICS	Brazil, Russia, India, China and South Africa
BSc	Bachelor of Science
CD-ROM	Compact Disk-Read Only Memory
CEO	Chief Executive Officer
CHE	Council on Higher Education
CMS	Content Management System
CPI	Consumer Price Index
DHET	Department of Higher Education and Training
DP	Department of Pathology
EE	eLearning Ecosystem
EMI	Extended Matching Items
ePBL	Electronic Problem Based Learning
FHS	Faculty of Health Sciences
GDP	Gross Domestic Product
GSHRH	WHO Global Strategy on Human Resources for Health
GBS	Graduate School of Business
HPCSA	Health Professions Council of South Africa
HTML	Hypertext Mark-up Language
ICM	Inverted Classroom Model
ICT	Information and Communications Technology
IHS	Integrated Health Sciences
ILA	Interactive Learning Artefacts
IP	Invention Programme
LMS	Learning Management System
LO	Learning Objective
LOOOP	Learning Opportunities, Objectives and Outcome Platform

MBChB	Bachelor of Medicine and Surgery
MCQ	Multiple Choice Question
MOOC	Massive Open Online Course
MS	Microsoft
NLC	New Learning Centre
NMU	Nelson Mandela University
NBT	National Benchmark Test
NQF	National Qualifications Framework
OER	Open Educational Resource
PASA	The Publishers' Association of South Africa
PBL	Problem-Based Learning
PC	Personal Computer
PDF	Printable Document Format
PLC	Pathology Learning Centre
POP	Predictions of Performance
QM	Quality Matters
QR	Quick Response
SDG	United Nations Sustainable Development Goals
SAQ	Short Answer Question
SME	Subject Matter Expert
SOAP	Subjective, Objective, Assessment, Plan
SSI	Semi-Structured Interview
TBL	Team-Based Learning
TVET	Technical and Vocational Education and Training
UCT	University of Cape Town
UK	United Kingdom
UN	United Nations
USA	United States of America
WHO	World Health Organization
WYSIWYG	What You See Is What You Get

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Acknowledgements

This MPhil journey has been a significant learning process. After completing undergraduate degrees in two disciplines and with different faculties at UCT, I have found this post-graduate qualification to be an incredibly rewarding learning experience. The research has straddled three very important elements of my life: education, business and medicine.

I have enjoyed the inputs from the Graduate School of Business (GSB) as well as the Faculty of Health Sciences (FHS). At the UCT medical school, I would like to thank Associate Prof William Horsnell for setting this journey in motion, Prof Mark Nicol for picking it up and pushing it forward and Prof Carolyn Williamson from the Department of Pathology at UCT for embracing the eReader project and seeing it across the line. At the GSB, I would like to thank the MPhil course convenor Nicola Jowell, as well as Nuraan Isaacs. I would also like to thank my entire MPhil class who managed to deliver the quintessential post-graduate learning experience.

I would like to thank my colleagues at EDGE Learning Media (Pty) Ltd for granting me the time to complete this journey – especially my business partner, Janse Maritz, for never once complaining about my absenteeism.

I would like to thank my co-supervisor, Prof Francois Cilliers, for taking this project on, and being my teacher in this two-year journey. The majority of what I have learned on this journey has been the result of his guidance and insights. I would like to thank my supervisor, Prof Geoff Bick for always being there for my questions and for getting me over the line.

I would like to thank my wife for enduring the past two years and for supporting me in our endeavour, as well as my three fantastic children for sharing their Dad for two years.

Chapter 1: Introduction

1.1 Research Area and Problem

South Africa has three health systems – a private system, a public system and a non-government system. Funded by the State, the larger public system is integrated and tiered. It services most of South Africa's population. The public system comprises a network of primary healthcare facilities or clinics, and a secondary (district hospital) and tertiary (academic hospital) referral system. The system includes 4 200 public health facilities.

These facilities are run by health workers who are defined as "all people engaged in actions whose primary intent is to enhance health" (World Health Organization, 2006, p.xvi). They are considered to be "fundamental to ensuring equitable access to health services and achieving universal health coverage" (World Health Organization & Imperial College London, 2015, p.3). Globally, there are 59 220 000 healthcare workers with a density of 9.3 per 1 000 population. In Africa, the density of health workers is 2.3 per 1 000 population, in contrast with 24.8 per 1 000 population in the Americas (World Health Organization, 2006).

In its Global Strategy on Human Resources for Health (GSHRH): Workforce 2030 report, the World Health Organization (WHO) describes equitable access to health workers as an accelerant in achieving universal health coverage (World Health Organization, 2016a). The United Nations' (UN) proposed health and health-related Sustainable Development Goal (SDG) target 3c is to finance, recruit, develop, train and retain the health workforce in developing countries. A sustainable health workforce is a priority globally (World Health Organization, 2016a).

Multiple strategies exist to increase the number, density and appropriateness of healthcare workers. The WHO guidelines for transforming and scaling up health professionals' education

require the “sustainable expansion and reform of health professionals education and training to increase the quantity, quality and relevance of health professionals, and in so doing strengthen the country health systems and improve population health outcomes" (World Health Organization, 2013, p.11). Migration and retention strategies, as well as education and training strategies, are particularly important.

Health workers can be considered health service providers or health management and support workers. The two largest groups of health service providers in South Africa are nurses and midwives, and physicians. The term physician is synonymous with doctor or medical practitioner and includes both generalist and specialist medical practitioners. There are 43 277 registered physicians in South Africa (Health Professionals Council of South Africa, 2016). However, the country needs to increase its stock of physicians. The latest available data, gathered in 2013, states that South Africa has a density of physicians of 0.776 per 1 000 population. Africa has the lowest density of physicians of all the regions globally. South Africa is ranked below Algeria (1.207 per 1 000 population), Seychelles (1.067) and Mauritius (1.057). Emerging BRICS economies recorded densities of 1.891 per 1 000 population (Brazil), 4.309 (Russia), 0.702 (India) and 1.491 (China). In other economies, Argentina records a density of physicians as 3.859 per 1 000 population and in Cuba 6.723 (World Health Organization, 2015). The density of physicians in the South African public health system is so low that 47 per cent of public clinics reported no visits from doctors from May 2011 to May 2012 (Health Systems Trust, 2013). To enhance healthcare, South Africa needs to scale up the education and training of physicians at medical schools.

The demand for places at South African medical schools is high. This research project was conducted at the University of Cape Town (UCT), which received 4 400 applications for 220 places in 2012. Pretoria University received 11 000 applications for 240 places, Stellenbosch

received 1 800 applications for 230 places, and the University of the Witwatersrand received 6 000 applications for 250 places (Carte, 2012).

Establishing more medical schools is a potential solution to scaling up the supply of physicians. The Nelson Mandela University (NMU) is planning to have South Africa's 10th medical school. However, the cost of establishing medical schools makes it an expensive alternative solution. Universities are under pressure to increase the number of available places at existing medical schools, but limited resources are a barrier to successfully meeting the need for more physicians.

Universities are under austerity pressure. The university function is built on the pillars of teaching and learning, and research. Teaching and learning, or continuing or undesignated activities, are funded via state subsidies and tuition fees; while research, also referred to as designated activities, is funded independently by state grants and external funders.

The financial sustainability of a university's teaching and learning activities requires a balance between subsidies, fees and costs. Each of these components faces different pressures.

State subsidy is subject to pressure from competing state priorities. The funding allocation for higher education institutions from the Department of Higher Education and Training (DHET), is decreasing – in 2017, public spending on universities in South Africa, was 0.8 per cent of gross domestic product (GDP), which is low compared to global levels of around 2.5 per cent of GDP (Phungo, 2015).

Fees need to be affordable to ensure student access. The "#feesmustfall" movement highlighted the pressure for student fees to fall. In South Africa, educational inflation continues to outstrip the consumer price index (CPI) (Statistics South Africa, 2014). The price of higher education for South African students has risen dramatically and fees for medical students are the highest

of all faculties. In 2014, the price of first year medical school at UCT was R58 000. This increased to R64 370 in 2015. In 2015, UCT's medical degree was South Africa's most expensive degree (Grant, 2015). In 2017, the same medical degree was priced at R69 560 per student per year. Despite the announcement by the President of the Republic of South Africa, in December 2017, for free higher education for poor and low-income households, the UCT 2018 academic year fees have been increased by 8 per cent.

University revenue is also earned from alternative sources of income such as commercial revenue streams and donations.

Revenues need to be managed against a backdrop of continued efforts to manage costs. "Increasing costs are intrinsic to universities striving for quality in teaching and research, social responsibility, community engagement, accessibility to all, transformation, and a positive working environment for staff and students" (UCT Department of Finance, 2016, p.2).

The cost of running health sciences faculties at universities is high. The cost of training doctors is high. The UCT medical degree is a Bachelor of Medicine and Bachelor of Surgery, or MBChB degree. It is divided into three pre-clinical years followed by three clinical years. Pre-clinical teaching and learning uses a supported problem-based learning (PBL) approach, featuring a series of clinical cases as the problems. As a method of training physicians, PBL has been described as expensive to set up and expensive to run. According to Finucane, Shannon, and McGrath (2009), the recurring cost at the University of Limerick medical school "equates to €2 767 per student per year, 89% of which relates to tutor salaries". The human resource cost of running PBL is high, largely due to the human resource cost of employing facilitators for small group on-campus learning.

The cost of training doctors is further adversely affected by attrition rates. In 2007, 21 per cent of all life and physical sciences students in South Africa (including medical students) did not

make it past the first year of study (Scott, Yeld, & Hendry, 2007). Attrition and retention of access is critically important in the African context (Council on Higher Education, 2013).

Attrition rates in South Africa are adversely affected by epistemological access. Morrow (1992) identified two dimensions of access: formal access and epistemological access. The former refers to institutional access or the number of places available at universities, whereas the latter refers to a "political as well as an educational issue" (Council on Higher Education, 2010, p.vi) that focuses on concept formation and knowledge acquisition, and therefore refers to the assumptions that determine the way in which teaching and learning is delivered at universities (Council on Higher Education, 2010). Boughey (2005) found that epistemological access to higher education in South Africa is an important yet understudied area, as the school system in South Africa does not adequately prepare students for access into higher education (Scott et al., 2007).

The PBL approach could potentially contribute to the difficulties experienced by first-year medical students. It contrasts the traditional discipline approach on which textbooks are classically based by bringing multiple disciplines together in integrated cases. This often presents an epistemological barrier that sometimes requires intervention.

The UCT Faculty of Health Sciences (FHS) has devised an intervention programme (IP) to support students who have experienced barriers, thereby impeding their success and progress. "The principle aim of IP is to facilitate the process of becoming an effective learner, by addressing the skills deficits that prevent students from realizing their full potential" (Alexander, Badenhorst, & Gibbs, 2005, p.66). While it is funded in part by ring-fenced funding provided through foundation grants, and its overall effectiveness is contributing graduates to the stock of physicians, the IP is "demanding in terms of staff and resources" (Alexander et al., 2005, p.69).

In, 2016, the UCT FHS Department of Pathology (DP) instituted an eReader project. The project commenced with an analysis of the learning objectives of the immunology, virology and microbiology divisions within the department to arrive at a coherent, sequenced and integrated eReader outline for each division. The DP's existing learning resources for each division were then collated and augmented with multimedia elements and professionally published in the eReaders, in conjunction with resources for the PBL cases, lectures and practical learning opportunities. The eReaders were then presented in an eLearning ecosystem (EE) and used in the discipline-integrated PBL learning opportunity that blends on-campus and off-campus study.

The purpose of this research is to explore and critically evaluate the implementation of the eLearning ecosystem as a key component in delivering a curriculum that blends on- and off -campus learning opportunities in undergraduate teaching and learning at the UCT FHS.

An EE that embraces pedagogy and learning experience and facilitates the effective delivery of off-campus learning opportunities in a blended learning curriculum (BLC) is a potential solution to increasing the number of available places at South African medical schools.

By offering certain learning opportunities off-campus in a BLC, on-campus teaching and learning resources could be reallocated to additional on-campus students, and ultimately more students could be accommodated on campus. Notwithstanding the increased demands placed on clinical teaching and learning, as well as other requirements for off-campus teaching and learning such as devices and data, and social implications, theoretically, if the time spent on campus could be halved, the number of students on campus could be doubled.

In addition, in increasing the number of places, a BLC and EE could also potentially increase epistemological access and reduce the costs of undergraduate medical education, and

ultimately potentially increase the number of physicians graduating from South African universities.

This research is inclusive and is significant to the South African society, particularly to communities where access to healthcare is limited. This research is also significant to students and academia because of the potential to help overcome epistemological barriers. Potential cost-saving implications could be significant to South African students who face financial pressures in covering fees, as well as to administrators and educators who must make resource allocation decisions.

1.2 Research Questions and Scope

This research project addresses the following questions:

1. How can an EE be used in a BLC to deliver off-campus teaching and learning?
2. How would students use an EE in the context of a blended problem-based learning opportunity?
3. What learning benefits accrue from the use of the EE, and what features of the EE support learning?
4. How is a diverse group of students supported by the EE and how can quality be maintained?
5. What other benefits accrue from the use of the EE?

The scope of the research includes a study of UCT second-year medical students studying Integrated Health Sciences (IHS) and second-year Bachelor of Science (BSc) students studying physiology.

This study does not describe, explain or determine whether electronic or eLearning used on or off-campus results in better knowledge, skills, attitudes or values of students. The limitations

to the study's success include external factors influencing the adoption of the EE, such as digital literacy, device and data availability.

1.3 Research Assumptions and Ethics

1.3.1 Assumptions

"Because qualitative study takes place in the natural setting it is extremely difficult to replicate studies" (Wiersma, 2000, p.211). It is also extremely difficult to predict unforeseen events.

The following assumptions were made at the beginning of the research project:

- Students will adopt the EE and use it in preparing for their formal course assessments.
- The quality and quantity of content included in the EE is sufficient.
- Certain students have access to their own devices as well as off-campus data; and there is sufficient on-campus access to devices and data. For students in residences there is sufficient device and data access.
- There is a high level of organisational adoption by the FHS and DP.

Some assumptions were met in their entirety; others were partially met, and some were not met at all:

- While students did adopt the system, they did not do so to the extent that was assumed would be the case. Anecdotally, the students used the EE for their formal course assessments, however, this was not measured as part of the research project.
- The quality of the content was sufficient, but the quantity was not.

- When teaching and learning was cancelled for the academic year, there was a concerted effort to make resources available offline as there was insufficient access to devices and data both on- and off-campus.
- There was a high level of organisational adoption by the DP.

1.3.2 Ethics

Educational research requires a high degree of ethical consideration given the potential vulnerability of students. Ethical approval was received from the Faculty of Health Sciences Human Ethics Committee – HREC 494/2016. Professor Carolyn Williamson, Department Head (Pathology) in the FHS granted permission to conduct the research. Permission was granted to work with both UCT students and staff.

All participants, including students, course convenors, senior lecturers and facilitators provided informed consent in writing. All identifying information was removed to protect privacy and anonymity, and to ensure confidentiality.

The EE curriculum project was implemented as a collaboration between EDGE Learning Media (Pty) Ltd and UCT FHS. The author is the CEO of EDGE Learning Media (Pty) Ltd. The curriculum project was not undertaken for the purposes of this research project. The curriculum project was rolled out to all students. At the time of writing, the EE remains live for all current students and has been extended with the inclusion of the resources from all the divisions within the DP.

Chapter 2: Literature Review

2.1 The Stock of Medical Practitioners

The UN SDGs are a set of 17 goals with 169 targets as an agenda for achieving sustainable development by 2030. SDG 3 is to "ensure healthy lives and promote well-being for all at all ages" (World Health Organization, 2016b, p.1). The WHO GSHRH: Workforce 2030 report authors consider the impact of achieving the sustainable development goals. The authors model a significant increase in the demand and numbers of health workers globally from 43.5 million in 2013 to 67.3 million in 2030 (World Health Organization, 2016a). This figure does not consider existing or future oversupply or undersupply in any region. They model an increase in the global demand for appropriately trained physicians from 9.8 million to 13.8 million by 2030, with a shortage of 2.3 million physicians – 1.1 million of which will be in Africa (World Health Organization, 2016a).

These figures reflect the need to increase the stock of physicians with the right training, which is training for roles that are appropriate to the changing healthcare demands. "While infectious diseases remain the major cause of death, development, industrialization, urbanization, investment and ageing are drivers of an epidemic of non-communicable diseases" (World Health Organization & Imperial College London, 2015, p.102). As epidemiology starts to change in developing and emerging countries, so will the demand profile of the healthcare worker. Consequently, health education will need to mirror changes in the type of healthcare worker demanded. Educational institutions will then need to have capacity to "meet current and future education requirements to respond to population health needs and changing clinical practice" (World Health Organization, 2016a, p.15).

With these changes predicted, there is a need to focus on the stock of physicians in terms of existing stock plus inflows less outflows. Inflows are the "number of new workers hired each

year" (Kinfu et al., 2009, p. 225). They are graduates of training institutions, immigrants or people re-entering the workforce. Outflows are the result of premature deaths among health workers, dismissals, emigrations, career changes and retirements. In a deficit country, inflows need to exceed outflows at a constant population growth. An increase in population places further demand on inflows. In their study, Kinfu et al. (2009), consider whether current pre-service training can meet the demand for graduates of training institutions, and emphasise the importance of boosting pre-service training, albeit that is a longer-term solution for increasing graduate numbers.

2.2 Medical Education in South Africa

As a strategy to increase the stock of physicians, the number of graduates can be increased by increasing the number of medical schools or by increasing the number of graduates from existing medical schools.

Medical education can be regarded as pre-service or in-service training. In South Africa, pre-service training is the domain of the public higher education institutions. There are three types of public higher education institutions in South Africa: traditional universities, universities of technology and comprehensive universities. In the undergraduate domain, universities offer degrees; universities of technology offer diplomas and BTech; and comprehensive universities offer both. Three-year non-professional undergraduate degrees are formative. Four to six-year undergraduate degrees are professional. Undergraduate degrees in South Africa exit as National Qualifications Framework (NQF) level seven qualifications for three-year formative degrees, and level eight for a four- to six-year professional degree (Republic of South Africa, 2008). A typical first year of a degree is placed at NQF level five and second year at NQF level six.

Medical schools sit within the domain of the traditional universities. Undergraduate medical degrees include the five- or six-year MBChB. This is an NQF level eight degree. This is followed by three years of in-service training comprising two years of internship and one year of community service. This amounts to eight to nine years of training for a general medical practitioner. There are currently nine medical schools in South Africa:

1. Sefako Makgatho Health Sciences University (previously known as MEDUNSA)
2. University of Cape Town
3. University of the Free State
4. University of KwaZulu-Natal
5. University of Limpopo
6. University of Pretoria
7. University of Stellenbosch
8. University of the Witwatersrand
9. Walter Sisulu University

It is potentially complex, expensive and time-consuming to create medical schools. A more cost-effective and efficient solution could be to focus on increasing graduates from existing medical schools. The output from existing medical schools or throughput is a function of intake of applicants and attrition.

2.2.1 Intake of Applicants

More school leavers in South Africa are qualifying for access to apply for higher education, but higher education enrolments have not grown in proportion to potential applicants. In 2008, 111 731 school leavers achieved bachelor's passes, compared with 166 263 in 2015 (Department of Basic Education, 2015). This is an average annualised growth rate of 8.13 per cent. In 2009, 837 776 students enrolled at public higher education institutions, compared with

983 698 in 2013 (Centre for Higher Education Trust, 2013). This is an average annualised growth rate of 4.35 per cent.

However, the number of potential higher education applicants applying to medical schools has increased. But despite this increased demand, there are limited places available. For example, UCT medical school received 5 063 applications for 220 available places in 2016. This highlights the imperative to make more places available.

South Africa has tiered selection criteria. At a meeting of the South African Committee of Medical Deans, a decision was taken to use the current practices at South African medical schools to point the way forward (van der Merwe et al., 2016). The tiered structure has academic and non-academic weightings: non-academic criteria carry between 10 per cent and 25 per cent weighting. The article concludes that "current policies target black and coloured students for selection" (Van der Merwe et al., 2016, p.81) and that more research is required to link throughput and career progression to the selection process.

2.2.2 Attrition of Students

The legacy of unequal education in South Africa has presented epistemological barriers to higher education, particularly to medical education for high-achieving individuals from previously disadvantaged schools. "This legacy presents a challenge to South African medical schools" (Alexander et al., 2005, p.66).

While its understanding is under-researched in South Africa, epistemological access encompasses more than introducing students to a set of language, cultural and social skills, and strategies to "cope with academic learning and its products" (Boughey, 2005, p.19). Students do not have "the necessary academic, cultural and linguistic resources to decode and interpret the discourses of their new context" (Badenhorst & Kapp, 2013, p.6). Students entering higher

education are “ill-prepared for the complexities of academic literacy” (Alexander et al., 2005, p.66).

Students who are academically at-risk struggle with the self-directed learning element of the curriculum as they are more familiar with “rote learning and instrumental spoon-feeding practises” (Badenhorst & Kapp, 2013, p.6). They also struggle with face-to-face sessions in which social interaction occurs at a speed that makes it difficult for the students to listen, reflect and compose. Sessions are often a source of anxiety and humiliation for students (Badenhorst & Kapp, 2013). That said, Burch et al. (2007) found that academically at-risk students benefit from integrated curriculums such as PBL, though in conjunction with the IP.

Epistemological access has been addressed by the UCT FHS by implementing the IP to coincide with the PBL curriculum introduced in 2002. Students who showed a need for greater academic support by the end of the first semester were entered into the IP for one year before continuing to the second semester of the PBL curriculum. “The principle aim of the IP is to facilitate the process of becoming an effective learner, by addressing the skills deficits that prevent students from realizing their full potential” (Alexander et al., 2005, p.66). While Alexander et al. (2005) consider the costs of the IP to be high, medical schools have an obligation to improve access and to support previously disadvantaged students.

Increasing the number of graduates from South African medical schools through increased throughput or through increased available places will require the application of sound curriculum design principles.

2.2.3 Curriculum Design

The distance learning curriculum is often touted as the solution to scale education. South Africa has only one distance learning university – the University in South Africa or UNISA. UNISA does not have a medical school. Distance learning is the term used when the education provider is registered with the Council on Higher Education (CHE) as a distance learning education provider. Nartker et al. (2010) researched distance learning as a means to increase health worker capacity in Tanzania. The assessment found numerous in-service distance learning programmes operating in Tanzania and in the region. They did not find any pre-service distance learning programmes.

A distinction needs to be made between distance learning and the off-campus learning opportunity. In its practice guide on distance higher education programmes in the digital era, the CHE (2013, p.1) recognises that most residential institutions "now offer a blend of lectures, tutorials, practical sessions, field work and/or work-integrated learning/work-based education, and ICT-supported learning experiences, as well as more independent self-learning and peer collaborative learning opportunities" that may take place on or off-campus. While students registered with residential institutions do participate in certain self-study learning opportunities off-campus and, therefore, at a distance, the distance learning distinction is the registration with a non-residential institution.

The existing six-year MBChB is divided into three pre-clinical years and three clinical years, as previously mentioned. The pre-clinical MBChB curriculum is intricate. "The curriculum is a sophisticated blend of educational strategies, course content, learning outcomes, educational experiences, assessment, the educational environment and the individual students" learning style, personal timetable and programme of work' (Harden, 2001, p.123). He describes the following ten windows for viewing a curriculum:

1. The expected learning outcomes
2. Curriculum content or areas of expertise covered
3. Student assessment
4. Learning opportunities
5. Learning location
6. Learning resources
7. Timetable
8. Staff
9. Curriculum management
10. Students

He describes the curriculum content or areas of expertise as made up of nodes or the "small discrete units which contribute to the course learning outcomes and can be assessed" (Harden, 2001, p.127) – these are the learning objectives or what you want students to know and do.

He describes the learning location to include lecture theatres, small group rooms, library, learning resource area, computer suite, hospital wards in teaching hospital, outpatient and ambulatory care areas, other hospitals, and in the community. The student's home or residence could be included in the location and a differentiation could be made between on-campus and off-campus locations.

He describes the learning resources as the books, articles from journals, computer programs, videotapes, displays, printed notes, models and simulators, and simulated patients given to support the student. These are the resources or material the students are going to consume.

He then describes the learning opportunities as the "formal presentations and whole-class teaching sessions, small-group work and individual independent learning" (Harden, 2001,

p.128). The learning opportunities are the activities that are created to allow students to engage with the learning objectives and learning resources in the learning locations.

The overall student learning experience in a curriculum is the student's experience of these windows, particularly the relationships between assessment and learning location, learning objectives, learning resources and learning opportunities.

Learning resources and learning opportunities need to be instructionally sound and aligned to the basic methods of instruction. Basic methods or first principles are applicable despite varied uses of learning resources, learning opportunities, approaches or theories (Merrill, 2002). Reigeluth (1999) distinguishes variable instructional methods from basic methods, and Merrill (2002) describes variable methods as programmes and practices. A programme is an approach consisting of a set of practices, and a practice is a specific instructional activity or learning opportunity. He describes the basic methods as first principles of instructional design which are always relevant, regardless of the practice or programme. According to Merrill (2002), practices, or learning resources and learning opportunities, promote learning when they:

1. are presented on interesting, relevant, engaging and contextualised real-world whole problems;
2. activate prior knowledge;
3. demonstrate knowledge;
4. apply knowledge; and
5. integrate knowledge.

Pre-clinical pre-service training requires learning opportunities to be designed on the first principles of instructional design.

2.2.4 PBL

PBL is itself a blended learning opportunity. Certain elements are conducted on campus and others off-campus. PBL has its theoretical foundations in information processing theory and social constructivist theories (Hmelo-silver & Eberbach, 2012). PBL is student-centred in that students work in small groups to solve a given problem. Students need to identify what they need to learn, engage in self-directed learning, and collaborate and reflect to build knowledge. The objectives of PBL are to develop knowledge, intrinsic motivation and self-directed learning skills, collaboration skills and problem-solving skills (Hmelo-silver & Eberbach, 2012).

A seven-step instructional model developed by Professor of Psychology Henk Schmidt from 1974 at Maastricht University (Kools, 2016) has been widely used. In this model, students follow a series of steps – "(1) clarification of terms and concepts, (2) definition of the problem, (3) problem analysis and collection, (4) construction of a systematic inventory of ideas, (5) formulation of learning objectives, (6) self-directed study, and (7) synthesis and discussion" (Woltering, Herrler, Spitzer, & Spreckelsen, 2009, p.726).

The steps have subsequently been adapted to a minor extent, but the process of knowledge construction remains the same (Hmelo-silver & Eberbach, 2012). At UCT, the first five steps occur in the first on-campus session where "the case is worked through and learning objectives are identified by the group" (Burch et al., 2007, p.349). The remaining two steps can occur over multiple on- and off-campus iterations. In the first on-campus session, students activate and draw on prior knowledge to understand the problem and identify learning objectives. They then conduct self-study off-campus to construct knowledge. The students share and construct further knowledge through collaboration and social interaction both on- and off-campus. The

PBL process is supported by practical laboratory sessions, small-group tutorials and lectures (Burch et al., 2007).

A significant number of studies compare the PBL lecture-supported curriculum with traditional lecture-dominated didactic curricula. Other studies identify the learning theories and the advantages and disadvantages of PBL. The proponents for PBL argue that it fosters early cognitive skills, higher-order thinking and integrated deep learning (Mansur, Kayastha, Makaju, & Dongol, 2012), and results in good collaboration between students (Hmelo-silver & Eberbach, 2012). Detractors of PBL argue that the approach results in less knowledge of pre-clinical sciences with potential gaps in the curriculum (Mansur et al., 2012). Critics also suggest that PBL does not provide sufficient frameworks for building or scaffolding knowledge, and the extended problems may increase cognitive load (Jin & Bridges, 2014). "These problems may be exacerbated by lack of tutor training, inadequate tutors or group size" (Wood, Wix, ByrneDavies, & Lumsden, 2016, p.8).

Notwithstanding the continued debate on the merits of PBL, there have been numerous eLearning interventions and supplementation of PBL with eLearning and indeed there has been exponential growth in eLearning offerings in higher education in general.

2.3 eLearning in Higher Education

The terms eLearning, digital learning and online learning are often used synonymously. eLearning is electronic or digital learning and can be defined as the delivery of instruction via an electronic medium which includes but is not limited to: "the internet, intranets, extranets, satellite broadcasts, audio/video tape, interactive TV and CD-ROM" (Govindasamy, 2002, p. 288). Clark & Meyer (2016, p.7) define eLearning as "instruction delivered on a digital device that is intended to support learning".

Online learning draws the distinction between eLearning that is only accessible when connected to a network, and offline or non-networked eLearning, which does not require a student to be online. eLearning or digital learning can be networked or non-networked.

The term eLearning is also understood in the context of blended learning where curriculum developers are seeking to use digital or online learning elements in their traditional teaching and learning, whether blended with traditional residential or on-campus learning; or blended with traditional distance learning.

Higher education eLearning offerings take multiple forms including short courses created by a particular university department or faculty and offered in collaboration with technology-partner service providers such as Coursera and Udacity, which offer Massive Open Online Courses (MOOCs) directly. Universities also offer MOOCs, often delivered by a centralised university body for technology development in teaching and learning. Short courses and MOOCs can carry credits towards qualifications.

For more than a decade, universities in South Africa have offered eLearning as adjunctive or blended with on-campus learning in undergraduate and post-graduate qualifications. Universities around the world are also beginning to offer qualifications that can be obtained solely through off-campus or distance eLearning.

2.3.1 eLearning, Pedagogy and Learning Systems

Duffy and Cunningham (1996, p.2) collate the many views on constructivism to the general view that 'learning is an active process of constructing rather than acquiring knowledge, and instruction is a process of supporting that construction rather than communicating knowledge'. The constructivist principles have been applied to strategies to maximise the effectiveness of knowledge creation in an eLearning environment (Sridharan, Deng, & Corbitt, 2008).

Sridharan et al., (2008) describe pedagogically sound active student-centred eLearning strategies such as collaborative learning, interactive learning, adaptive learning and the use of concept mapping techniques. Mayes & De Freitas (2004) extend eLearning strategies to the level of behaviour and social practice.

Regrettably, Sridharan et al. (2008) point out that the success of eLearning strategies is largely dependent on the technologies that facilitate their implementation that have not necessarily kept up with the millennial generation. The WHO & Imperial College London (2015, p.92) concur with Sridharan et al. (2008) that in "eLearning the focus is often placed on the use of educational technology rather than on educational technology being applied to the process of teaching and learning". More than a decade ago, Govindasamy (2002) bemoaned the use of tools in ways that are not pedagogically sound.

Conole, De Laat, Dillon, & Darby (2008) discuss the changed educational needs of students born after the 1980s. This group's familiarity with technology has altered their way of processing information and communicating with each other. They prefer to receive information quickly and are highly skilled at rapidly processing new information. They also prefer to use multimodal channels of communication to communicate with lecturers and peers.

The authors of the study suggest that universities are not equipped to deal with the new generation of students due to the mismatch between teaching and learning practice and emerging technologies. Any online learning needs to be designed with the student in mind.

Ozkan & Koseler (2009) conclude that there is little research on LMSs within the educational context, and particularly as a mechanism for supporting blended learning. Effective eLearning is not simply the management of learning resources through an LMS (Sridharan et al., 2008), nor is it taking a conventional course and replicating the classroom experience in an online format (Park, 2015). When constructing a course, an educator needs to consider the

instructional design of the learning resources, the method of instruction or learning opportunities, and the tools available to students in the LMS.

Traditionally LMS technologies have focused on a reporting or student management function, a learning resource or repository function, and a learning opportunity or social, communication and collaboration function. Within the context of the learning resource and learning opportunity functions, Conole et al. (2008) present four tools in a LMS that are important for students – learning resource seeking and handling, communication, integrated learning, and assessment preparation.

The focus for eLearning has traditionally been as a file repository system for the delivery of educational resources. Rather, eLearning needs to be considered holistically as a system that embraces pedagogy and the learning experience and places a relentless focus on student engagement.

Engagement takes place in an eLearning ecosystem. An EE is defined as a system in which members benefit from the participation of others, via symbiotic relationships through components such as web-based training, online university, learning objectives, electronic performance systems, collaborative and intelligent search functions (Sridharan et al., 2008).

Moore (1989) relates three types of engagements or interactions: the student-content interaction; the student-student interaction and the student-lecturer interaction. On-campus interaction between students and between students and lecturers are active or synchronous (So & Brush, 2007). Off-campus learning interactions can be synchronous, as with video or web conferencing, chat or telephone; or asynchronous, as with email. Off-campus engagements are limited because of geographical and technological distance. That said, technology has improved off-campus student engagement and reduced psychological distance.

Psychological distance is the degree of separation from interaction and engagement a student feels in an off-campus learning opportunity. It results from the "physical and temporal isolation experienced by learning at a distance" (Croft, Dalton, & Grant, 2010, p.33). Psychological distance is caused by low social presence during a course. It reduces student motivation and satisfaction during a course (So & Brush, 2007). A student's perception of psychological distance will affect their perception of learning. By increasing social presence through collaborative learning in a blended learning environment, psychological distance is decreased and the effectiveness of a learning opportunity for the student is increased (So & Brush, 2007). Off-campus learning needs to be carefully constructed to ensure the student is not burdened by the effects of psychological distance. This requires the use of multimedia-rich tools to facilitate collaborative interactions that enhance social presence in off-campus online learning opportunities (So & Brush, 2007). Collaborative interactions in learning opportunities allow more control and dialogue between students and increase social constructivism (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015).

With synchronous blended learning, the on-campus learning opportunity attended by a cohort of on-campus students is extended to a cohort of off-campus students. Bower et al. (2015, p.1) described synchronous blended learning as teaching in which students located remotely "participate in face-to-face classes by means of rich media synchronous technologies such as video conferencing, web conferencing or virtual worlds". They found that, when given a choice, students preferred synchronous delivery over contact, blended and online learning. The researchers found that, when facilitated correctly and designed for active learning, synchronous blended learning allowed distance-learning students to experience an instructor's lesson, ask questions and receive acknowledgement, add comments to a class dialogue; and engage with learning resources and other students in a similar manner to on-campus students.

However, synchronous blended learning must not imply that for every learning opportunity some students need to be on campus. Neither should it imply that if all students are off-campus in the learning opportunity there needs to be asynchronicity. As with blended synchronous learning, synchronicity in off-campus eLearning is achieved through the increased social presence of both students and lecturers. Online tools that facilitate social constructivism include chatrooms or forums that acknowledge student queries (So & Brush, 2007).

Various currently available tools can be used to deliver blended synchronous learning. These include: room-based videoconferencing technologies; web-based videoconferencing platforms such as Skype, Blackboard Collaborate or live webinar plugins for Moodle; interactive white boards and Tablet View, which lecturers can use to annotate diagrams and work out formulas (Bower et al., 2015).

Equally there are barriers to delivering blended synchronous learning as casted lessons from an on-campus cohort. These include: platform performance and functionality and student connectivity that may result in poor or broken audio connections; and difficulties communicating with lecturers and students (Bower et al., 2015). Technology tools can potentially facilitate the learning opportunity itself and not simply deliver the learning opportunity.

An EE that facilitates the learning opportunity by engaging with all three of Moore's (1989) interactions will facilitate single off-campus delivery of learning opportunities.

The third of Moore's (1989) interactions, engagement with learning resources, is a large component of off-campus engagement (Sweller, Van Merrienboer, & Paas, 1998).

2.3.2 eLearning Resources

An eLearning resource in its simplest form is the eBook published as either an EPUB file format or a simple PDF format. The PDF file format is ubiquitous and is the most widely used form of eLearning resource. The EPUB file format with the file name ending in .epub, is the format used by numerous eBook readers including Adobe Digital Editions. Both EPUBs and PDFs can be 'enhanced' to facilitate engagement through the inclusion of hyperlinks and other multimedia elements.

The past 20 years have seen a surge in publishers turning to the production of eBooks in conjunction with their printed counterparts. Despite this, in 2015, eBook sales in the United Kingdom (UK) declined by 1.6 per cent, while printed book sales grew by 0.4 per cent. Stephen Lotinga, the Chief Executive Officer (CEO) of The Publishers Association in the UK, attributes this to the influence of several big-name fiction releases rather than a terminal decrease in eBook sales (The Publishers Association, 2016). It should be noted that these figures are based on the entire UK book industry and do not differentiate between academic and non-academic textbooks.

In 2014, 87 per cent of textbooks sold in the United States of America (USA) were printed books. (Rosenwald, 2015). However, this does not differentiate between prescribed and non-prescribed textbooks, and nor does it indicate whether an eTextbook was even available for a particular printed title (Crum, 2015). Electronic textbooks are becoming more prominent in many universities. Students now have a choice. They can access to printed books in physical libraries as well as digitally through online license facilities. Despite this choice, there is much debate as to whether students and educators prefer eTextooks over printed textbooks.

The main advantage of eTextbooks is the lower price – often eTextbooks cost less than second-hand textbooks. However, many students do not factor in the cost of the reading device required

to view eTextbooks. An additional advantage is that eBooks are easier to transport than cumbersome textbooks. With all the required books available on their laptop or tablet, students do not need to carry heavy textbooks to lectures. However, in a study conducted by Naomi Baron, a linguistics professor at American University, 92 per cent of participant students preferred a printed textbook over digital for various reasons, including eye strain from reading on a digital screen; better comprehension and fewer distractions in a print book; and the feel and smell of a physical book (Baron, 2015). Additionally, psychology professors in the Department of Psychology at James Madison University in Virginia also found that readability issues, such as eye strain and reading speed, and accessibility issues, such the need for reading applications and file formats, are a barrier to preference for eTextbooks. Myrberg & Wiberg (2015) and Pálsdóttir & Einarsdóttir (2016) reported that participants chose printed resources as their preferred medium; and at the University of Kansas, Waters, Roach, Emde, Mceathron, & Russell (2014) showed – as depicted in the figure below – that students in some departments preferred eBooks and other departments preferred printed books.

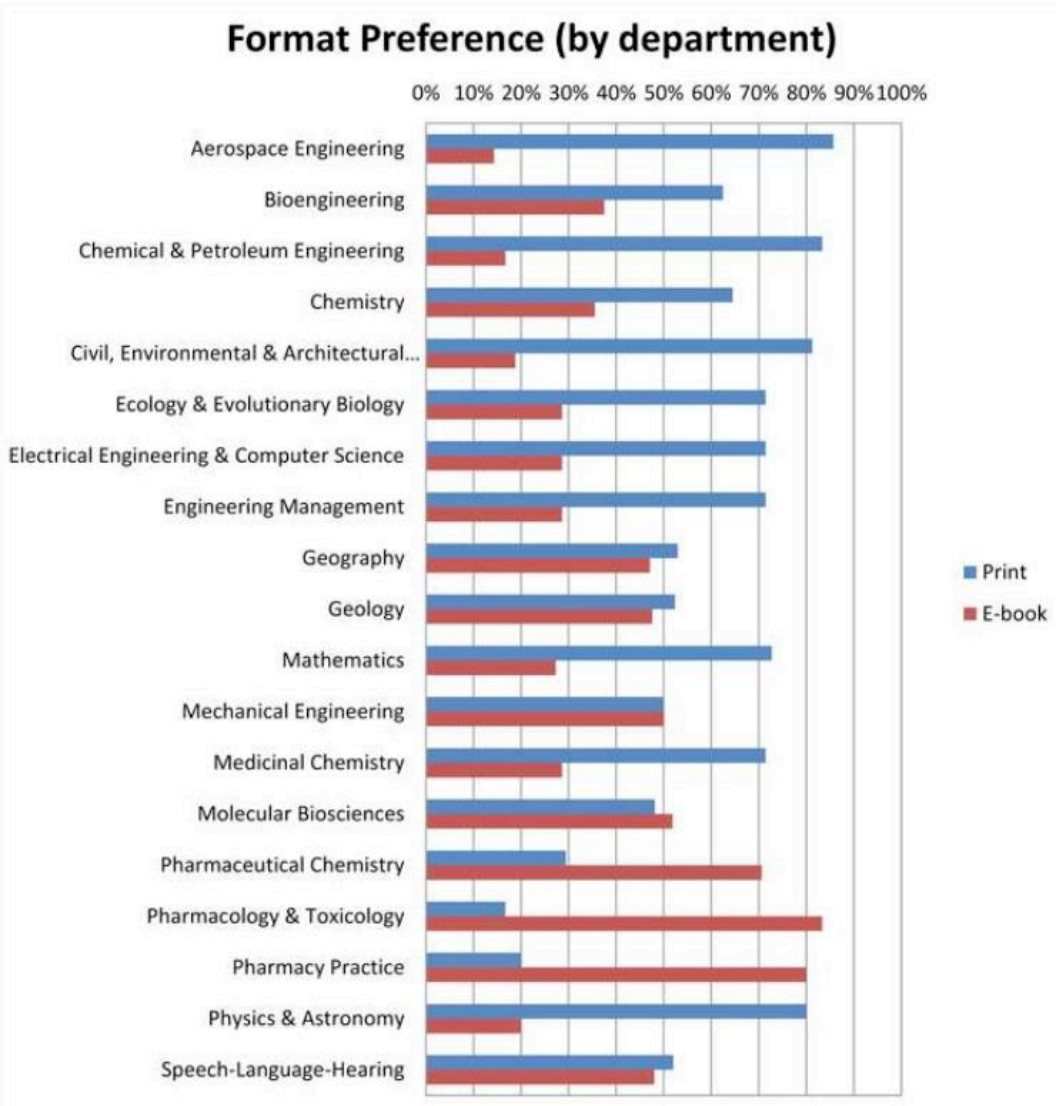


Figure 1: Student preference of textbook by department

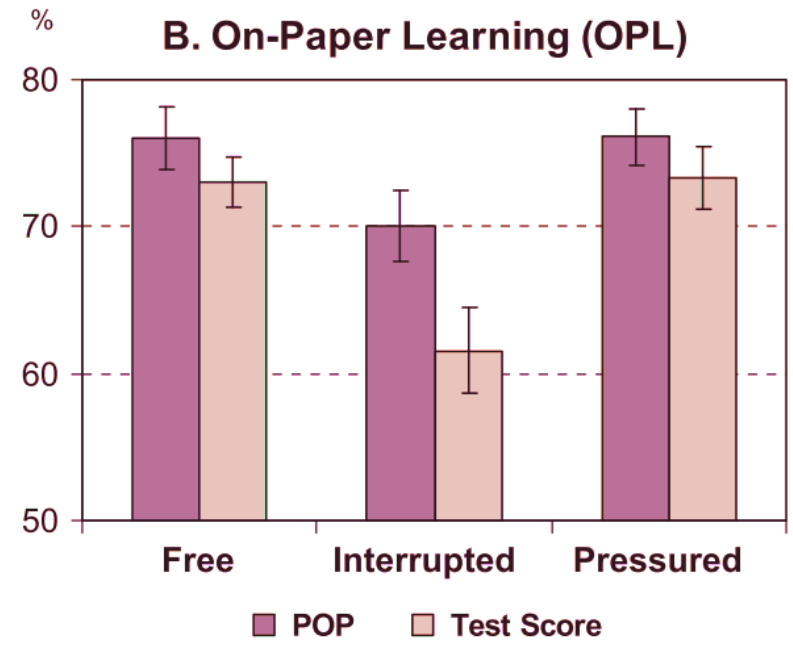
Source: (Waters et al., 2014, p.8)

Regardless of student preferences, an important question is whether students perform better using printed books over eBooks? Crum (2015) found that stories were more immersive when read from a printed book. Respondents were better at placing a story's events in chronological order if they consumed the story in the printed form. In a study of 96 students, Singer & Alexander (2017) found that there was no significant difference in results in basic comprehension. However, digital students were less proficient at some key points. Daniel & Jakobsen (2018) found that the same level of learning could be achieved using both methods.

However, they found that students took longer to reach the same level of understanding when learning from an eBook. Crum (2015) concluded that printed consumption was more conducive to extended periods of concentration; albeit digital consumption allowed for three times more efficient multitasking.

eTextbooks have been praised for their search capability and increased productivity facilitated by multitasking activities including reading social media, checking emails and searching the Internet. However, Adler & Benbunan-Fich (2012) researched the relationship between multitasking and performance in terms of productivity and accuracy and concluded that some multitasking does improve productivity, but too much has the opposite effect; and when performance is measured in terms of accuracy, multitasking has a negative effect. Baron (2015) found that students read more slowly, were less distracted and ultimately comprehended more. However, Conole et al. (2008) argue that the millennial generation is adept at multitasking.

Comprehension and memory is a key consideration in efficient knowledge construction. Dooley (2015) describes a study performed by Canadian neuromarketing firm TrueImpact which examined brand memory and recognition of print vs. digital advertising media. The study revealed that physical media enabled higher recall. Ackerman & Lauterman (2012) compared the mean test scores and predictions of performance (POP) for on-screen learning vs. on-paper learning under three different time conditions – free or no time restraint, interrupted and pressured. The figures below show that for both media the effect was significant, but was more marked in on-screen learning.



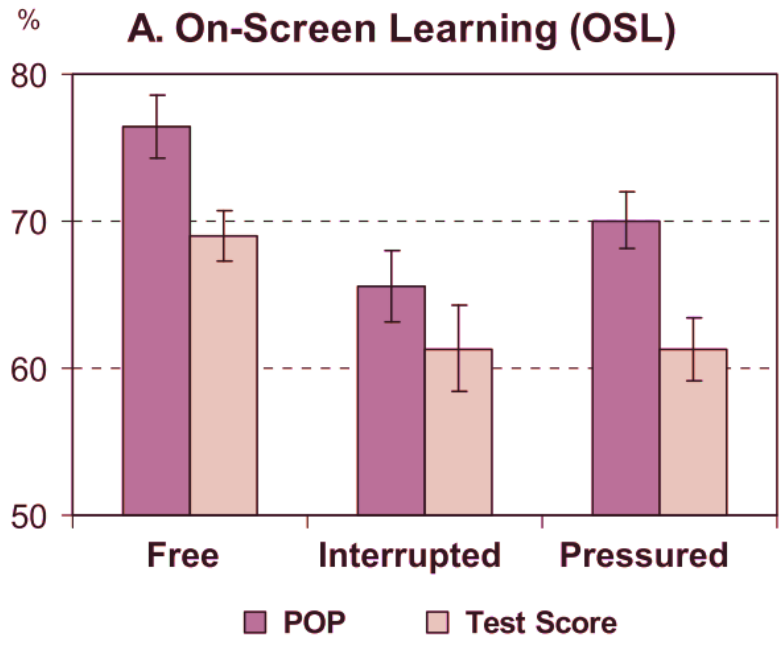


Figure 2: The performance of students learning on-paper and on-screen

Source: (Ackerman & Lauterman, 2012, p.1820)

Myrberg & Wiberg (2015) reviewed short essays (1 400 – 2 000 words) written by two different groups of students. The group which read the texts as PDF files scored significantly lower on comprehension.

In collaboration with Bangor University, Millward Brown (2009) found greater activation of the area of the brain that coordinates aspects of cognition, including action planning, decision-making, motivation, reward perception and reinforcement, when respondents were consuming print media. Consuming paper media also causes a higher emotional reaction to content and greater emotional processing: the brain perceives the content to be "more real" and as a result activates multiple senses, spatial memory and networks. Information is internalised to a greater degree, converted to knowledge more efficiently and recalled more confidently (Dooley, 2015).

A distinction needs to be made between the use of eBooks without multimedia elements and eBooks with multimedia elements, as well as multimedia elements included separately to textbooks, whether they are in print format or as eTextbooks. Consumption of information from an eBook without the inclusion of multimedia and interaction, constitutes "paper behind glass" and serves the print versus eBook debate. Anderson-Inman & Horney (2007) suggest that eText is more than a digitisation of printed material, but can and should be used as an assistive technology to further enhance the learning experience, to increase reading comprehension and extend meaningful learning. Dooley (2015) concluded that memory retention and active learning is greater when engaging with multimedia or digital learning resources such as audio, video and particularly when quizzes are included. The Book Industry Study Group (2015) also found that students who prefer digital multimedia content claimed that it helped them master difficult concepts through interactions and test preparation, and ultimately helped improve their grades.

The design of successful digital learning resources embraces several learning theories. The cognitive load theory of multimedia learning describes our working memory as the mechanism to acquire knowledge. Working memory is transient and constrained by the intrinsic load of the information, the extraneous load of the way the information is presented and the germane

load. The extraneous load is the focus of instructional design. It can be overloaded by visual or auditory processors. “Visual and auditory working memory are partially independent” (Van Merriënboer & Sweller, 2010, p. 88).

It is possible to maximise the limited capacity of working memory by using the “independent operation and additive effects of the channels operating in working memory” (Mayer, 2014, p. 52). When information is presented using both visual and auditory channels, working memory is able to process more information overall. Instructional design strategies in multimedia need to be carefully considered to ensure that neither channel is overwhelmed by cognitive load.

Active learning theory describes meaningful learning that occurs as a result of the student’s activity during learning. The theory can be applied in instructional design strategies by embracing the use of guiding questions and interactive integrated features that give students control and improve engagement. This could be, for example, asking questions during a video with jump-ahead options; or asking questions before a video and then answering them during the video (Mayer, 2014).

When applied to instructional design, arousal theory describes how the addition of entertaining elements will make a learning activity more interesting, increase the overall level of arousal and increase attention. Learning resources need to be interesting with good production value, without being distracting (Mayer, 2014).

Learning resources in an EE can potentially take full advantage of multimedia and the EE need not be constrained by the limitations of using multimedia in printed or electronic books.

2.4 eLearning in Medical Education

The use of both networked and non-networked eLearning in medical education is ubiquitous. In their systematic review, the World Health Organization and Imperial College London said, "the use of eLearning and blended learning to support the delivery of learning objectives has become a common feature in health professional education" (World Health Organization & Imperial College London, 2015, p.79). The review revealed that "29% of the studies comparing web-based eLearning to traditional learning found significantly higher knowledge" (World Health Organization & Imperial College London, 2015, p.79). Similarly, "40% of studies comparing web-based eLearning to traditional learning found significantly higher skill gains in students using the web-based intervention" (World Health Organization & Imperial College London, 2015, p.79).

In their systematic review, Jin and Bridges (2014) found that educational technologies have been increasingly used in health sciences PBL. They identified three types of educational technologies used to support PBL: learning software and digital learning objects (video/3D models), interactive whiteboards, and learning management systems (LMS) (Jin & Bridges, 2014).

In a 2005 study, Harvard University introduced 50-inch, wall-mounted plasma screens and broadband Internet access into tutorial rooms. The screens were used to display course-specific material and to enable access to online sources. This study critically analysed the impact on small group tutorials. The researchers found that the screens did occasionally disturb the course of the tutorial discussion (Kerfoot, Masser, & Hafler, 2005). They did not use an EE. The study was focused on the use of technology within the on-campus environment, as opposed to altering the process of teaching and learning. The researchers suggested further research be conducted on the effect of eLearning on the PBL process.

At its founding in 2009, the University of Botswana School of Medicine chose a "PBL curriculum with elements of rural and community-based, socially accountable medicine to ensure that the curriculum would match with the healthcare needs and characteristics of medical practice in Botswana" (Kebaetse, Nkomazana, & Haverkamp, 2014, p.44). The university used four sites of learning and adopted a decentralised medical education model to ensure early exposure to rural medicine and to enhance rural retention of physicians. In this decentralised model, the university used various technologies to ensure access to resources and teaching and learning, as well as to foster communication and active, engaged and collaborative learning. These technologies included videoconferencing, databases of biomedical images, interactive boards, classroom response systems and closed user-group cellular communities.

While Kerfoot et al. (2005) did not focus on altering the process of teaching and learning, Kebaetse et al. (2014) presented an altered curriculum as a decentralised or partially off-campus or blended learning delivery.

A BLC is an altered curriculum. Woltering, Herrler, Spitzer, & Spreckelsen (2009) use the acronyms bPBL and ePBL for blended and electronic PBL respectively. In their study, they compared a bPBL cohort of students with a PBL group. The bPBL approach "seems to increase the motivation and orientation of the students and leads to a more flexible way of organizing the PBL process" (Woltering et al., 2009, p.736). They further describe how ePBL or bPBL can enhance PBL without adding resources (Woltering et al., 2009). ePBL or bPBL flips the classroom, which Tolks et al. (2016, p.1) describe as the inverted classroom model (ICM) – "a blended learning method in which a self-directed learning phase (individual phase) precedes the classroom-instruction phase".

2.5 Conclusion

The problem of a severe shortage of physicians in Africa and South Africa is currently worsening. The stock of physicians is a function of existing stock plus inflows less outflows. By far the greatest contributor to inflows is graduates from medical schools which, in turn, is a function of student attrition and the number of places at medical schools. Epistemological access poses a threat to student throughput and medical schools are being mandated to increase the number of available placements, despite austerity pressure on the revenue and costs sides of the equation.

The medical curriculum is complex, with multiple moving parts. Its design and management are critical to meeting the demand for more places. Learning objectives, resources and opportunities need to be effectively managed.

With high-quality learning resources and properly conceptualised learning opportunities, eLearning that embraces pedagogy and learning experience has the potential to be an extremely effective tool in higher education.

In the South African context, PBL has the potential to be an effective learning opportunity, as well as the potential to be delivered as ePBL or bPBL. This research builds on the literature by conceptualising bPBL in the context of using the EE off-campus.

By delivering certain learning resources and opportunities at the appropriate level off-campus, and freeing up teaching and learning resources, blended learning has the potential to increase institutional access to and throughput in undergraduate medical education, and to supply the country with the physicians it demands.

Innovation is required to aid universities to potentially deliver blended learning curriculums.

Chapter 3: Context of the Research Project

The current system of delivery of learning resources and opportunities in the UCT MBChB uses a combination of first principles of instructional design and delivery. In the first three pre-clinical years in integrated health sciences, and in the second and third year of the MBChB, students study multiple disciplines including, among others, human biology, public health, critical health humanities and pathology. Learning opportunities comprise lectures, bench- and computer-based practical opportunities and PBL. Learning resources are provided as course reading packs, discipline-centred readers and prescribed textbooks. The learning resources demonstrate knowledge; as do lectures. Practical opportunities allow knowledge to be applied.

The timetable is one of Harden's (2001) windows and is intricate. Different departments manage teaching and learning in different semesters. The Department of Pathology is responsible for teaching and learning in semester four, five and six. The DP manages the PBL learning opportunity for semester four.

PBL is a learning opportunity that follows the first principles of instructional design. In each PBL cycle, students work through a clinical case that is typical in the South African health context. The cases integrate the learning objectives of multiple medical disciplines. The PBL cycle is conducted over two weeks. In each cycle, students attend four facilitated on-campus PBL sessions, amounting to 12 hours of contact.

Students are divided into approximately 22 groups of, on average, 12 students each. The DP allocates students to PBL groups to achieve balance in gender, culture and academic achievement. Each group is allocated a facilitator.

The groups meet on campus in dedicated PBL rooms in the Anatomy Building on the medical campus at UCT. The rooms are equipped with a conference-style table, whiteboard and flip

chart facilities and a cupboard containing reference textbooks and other learning resources. A facilitator attends and guides each session. The facilitator may or may not be a medical practitioner.

PBL is a blended learning opportunity since students are engaged in both on-campus and off-campus study.

3.1 The EE

For the curriculum project, eReaders were published and delivered in the EE. The virology and microbiology eReaders were published from an existing departmental combined paper reader. Dr Stephen Korsman was the author of the virology eReader and Dr Tina Wojno was the author of the Microbiology eReader. The eReader for immunology was written from scratch by Assoc. Prof. William Horsnell. These eReaders were published with PBL case material from the DP.

The eReaders were included in the EE as volumes and were included on a "bookshelf" (see Figure 3. Each eReader has a contents page to click into the unit (see

Figure 4 and Figure 5). All the lecture slides and the video recordings of the lectures (where applicable) were included in a "Lecture Series" volume. Additionally, the practical learning opportunities were also included as a "Practical Book" volume. Each eReader has multiple media elements including text, video, quizzes, eBooks and interactions (see Figure 6).

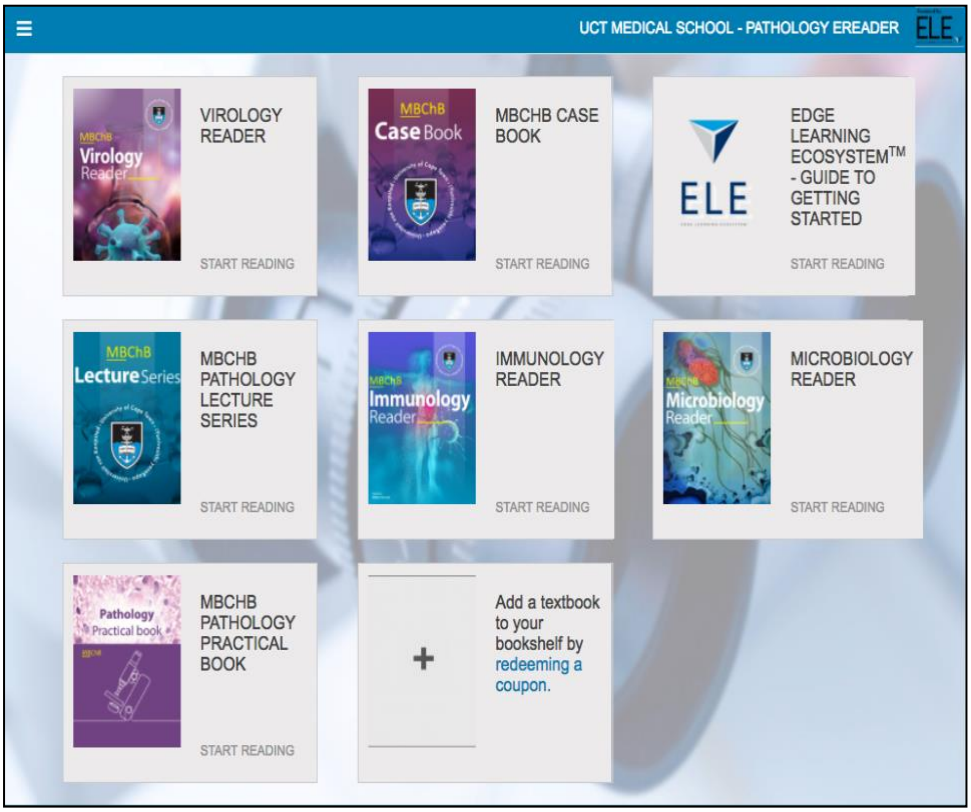


Figure 3: The EE bookshelf

Source: (EDGE Learning Media (Pty) Ltd, 2018a)

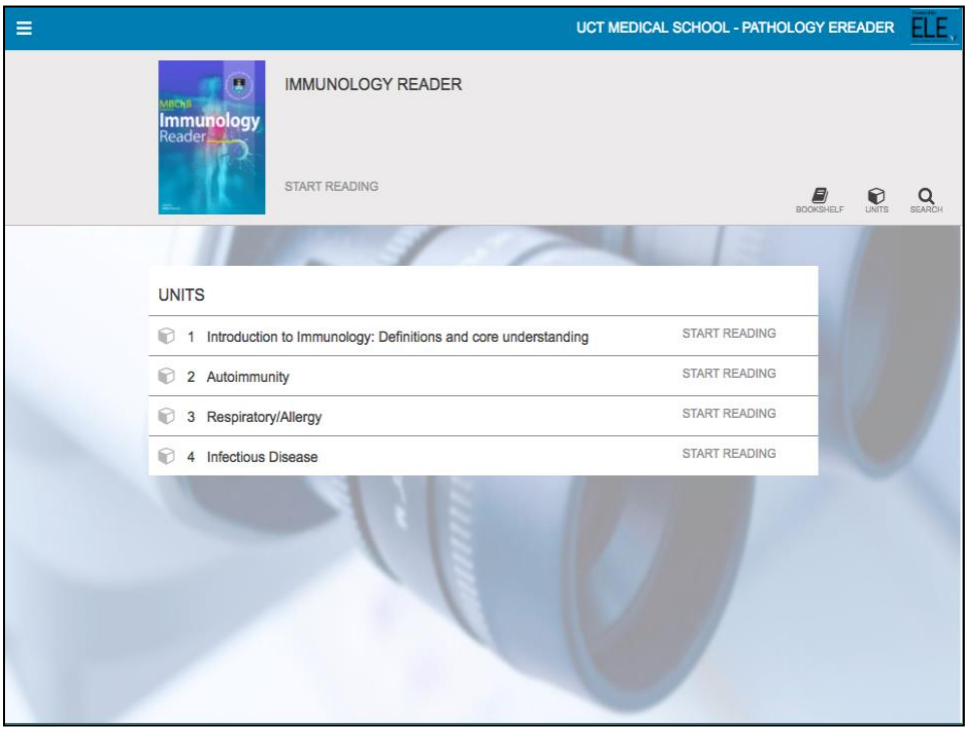


Figure 4: The immunology eReader contents page

Source: (EDGE Learning Media (Pty) Ltd, 2018a)

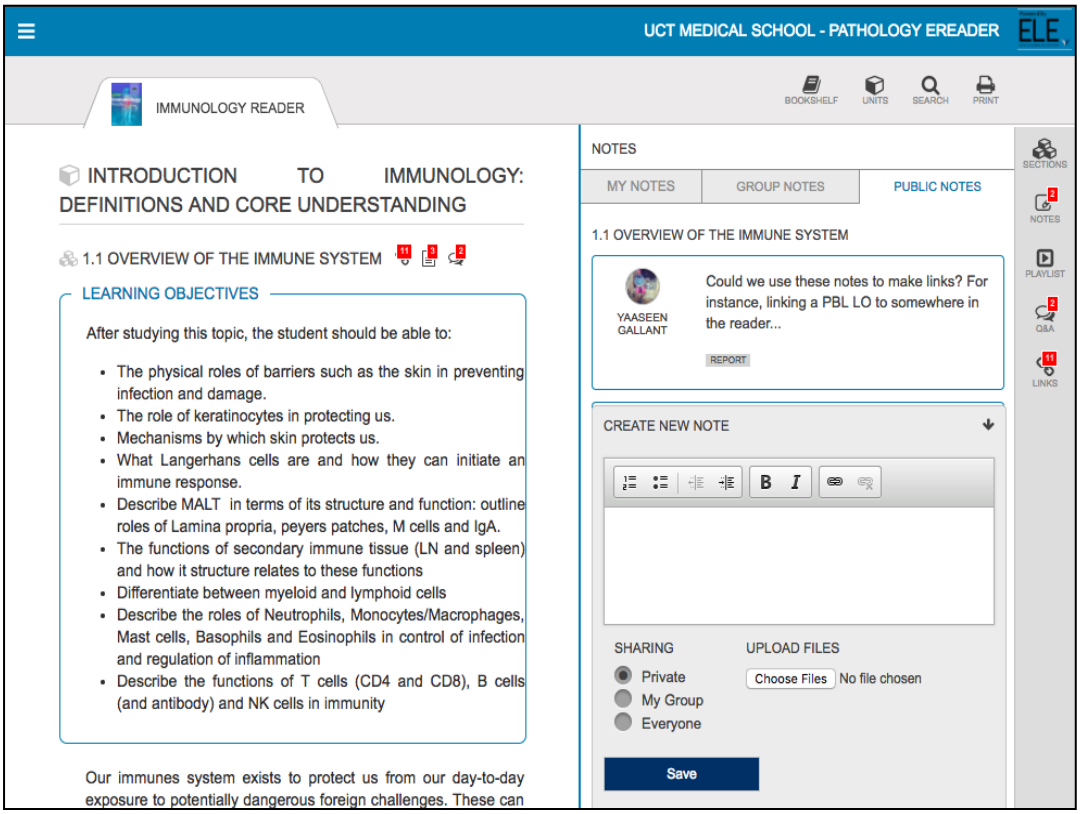


Figure 5: The immunology eReader

Source: (EDGE Learning Media (Pty) Ltd, 2018a)

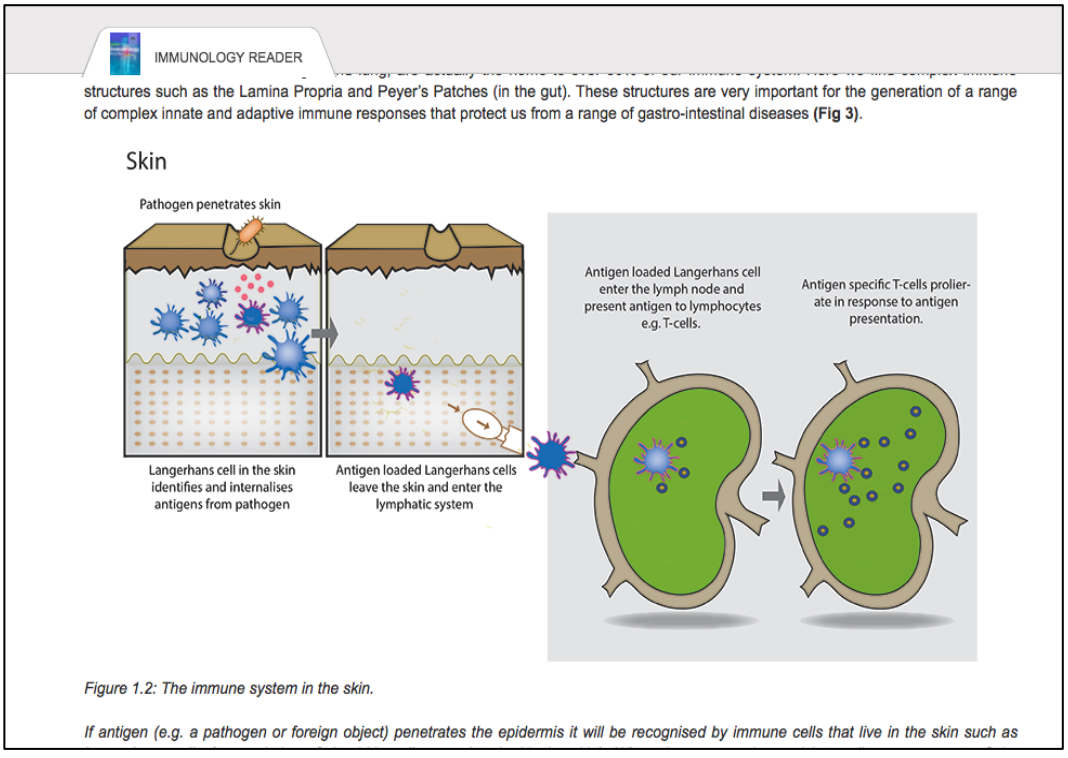


Figure 6: eReader multimedia

Source: (EDGE Learning Media (Pty) Ltd, 2018a)

However, the inclusion of the "Casebook" volume in the bookshelf was most important because it integrates learning across the disciplines for which there are multiple eReaders.

The case narratives for all the applicable PBL cases were included in the Casebook. The learning objectives were released in the EE on the Tuesday following the first session on a Monday. The facilitator notes for each case, which are usually only made available to the facilitators, were also included in the Casebook. Most importantly, an electronic quiz was included for each case.

The EE contained multiple tools and functionalities. The linking functionality is a key tool in the EE. It allowed educators to link different volumes, units and sections to other volumes units and sections (see Figure 7).

The EE allowed students to take notes on any section in any volume. The students could then share that note with their whole class or their PBL group and facilitator (see Figure 8).

The EE also had a question tool which allowed students to ask questions of other users. Students could also ask a question of the same cohort with whom they could share a note (see Figure 9).

The EE also had a search functionality which allowed students to search across multiple volumes; as well as a dictionary functionality that allowed students to look up a word online with the right-click mouse button.

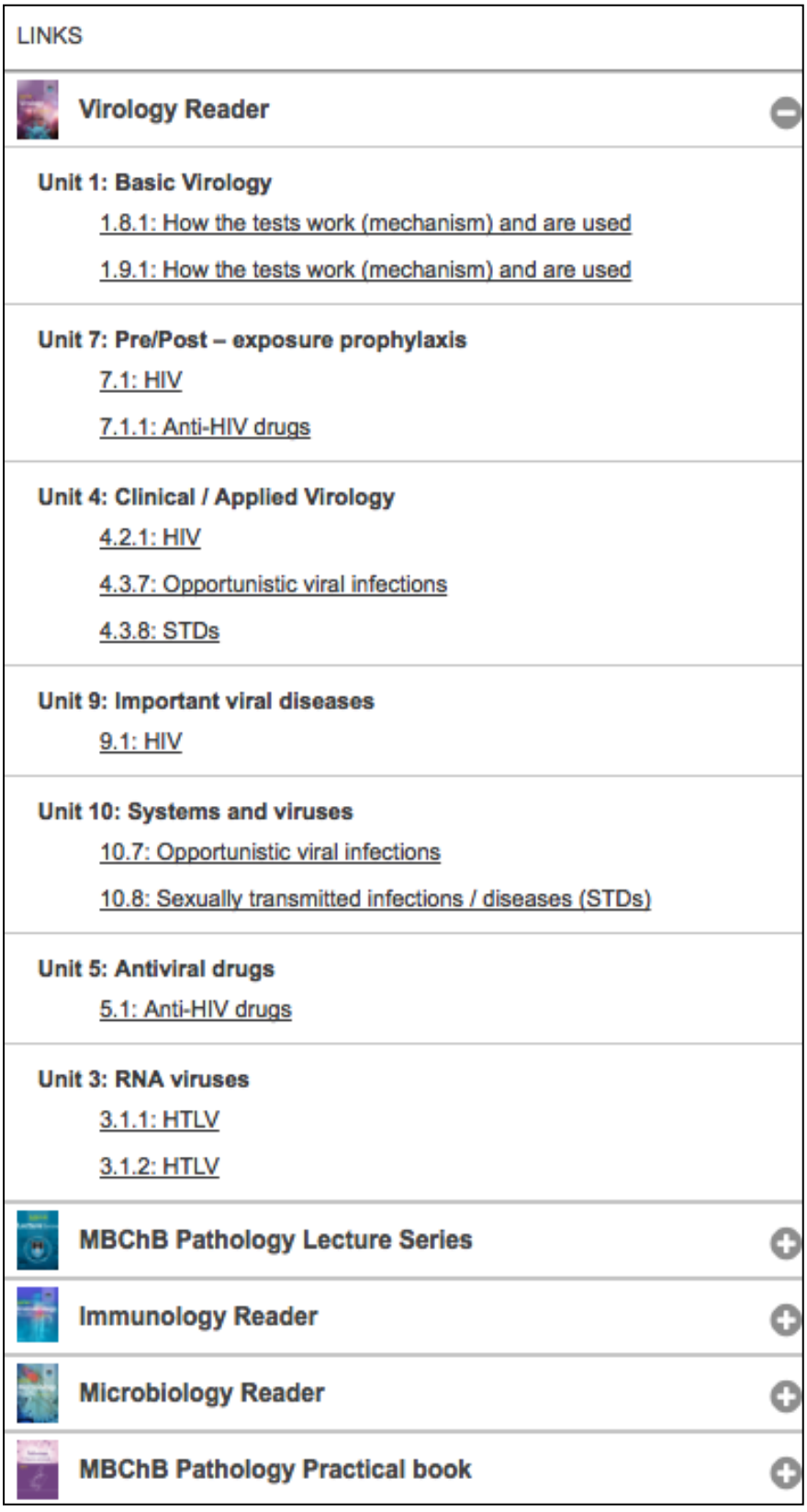


Figure 7: The EE linking functionality

Source: (EDGE Learning Media (Pty) Ltd, 2018a)

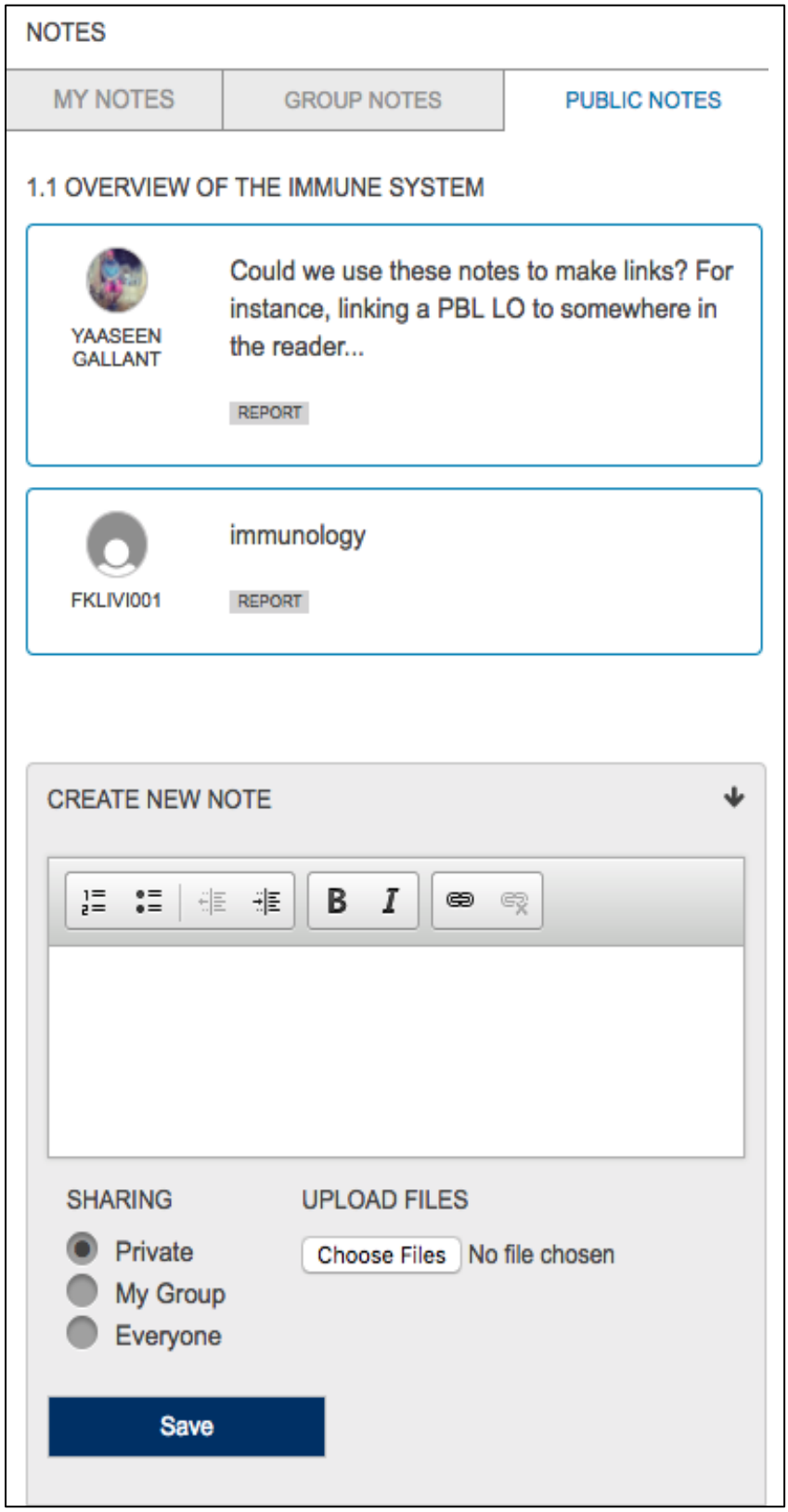


Figure 8: The EE notes tool

Source: (EDGE Learning Media (Pty) Ltd, 2018a)

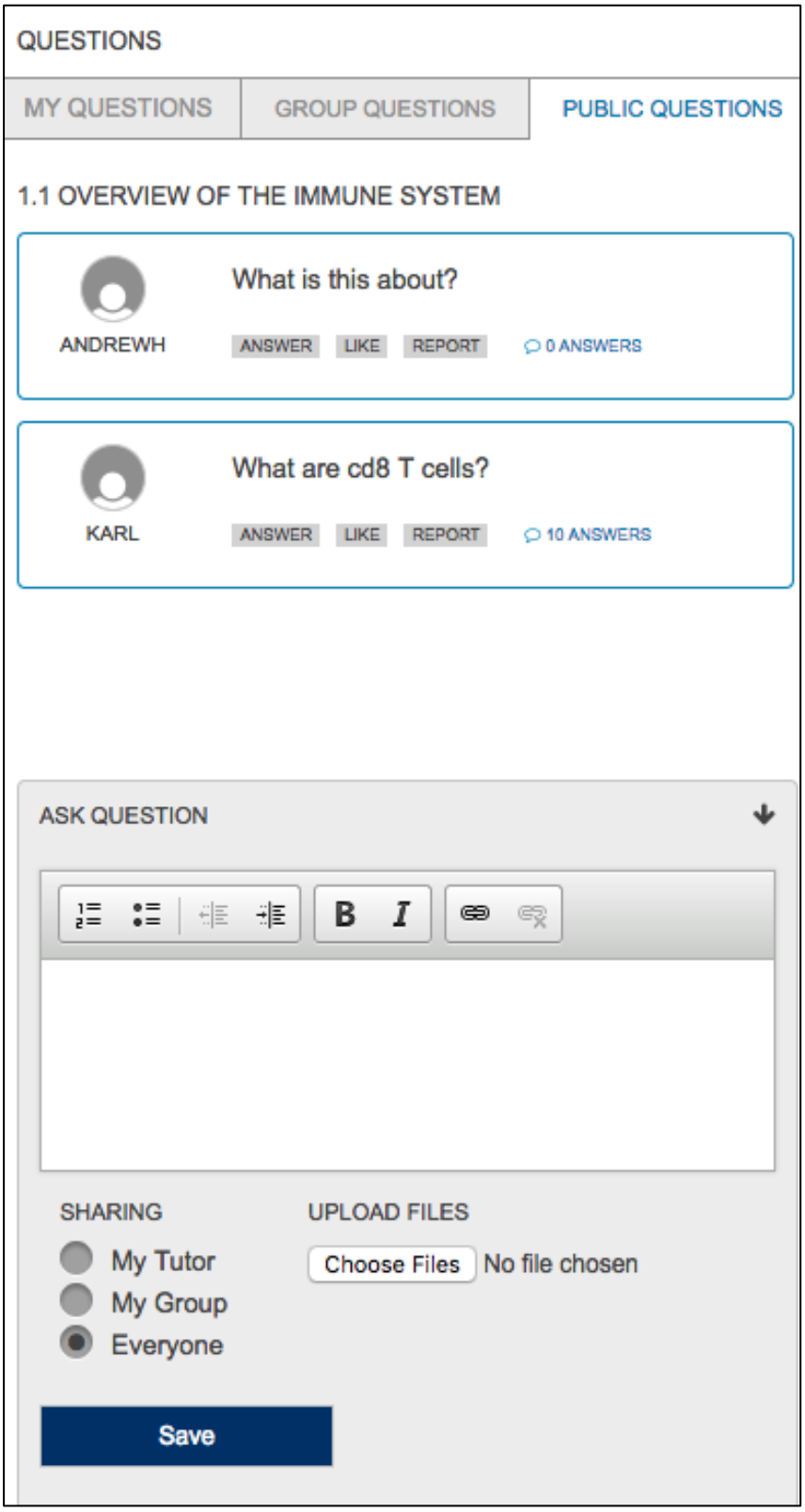


Figure 9: The EE question tool

Source: (EDGE Learning Media (Pty) Ltd, 2018a)

Chapter 4: Research Methodology

4.1 Research Approach and Strategy

According to Maree (2016), ontological assumptions give rise to epistemological assumptions, which in turn give rise to methodological considerations that inform instrumentation and data collection strategies.

The first step in research design is an assumption on the nature of reality, and therefore a philosophy on acquiring knowledge of reality. The paradigmatic assumptions in this research are a realist ontology with an interpretive epistemology – the assumption that people create reality subjectively, and that people construct knowledge by understanding the meaning of their experience.

This was an inductive and exploratory research project. According to Gabriel (2013), an inductive project is concerned with the origination of new theory from the data.

This was a mixed or multi-method research study using qualitative and quantitative data collection techniques. The study was interactive, featuring engagement with respondents; and iterative, with multiple data collection cycles.

4.2 Research Design

Of the traditional qualitative designs, case study design is the most appropriate to this research. An ethnographic approach was considered: although participants could have been observed over an extended period of time, a decision was taken that a strategy with multiple participant groups would add more diversity and exposure. Phenomenology was excluded since its purpose is to describe a person's experience of a phenomenon; and grounded theory, introduced by Glaser and Strauss, was excluded because it requires the researcher to have no

preconceptions at the beginning of the research (Patton, 2015). This research is not action research as the results are not shared with participants in the spiral process (Berg, 2004).

'Case studies can be used to accomplish various aims: to provide description, test theory, or generate theory' (Eisenhardt, 1989, p.535). While theory may be uncovered in case study design, the purpose is to describe the case and address the research questions and problems. Stake (1994) categorises case study research into three types: understanding confined to the case (intrinsic case study); understanding beyond the case (instrumental case study); and a comparison between cases (collective case study). This study was instrumental in design.

A case study is an empirical enquiry about a phenomenon in the real world that is bound by context – i.e. it is a "person, organisation, behavioural condition, event or other social phenomenon" Maree (2016, p.81). The phenomenon in this case study is the EE in medical PBL. The case being studied in this research is the use of the EE by students in the blended learning opportunity that is PBL.

4.3 Sampling

In case study design, a case may be selected for theoretical and not statistical value, and cases may be selected to "replicate previous cases or extend emergent theory" (Eisenhardt, 1989, p. 537). Maxwell (2005, p.235) describes purposeful sampling as "a strategy in which particular settings, persons, or events are deliberately selected for the important information they can provide". The proposed sample was medical students in semester four, because of the EE curriculum project run by the DP. The students in the sample were the first cohort using the EE. The cohort was further divided into groups based on their PBL groups. To achieve heterogeneity, the proposal envisaged iterations of data collection with five groups. This was not achieved because teaching and learning for medical students was cancelled before the end of the 2016 academic year, during data collection.

Since 2015, protests calling for the reduction or abolition of higher education fees have caused significant disruption in teaching and learning in South African universities. In 2015, disruption at the UCT medical school was minimal, but in 2016 medical students played a greater part in the #feesmustfall movement. The Dean of Health Sciences took the decision to suspend teaching and learning before the completion of the academic year in 2016. As a result, data collection from medical students only included two focus groups. A decision was taken to extend the sample of students to second-year Bachelor of Science (BSc) students studying immunology as a two-week course. A request was received from the author of the eReader to extend a version of it to a cohort of BSc students studying physiology. The intention was to provide off-campus teaching and learning to these students during the period of protest action. A variance on the ethical clearance was granted and the physiology students were included in the study.

4.4 Data Collection Methods and Research Instruments

Case studies typically use multiple "data collection methods such as archives, interviews, questionnaires and observations. The evidence may be qualitative, quantitative or both" (Eisenhardt, 1989, p. 534).

Our proposed methodology for each of the five focus groups was to observe all introductory and training sessions and all facilitated PBL sessions (focus group observation sessions); conduct a semi-structured focus group interview (SSI) with the students and their facilitator; and administer a questionnaire to the focus group and their facilitator. The five data collection iterations were built on five PBL cycles.

An introductory session was conducted with students and facilitators in the first week of the first cycle, as part of the rollout of the curriculum project. The student introductory session was a whole class session presented in the New Learning Centre (NLC) lecture theatre. This was

the students' first lecture on their first day back from their mid-year break. The facilitator introductory session was conducted in the Pathology Learning Centre (PLC). This meeting was generally a briefing meeting with facilitators to discuss general housekeeping and content discovery in a case. The purpose of these introductory sessions was to introduce the EE and to obtain informed consent from respondents.

Students and facilitators were briefed on the informed consent form and invited to read the form, ask questions, and sign and submit the form.

The informed consent forms were analysed to ensure that signed forms were received from both the students of a group and their facilitator. This was achieved for groups 1, 2, 3, 4, 5, 7, 9, 10, 12, 13, 15, 17 and 18, in a total of 22 possible groups. Group 18 was randomly selected as the first focus group as it was the first group for which all consent forms were received.

The introductory sessions were followed up with EE training sessions for students and facilitators. The purpose of these sessions was to familiarise both students and facilitators with the EE and to ensure that they adopted the EE. A fieldworker was engaged to assist with data collection and was briefed to record her observations and student responses. The researcher and the fieldworker both captured notes in real time during, as well as after each of the four training sessions. All field notes were captured in Evernote. The fieldworker captured her field notes in red font and the researcher captured his notes in blue font.

All four on-campus PBL sessions were observed in each focus group iteration. Observation is key to understanding exactly how students interact with the EE and often delivers more reliable information (University of Surrey, 2014). In each observation session, researchers observed student interactions with their facilitator and with the EE, and captured notes in Evernote in real time during the session.

4.4.1 Focus Group Data Collection Iteration One

Group 18 consisted of ten students. An SSI was conducted with Group 18 and their facilitator at the end of PBL session four, at the end of the two-week cycle.

The first focus group SSI was designed after the first interim data analysis iteration. All data preceding PBL Group 18's facilitation session four was analysed and coded into five categories (see the details of the approach used in the data analysis section 4.6.1 below). The categories were given descriptions and were used to introduce the following topics for discussion in the SSI (see Appendix 1: Topics for discussion in the Group 18 SSI)

Permission was requested from the facilitator and the students of the group at the beginning of session one, to use 30 minutes of their session four to conduct the SSI. The SSI was conducted around the five broad topics in Appendix 1:

1. Content in a BLC
2. Other learning systems
3. The EE as a learning ecosystem
4. Lectures in a BLC
5. PBL

The researcher and the fieldworker were present in the SSI as investigators. Multiple investigators enhance the creative potential of the study and enhance confidence in the findings. This can also be achieved by splitting the interviewing and note-taking roles (Eisenhardt, 1989). The researcher conducted the interview, and both the researcher and fieldworker took notes in real time. Both investigators recorded field notes after the session, since recording field notes during the SSI was distracting and inefficient. After the first SSI, an amendment to

the existing ethical clearance was granted to use audio recording equipment to record subsequent SSIs.

The research proposal included a post-SSI focus group questionnaire to be delivered individually to the observed students, and a different questionnaire to be delivered to the observed facilitator. A different approach was taken for the first focus group questionnaire – while the group SSI was constructed to yield qualitative data, the group questionnaire questions were constructed to yield quantitative data for triangulation purposes. The data from the Group 18 SSI was analysed and used in the construction of the Group 18 questionnaires. For the student questionnaire, the research questions were reviewed and the categories from the first interim data analysis were collated as a series of enquiry questions under elements of the research questions (see Appendix 2: Enquiry questions for Group 18 questionnaire, grouped around elements of the research questions). From these questions, the questionnaire was constructed on Google Forms (see Appendix 3: Group 18 student questionnaire).

In preparation for the Group 18 facilitator questionnaire, a decision was taken to use the same approach as with the student questionnaire – generating questions by synthesising data from the first iteration of data analysis and the research questions. However, this transformed the questionnaire into a questionnaire about facilitation. This was outside the context of the research questions. To counter this, the facilitator questions were constructed from the student questions by applying the facilitator's perspective on how students are using the EE.

The student and facilitator questionnaires constructed on Google Forms comprised multiple question types, including dichotomous questions, multiple choice single answer and multi-answer questions, free-form open-ended questions and Likert scale response questions.

The questionnaires were emailed to respondents, inviting them to complete them on Google Forms. The questionnaires were left open for two weeks. As responses were initially slow, two

successive requests to complete the questionnaires were made on the students' WhatsApp group. Ultimately, five student responses were received. The facilitator also completed her questionnaire.

4.4.2 Focus Group Data Collection Iteration Two

PBL Group 3 was randomly chosen as the focus group for the next data collection iteration. The group also consisted of ten students. A one-week university vacation separated observation sessions two and three.

The research proposal included modification of the focus group SSIs and questionnaires based on the data analyses of the previous PBL cycles. The second focus group SSI was designed after the second interim iteration of data analysis. All additional data was collected after the first interim data analysis iteration, but before the fourth session of PBL Group 3 was included and coded.

Categories were structured from the first interim data analysis iteration into six topics; and questions were applied as descriptors to each topic and used these to introduce the topics for discussion in the SSI (see Appendix 4: Topics for the Group 3 SSI).

As with Group 18, permission was requested and granted from PBL Group 3 to use the last 30 minutes of the their fourth PBL session to conduct the focus group SSI. The entire interview was audio recorded using a dictaphone placed on the table in the centre of the room. The recording was of a high quality and was later transcribed into a word processing document, and later was also included in Evernote.

All teaching and learning at the UCT medical school was suspended on the Monday following the Group 3 SSI, held on the Friday before. All PBL sessions were cancelled as students embarked on protest action against rising student fees. Faculty were confident that the

disruption to teaching and learning would be short-lived and that students would return to campus. Unfortunately, students did not return and four weeks later all teaching and learning for the semester was cancelled. Students were instructed to return home. Group 3 was unable to complete the focus group questionnaire. At this point, data from only two of the five proposed iterations of PBL cycles had been collected.

4.4.3 Focus Group Data Collection for Physiology Students

An online questionnaire was constructed for these students based on the medical student PBL Group 18 focus group questionnaire, and adapted slightly to contend with the specifics of their physiology course. Responses were received from six students.

4.4.4 Final Data Collection

The methodology included in the research proposal included a final questionnaire that was to be administered to all second-year medical students at the end of their semester, their PBL facilitators, senior lecturers, professors and course convenors. The questionnaire questions for this final research instrument were to have been constructed based on the analysis of preceding data and were to be quantitative rather than qualitative in nature.

A decision was taken to modify the proposed final questionnaire when learning and teaching was cancelled. The richest data emerging from the PBL data collection cycles arose from the SSIs, so the questionnaire was constructed to be qualitative rather than quantitative in nature. This questionnaire was created after the third interim data analysis iteration. All data was recoded and recategorised.

The data analysis generated eight topics:

	Topic
1.	Online/blended/digital
2.	The eReader system
3.	Lectures
4.	Learning resources
5.	Sharing
6.	Groups
7.	PBL
8.	Barriers to studying

Table 1: Topics for the final questionnaire

The questions for the questionnaire were based on these topics, with one final catch all 'anything else' question (see Appendix 5: Questions for the final questionnaire).

Minor language and sentence modifications were made to use the questionnaire for staff including facilitators, course convenors, senior lecturers and professors.

Students received the questionnaire via Vula, the university LMS, seven weeks after instruction for the year was cancelled. Responses were initially slow as students were on holiday at the time. Students returned to campus in the new year for a so-called mini-semester – an intensive month of catch-up learning – to complete the teaching and learning from 2016. The whole class of students was addressed in an attempt to elicit more responses. Ultimately, 19 responses from the cohort of fourth-semester medical students were received. The questionnaire was issued to staff, including facilitators, course convenors, and lecturers in early January 2017. All staff were repeatedly encouraged to complete the questionnaire. Ultimately responses were received from five facilitators, and four lecturers.

Data collection methods are summarised as follows:

Data collection method	Students	Facilitators	Course convenor	Senior lecturer/ professor
Observation and participation – Student EE introduction session	All second-year medical students	No	Yes	No
Observation and participation – Facilitator EE introduction session	No	All MBChB semester 4 facilitators	Yes	No
Observation and participation – Student EE training sessions 1 – 4	All second-year medical students	No	No	No
Observation – PBL Session 1 – 4	Medical students – PBL groups 18, 3	Yes	No	No
Focus group semi-structured interview	Medical students – PBL groups 18, 3	No	No	No
Focus group questionnaire	Medical students - PBL Group 18; BSc second-year students	Yes	No	No
Final questionnaire	All second-year medical students	Yes	Yes	Yes

Table 2: Summary of data collection methods

4.5 Research Criteria

Trustworthiness is a measure of the quality of a qualitative study. A high-quality qualitative study will have a rigorous research process and more trustworthy findings as a result. Guba &

Lincoln, (2005) use the terms credibility, dependability or consistency, applicability or transferability, neutrality or confirmability. A study is trustworthy if it is credible, dependable, transferable and confirmable (Golafshani, 2003; Guba & Lincoln, 2005). Credible research findings are believable and authentic. Dependable research findings can be reproduced. Transferable findings are applicable in other contexts. Confirmable findings are not influenced by the researcher's goals or bias. Confirmability or auditability refers to how adequately information is reported from the research questions, the protocol for data collection, the raw data and the analysis thereof, and the interpretation of the findings (Sharts-Hopko, 2002).

Triangulation is a qualitative concept for rigour in research methodology and, accordingly, for ensuring credibility of research findings. "Triangulation is typically a strategy (test) for improving the validity and reliability of research or evaluation of findings" (Golafshani, 2003, p.603). Triangulation requires two or more perspectives in research design, data collection methods and research instruments. Triangulation is appropriate in qualitative research case study design and needs to be viewed as not only a method for validation or verification, but also as a technique to deliver a rich, robust, comprehensive and well-developed account (Cohen & Crabtree, 2006). "Triangulation made possible by multiple data collection methods provides stronger substantiation of constructs and hypotheses" (Eisenhardt, 1989, p.538). Using multiple methods, such as observation, interviews and questionnaires "will lead to more valid, reliable and diverse construction of realities" (Golafshani, 2003, p. 604).

This study has used multiple researchers, multiple respondent groups, and iteration and multiple data collection methods, including observations, interviews, recordings and questionnaires.

Data saturation is a concept applied to methodology and a tool for rigour. The process "is continued until the researcher reaches data saturation, or a point when no new insights would be obtained" (Ritchie & Lewis, 2003, p.80).

4.6 Data Analysis Methods

Inductive research 'involves the search for pattern from observation and the development of explanations – theories – for those patterns through series of hypotheses' (Bernard, 2006, p.452). Data was analysed using an iterative inductive coding process beginning after the first iteration of data collection and concluding after the final literation of data collection.

4.6.1 Interim Data Analysis Iteration One

The first interim data analysis iteration was conducted on the field notes from the student and facilitator introduction sessions, the four training sessions, and the first three PBL sessions for Group 3. The data was analysed in preparation for the SSI and questionnaire for Group 3.

An inductive coding process progressed by reading text closely, identifying text segments, and considering their potential inherent multiple meanings ; and identifying and assigning labels or codes to multiple meaning units (Thomas, 2006).

The captured field notes were scrutinised and the text segments that were considered as having meaning were changed to bold font and copied into a Google spreadsheet. Each text segment became a record in the spreadsheet database. In this iteration the text segments in Evernote considered without meaning were excluded from the data analysis spreadsheet – this process was changed in data analysis iteration two to include all text segments.

This process resulted in 86 records in the Google sheet. Data fields were added, and headings were assigned to facilitate the process of coding:

	Field
1.	Text segment (a text segment in the field note with meaning)
2.	Iteration (the PBL cycle)
3.	Session (introductory; training; PBL 1,2,3,4)
4.	Researcher (Andrew Hibling; Mandy Coetzee)
5.	Method (observation, SSI, questionnaire)
6.	Code (a proposed code)
7.	Category (a proposed category for the code)

Table 3: Fields for interim data analysis iteration 1

In this first data analysis iteration, the text segment records were coded with one code. This process generated 28 codes (see Appendix 6: Codes for interim data analysis iteration 1). The 28 codes, or meaning units (Thomas, 2006), were then categorised into five categories:

	Category
1.	The EE as a learning ecosystem
2.	Learning resources in a BLC
3.	Lectures in a BLC
4.	Other learning systems
5.	PBL in a BLC

Table 4: Categories for data analysis iteration 1

4.6.2 Interim Data Analysis Iteration Two

For "in vivo" coding, categories are created from meaning units from multiple readings of the raw data (Thomas, 2006). Multiple readings of the raw data captured in Evernote continued to reveal additional meaning units and the SSI for Group 18 also showed that it was premature to

exclude certain field notes as being without meaning. Furthermore, it was revealed that individual text segments have multiple meaning units.

A decision was taken at the beginning of the second iteration of data analysis, to recapture all the raw data from the first iteration from Evernote into a new data analysis Google sheet. The data was tabled under a new set of fields, to allow for multiple codes for each record. The fields were also expanded to record and differentiate between the different groups of respondents, different data collection tools (observation, interview and questionnaire) and the timing of whether the data was collected in real time or after the session (see Appendix 7: Fields for interim data analysis iteration 2). This added an additional 35 records to the 86 captured from the first iteration of data analysis.

Concurrently, the field notes from Group 18's PBL session four and SSI and Group 3's PBL sessions one, two and three were captured. An additional 159 records were added, totalling 280 records for the iteration.

The code for the initial 86 records was kept in the initial code 1 field. The code fields were named as initial codes to prepare for a process of continuous "revision and refinement" (Thomas, 2006) in interim data analysis iteration three. The new records were coded with multiple codes, ultimately generating 82 unique codes (see Appendix 8: Codes for interim data analysis iteration 2).

The categories for these codes were not refined and revised at this point. In interim data analysis iteration one, each record had a single code. This one-to-one record-code relationship allowed for each code to be allocated to a single mutually exclusive category. In iteration two, the multiple code fields resulted in a one-to-many relationship: a single record could be allocated multiple codes and a single code could belong to multiple categories. "One segment

of text may be coded into more than one category" (Thomas, 2006, p.5). A decision was taken to revise and refine the codes after interim data analysis iteration three.

4.6.3 Interim Data Analysis Iteration Three

Iteration three commenced after teaching and learning was cancelled for the academic year, and after the Group 3 SSIs had been completed. The audio recording was transcribed and added to Evernote. The notes from Evernote from Group 3's PBL session four and the Group 3 SSI transcription (216 records) were added to the Google sheet. This resulted in 496 records. These records were condensed into 452 records. The "initial code" fields were renamed to "second code" and through an additional process of review and refinement, additional codes were applied to the records.

The seven code fields were then combined into a list of codes and followed by a process of "lumping and splitting" (Thomas, 2006). By refining the description of the code, certain codes were deleted because of overlap in meaning, and additional codes were added for new meaning. This process resulted in 452 records having 688 code entries of 483 unique codes.

In this third iteration, a categorised code sheet was created and populated with the 483 unique codes – each of which was categorised and nested into multiple categories. Each code became a record in the data sheet and each code could be included in multiple categories. Twenty-eight categories were generated (see Appendix 9: Categories for interim data analysis iteration 3). The codes and categories from interim data analysis iteration three were used to prepare the final questionnaires.

4.6.4 Final Data Analysis

The final data analysis commenced after all the final questionnaires had closed. Because of the one-to-many relationship between codes and categories, a simple "Visual Basic" script was

written to generate a macro that created a "base data set" that converted the multiple codes for a particular record into multiple records. This allowed the data to be explored using pivot tables. These pivot tables provided the ability to easily view all records coded with a particular code or category.

As deeper description was added to the codes, another process of "lumping and splitting" codes was conducted. This process resulted in 360 unique codes and 48 categories.

The answers from the final questionnaires were then added as records to the data set. The qualitative and quantitative information from the Group 18 group questionnaire was also added to the data set.

This process of coding these new records resulted in further "lumping and splitting" of codes. The entire list of categorised codes was reviewed by searching for codes based on certain keywords. The keyword search was used to illuminate any potential overlapping codes based on their description. If the keyword search revealed an applicable code, it was used. If a code was similar to others, a decision was taken to either split or lump the codes to achieve a desired code. If this was not possible, a new code was created and categorised. This was an iterative process presenting different codes for review, since, often, further search words would be revealed. As part of this process, the categories applicable to the codes were also reviewed. Once a code was reviewed, the description was expanded, and it was marked as reviewed. The corresponding records were then updated with the new code.

Spreadsheet data validation tools were used to ensure that a record could not be coded unless the code had been used from the categorised codes sheet. If no code was applicable, a new code was created. A code could not be categorised unless the category was from a range of data validation categories. In some instances, the keyword was already a category in its entirety; in

other instances, the keyword exposed a new category. All keyword searches within code names were recorded.

The categories were then extracted to arrive at a final list of categories. Through this process, categories were deleted, added or the names were changed.

The data analysis Google sheet allowed for each category to be viewed with its component codes and its component records. By constantly rereading the raw data, the analysis provides a full and thick description. “Thick description has been translated in many ways but essentially requires the researcher to provide sufficient detail of the original observations or commentaries” (Ritchie & Lewis, 2003, p.268).

Throughout this process the data were monitored for data saturation as data from different parts in the collection process were reviewed for triangulation.

The data analysis concluded in eight themes:

1. Learning and PBL
2. Assessment range
3. Usability of the EE
4. Lectures and lecturers
5. Group learning
6. Sharing and trust
7. Learning opportunities
8. Learning resources

For each theme, the findings were considered in relation to the research questions as well as whether they were trustworthy – i.e. credible, dependable, transferable and confirmable.

Chapter 5: Research Findings

This chapter presents the research findings under the headings of the emergent themes.

5.1 Learning and PBL

The first on-campus PBL session for students includes a process of understanding the case or problem by reading through the case narrative, identifying any unknown terminology and drafting a list of learning objectives. Student respondents used a subjective, objective, assessment, plan (SOAP) methodology, in which they identified and separated information as subjective (part of the medical history); objective (a potential clinical sign); part of the assessment or differential diagnosis; or part of the plan. In both Group 18 and Group 3, a chairperson was elected to chair the session and a scribe was elected to take notes. There was a pervasive disgruntled feeling in both groups when it came to elect the chair or the scribe for the session. One respondent commented: “seriously, nobody wants to scribe, or at least I have yet to meet someone who does”.

Knowledge is activated when students are directed on previous experience, or provided new experience to activate or introduce a structure to receive information (Merrill, 2002). The SOAP methodology provides not only a methodology to activate prior knowledge, but also a framework or structure on which new knowledge can be built. Student respondents were drawing on prior knowledge when they read the cases and identified any unfamiliar words. Students in both focus groups followed the process well.

Students were given reading packs before the first on-campus sessions commenced. This was a reading activity to activate prior knowledge. Some student respondents indicated that they did use the reading packs, but some indicated they considered them too much reading and as such did not read the packs. “They are a waste of paper,” said one respondent.

In the observed sessions, the SSI and the questionnaires, almost all students indicated the value they placed on the clinical contextualisation that SOAP offers a clinical facilitator. In the words of a medical student: “Another hugely important thing: make the quality of the facilitator at least somewhat reliable. The difference in the amount learned by a PBL group whose facilitator is essentially a lay-person with no clinical background and a group whose facilitator can give clinical pearls and relevant information is profound”. Another student said: “If one group has a good facilitator - their entire experience is different”.

Problematisation is at the core of PBL. In both focus groups, students identified the learning objectives applicable to the case.

The DP did not conduct the learning objective collation session on the Friday following the first Monday on-campus session. This was in contrast to semester-three students. For these students, the Human Biology department chose to have a representative from each PBL group attend a session in which the respective groups’ learning objectives were collated into a single “approved” list of learning objectives. The department released these objectives back to the groups after the collation session.

The DP released a pre-collated “approved” learning objectives list on the Tuesday following the first Monday on-campus session. This practice allowed groups to proceed directly to the self-study learning phase of PBL. Some student respondents indicated that they prefer to have the list of learning objectives provided to them. They did not want to wait until the Friday to receive the list of approved learning objectives. They preferred to begin the self-study phase of PBL directly after the first on-campus contact session. This was directed self-study and not self-directed study: students were directed by the approved learning objectives. Some respondents indicated that they prefer the self-study element of PBL, and they would prefer PBL to be entirely self-study.

For the self-study learning phase, respondents in the different groups elected to task split or task share. In Group 18, all students researched all approved learning objectives. In Group 3, students self-organised and allocated learning objectives to avoid overlap and duplication. One student indicated that doing all the learning objectives was a "waste of time" and that they could be done "online at home".

In subsequent on-campus sessions, students demonstrated knowledge to each other. They applied and integrated knowledge through discussion, presentation and articulation. The facilitator played an important role in integrating knowledge by supplying not only the relevant clinical contextualisation, but also by facilitating the discussion and questions. Student knowledge is integrated when there is opportunity for reflection and discussion, and the opportunity to defend a position; when students are able to create, invent and explore; and when students are able to publicly demonstrate their knowledge (Merrill, 2002). The level of presentation of learning objectives varied considerably among students. Some students read their allocated learning objectives while others embraced their presentations. Respondents indicated that inadequate presentations by colleagues adversely affected their learning. One sentiment expressed was "bring in your interpretation rather the regurgitate the lecture slides".

The expressed reaction to PBL was mixed. This was evident from the observation sessions, the focus group SSIs and the final questionnaire. Some students valued PBL and others did not. Some students valued different elements of PBL. The dissatisfaction seemed to be less concerned with PBL, but more within the context in which PBL is delivered.

PBL is one of many learning opportunities given to students and it was within this perceived hierarchy that the dissatisfaction exists. Students saw PBL as adjunctive to lectures which were their main source of teaching and learning.

Both medical and BSc students indicated that lectures are their most valued learning opportunity. Medical respondents value lectures because of their perceived contribution to passing their assessments. They believe the lecturer sets the assessment questions, particularly their short answer questions (SAQ). They believe the learning objectives from lectures are most accurately aligned to their assessable learning objectives and to their ultimate assessment. They also value lectures as their primary source of, as one student said, "current" learning resources. BSc respondents had no lectures for physiology because of the protest action. Many of them expressed dissatisfaction at not having lectures and saw the EE as supportive in the absence of lectures.

Some of the medical respondents regarded the seven hours per week spent on-campus in face-to-face PBL sessions as time that could have been better spent elsewhere. However, most of these students considered that the off-campus self-study element of PBL was efficient. One student indicated that the first PBL on-campus session "could be done away with".

5.2 Assessment Range

For the MBChB students, an accurate, coherent and communicated assessment range is the most important curriculum guide. Students expressed the need to know how they would be assessed and the extent they needed to study to pass these assessments. Students wanted to know the structure and breakdown of their various assessment opportunities, as well as the tools and instruments used in the assessments. Most importantly, they wanted to know the depth of knowledge they were required to have for each assessment opportunity.

Students wanted the approved learning objectives to be clear, concise and centrally agreed. They also wanted an indicator of the assessment range. That said, some respondents indicated they struggled with the range of a learning objective, regardless of how well it was crafted. Student respondents did not believe the learning objectives from PBL indicated an assessable

range. They also considered that the learning objectives were too broad and did not focus on the learning opportunity.

Students indicated that learning opportunities should be focused on "essential or difficult to understand learning objectives". Many medical student respondents indicated that they found the duplication of learning objectives within multiple learning opportunities confusing. As one said: "certain learning objectives are covered in PBL and not in lectures" and vice versa.

Students also found inter-discipline duplication and gaps in communicated learning objectives confusing when they were trying to determine their assessable range. In addition to lectures, students place considerable value on past examination papers for determining their range. Students benchmark against other students when determining range. Range indication in learning resources is extremely important for students and it is critical for them to know what learning resources they are going to be assessed on.

Students did not indicate that they believed the textbook determined the assessment range, but they did value the discipline eReaders for this purpose: "Having all our resources in one place, tells me what I have to study," one student commented. Students expressed a desire for their readers to have sufficient resources to cover the learning objectives and, as such, to function as a course outline. Students regarded the linking functionality within the EE as an aid to determining assessment range because it outlines the content in a specific discipline eReader that covers the case.

5.3 Usability of the EE

5.3.1 Digital Learning and Proficiency

There is an FHS digital learning policy (UCT Department of Health Sciences Education, 2016). However, implementation and adoption of digital learning initiatives is fragmented. Almost all student respondents perceived digital/online learning to be an alternative to traditional learning. They did not comprehend the entity that is digital/online learning and did not see it as an acceptable learning methodology for their on-campus experience. They do not want digital/online learning to replace lectures.

However, students do differentiate between on-campus and off-campus learning, and also between self-directed study or free learning from scheduled or directed self-study learning opportunities. They do not see digital/online learning as acceptable in either of these contexts.

Students did consider digital/online learning as a mechanism for delivering learning resources, but they did not consider it for facilitating engagement and hosting learning opportunities constructed around those learning resources. Students perceived the eReader primarily as a learning resource and not as a learning ecosystem that could facilitate online learning opportunities. The EE was perceived as the eReader and not as a learning ecosystem. This perception was a barrier to using the online tools.

Many students indicated that they used paper-based learning resources at school and this is how they prefer to learn. Some students had very good digital proficiency. The level of digital literacy skills is a barrier – some students have advanced digital skills while others lack even basic skills.

Some students believed that the EE functionality did not sufficiently cater for existing study techniques and some students considered the forced use of social online tools, including sharing notes and asking questions, to be a barrier to them using the EE.

Those students engaged in digital learning prefer to use a laptop rather than a tablet as their primary learning device for digital learning. Mobile phones are used for, as one student said, "communication and organisation purposes and not for learning". Students who do enjoy accessing online digital learning resources want them to be available offline. In both Group 18 and Group 3, at least 50 per cent of the students were using laptops during PBL face-to-face sessions. There was a marked difference in study techniques for those students with laptops. The devices were used for accessing OERs, but also to collate learning resources. Few students used their tablets or smartphone devices. In an observation session with Group 3, researchers noted four laptops (three Acers and one 17-inch MacBook Pro), one iPad, and two students using paper base. Only two students had their phones on the table.

Some students indicated that having multiple learning resources and learning opportunities in multiple locations online – as is the case with Vula – discouraged them from online learning. Students appreciated the EE's capability in this respect, as expressed by one respondent, who said: "I found the eReader much easier to navigate than Vula especially the direct linking of the case to relevant areas whereas Vula requires having to go to different areas without the links".

Disparities exist for digital skills as well as access to data and devices, both on campus and off-campus. Despite on-campus connectivity within and out of the residences, download speeds frustrate students and this prevents them from consuming online learning resources.

Some student respondents still used their printed readers supplied in the previous semester and elected not to use the digital online system at all – as one student said: "I learn better from

something that's a hard copy and as a result I have been using my old Microbiology reader". Some students still want to engage in paper-based learning techniques since they do not believe these can be replicated online – as another student wrote: "I believe in writing down everything on paper to study". Some student respondents believed that they cannot learn online.

One student did not want to engage in digital/online learning because they considered it "exclusionary", saying: "I do not feel as if certain learning activities should be online at this point, until complete access is 100% guaranteed for who need to access it". Disparity in devices, data and digital literacy is a barrier to equitable learning and the disparity is accentuated off-campus.

Some students cited barriers to digital learning, including concentration, eye strain, distraction and device inefficiency. Some students indicated that they believed that social skills could not be acquired through digital learning. This perceived lack of collaboration and social interaction in digital learning was considered a major deterrent. This perception exists, despite the pervasive use of chat applications such as WhatsApp.

That said, some students did believe that digital learning represents an opportunity and should be used for specific learning resources and opportunities. Students valued the DP's "modern approach" to learning, recognising the global digital trend. Students valued the improved accessibility of online readers and recognised the potential for online readers to be easily updated to contain the latest learning resources.

Some students recognised the potential for eReaders to increase access to OERs and as a tool for immediate feedback and answers to their questions. As many respondents said many times: "just ask Google". Students engaged in digital learning regard this synchronous feedback as extremely valuable.

One student suggested the use of quick response (QR) codes as a mechanism to bridge the physical pathology specimens in the PLC with the digital photographs contained online.

Students recognised the potential for digital learning as an aid to accessing and searching for information and retrieving work they had previously accessed.

For students to fully engage with digital learning, they said it should not be obstructive – it should cater to their needs; be sufficiently fast and suffer minimal downtime. One student said: "I must be able to log on for an extended period of time. It kicks me out and I can only get there through Vula".

Students showed varying digital proficiency. They used various paper and digital learning techniques, tools and habits.

When engaging with digital learning, some students used digital techniques entirely. Across all data collection methods, students asked the EE to facilitate writing, highlighting, summarising, underlining, curation, collation, chatting, sharing, presenting, discussing, questioning and note-taking.

Students indicated that they needed paper-based techniques to be facilitated online. However, despite some of this existing functionality, some students preferred to use the EE functionality to print their sections, notes and questions. Print functionality is an important tool within an EE for students who are unable or unwilling to adjust to digital learning techniques.

5.3.2 Highlighting Functionality

For student respondents, the greatest deficiency in the EE was the lack of a highlighting tool. In an answer to a question in the final questionnaire, one respondent said: “If highlighting could be a feature that is added and the highlighting could be stored for whenever you log on again”; and another suggested: “A highlighting function (where highlights can be saved)”.

Because the EE is a web page, hosted in an online environment, a direct highlighting tool was not available to this sample. The students regarded signalling functionality as a core tool required to draw special attention to text or media. Students used the right-click functionality that was added to enable them to select text, and copy and paste into the notes functionality as a signalling mechanism in the EE.

5.3.3 The System, Structure and Taxonomy

Students indicated that system speed and bugs detracted from using the EE. They liked the overall layout and typesetting of the eReaders from the different disciplines and the presentation of their learning resources in a book format. They also liked the taxonomy of units, sections and subsections. Students requested a feedback function which would enable them to offer suggestions on how the system could be improved.

5.3.4 Off-campus vs. On-campus

Students accessed the EE primarily off-campus, and primarily in self-study before PBL sessions.

5.3.5 Dictionary Functionality

Student respondents valued this highly. In answer to a question in the final questionnaire, a student respondent wrote: “The dictionary is great”. Having the dictionary available online enabled students to determine the description or meaning of a word efficiently.

5.3.6 Reference

Students expressed the desire to know where they were, where they have been and where they needed to go. They needed to see the whole system at any point.

Students wanted to be able to find information easily when they were looking for it and did not want to “just spend a lot of time searching for ways to find what you need,” as a student respondent in the Group 3 SSI said.

Respondents indicated that a detailed contents page to use as a “map” to search for information, that guides a progression through a single eReader, and enables random access into an eReader, would be useful.

Respondents valued the random or parachute access that the linking functionality facilitated. They also praised the tabs functionality that was added after the Group 18 iteration, which allowed multiple eReaders to be open at the same time, improving simultaneous access to multiple learning resources.

Search functionality is critically important for finding information efficiently. Respondents regard search as a major benefit of using digital learning resources. Search functionality initially only catered for intra-eReader or single eReader word search, but students requested trans-EE word search as well as trans-EE tags or keyword search functionality.

Most commercial eBook readers have some form of progress indication. This feature is important to students and was specifically requested. Although it was initially included as a tool, it was removed because non-linear or "parachute" access facilitated by linking made it inaccurate. Within the Casebook, students wanted the ability to determine how many learning objectives they have completed. Respondents want to be able to easily return to the location of their last session.

User-friendly navigation is a major determinant of user-friendliness and efficiency in digital learning. Navigation tools and capability are critically important for students. Respondents liked floating navigation tools as well as breadcrumb tools to access preceding and following sections. In the mobile environment, students expected swipe capability.

One student suggested a print view – the ability to see multiple sections within a unit at the same time that would help them to contextualise the section within the unit.

Scrolling functionality was very important to respondents. This had to apply to all panes within the EE and to be adjusted on the location of the mouse cursor. Students were frustrated by the lack of this functionality.

Keyboard navigation was extremely important for students, who requested back/forward buttons as well as home/end buttons.

Students valued the responsive screen functionality, regarding it as an important enabler in digital learning. Students used a technique called window splitting to view multiple windows or applications with the EE at the same time. Students need the ability to toggle between different windows, though many students were unaware of the "Alt-Tab" keyboard window toggling functionality.

5.3.7 Notes Tool

Students wanted the ability to efficiently access the different tools within an EE, preferring to have tools panes visible on demand. The notes tool was initially set for the pane to "fly in" on click, but this was changed to have the pane permanently visible. Students wanted to use the tool panes as navigation tools – they wanted to be able to click on a note or question and be directed to the relevant section in the eReader.

Different students took notes in different ways and for different reasons. Students using paper-based techniques used A4 paper pads and books to take notes. Those using digital techniques used various collation applications such as MS Word, MS OneNote, Evernote and Google Docs. Students valued the ability to take notes in a digital learning environment. They differentiated between short notes, or memos or annotations, added to a particular paragraph, versus long notes for collation and summarising relating more to sections or units. These different types of notes were interdependent, but students used them for different purposes in the knowledge construction process. Students were confused about whether the notes tool was for short or long note purposes and did not initially use the note-taking functionality.

The default setting of the notes tool functionality was initially set to share the note with all users in the system, but this inhibited students from using the tool. Students regarded their notes as their own first and foremost, and they preferred a private setting as the default. A student respondent in the Group 18 SSI said, "I feel the note that I have created is mine to share if I want". Privacy was important to students and they wanted to choose whether their notes would be shared. Some students indicated that they may have shared notes more if they were anonymous. As best described by a student in an SSI: "would it be possible to like [sic] make it anonymous so like [sic] if I shared nonsense so that like [sic] everyone doesn't like [sic] trace it back to me in a way". Another barrier for the receiving student to use the notes tool is whether

the sharing student's notes are well-curated and legible. For the sharing student, a barrier is their peer's perceived level of knowledge or their own competitiveness.

A few students indicated that a collation tool such as a clipping tool could be included in the notes functionality. Clipping is a term used to refer to the process of capturing what is shown on screen and then including it in an application, whether this be a page, an article, a section or a screenshot – if a student finds an OER, they want to include it in their notes. Students requested functionality to upload document and graphics files to collate and share in the desktop and mobile environment.

The notes tool was intended to create and share notes so that as more and more notes were created and shared, the body of knowledge within the EE would increase. Students did not view the note sharing tool in the context of its intended body of knowledge building capability and did not embrace the concept because they did not want to share their notes by default.

Students did not enjoy the centralised note-taking in the PBL contact sessions. They preferred to take their own notes, or at least collaboratively collate notes in the contact sessions. Nor did students use the notes tool for scribing or note-taking in PBL contact sessions.

Students requested functionality to reply to notes that have been shared, enabling them to have a conversation about or discuss a note. They expressed the need for functionality to tag other users in notes through mentions. As a student in the Group 18 questionnaire wrote: "Mentions where at a specific part in the reader you mark and comment, say '@DrHibling' (for example). You then ask your question and the person this was directed to could respond. By using '@name' another student is notified when they have been mentioned or tagged in a student's note."

Notifications for students are important. They wanted to be notified on mentions, tags, learning resource updates, responses to notes and answers to questions. The EE currently caters for email notification and students requested the ability to switch this on and off. Students also requested a notification mechanism other than email – such as mobile notification systems or "in-app" or intra-application notifications.

Students differentiated the notes tools from the discussion, forum and chat tools. They were aware of the different conversations they were having with students and educators. They wanted notes to be reserved for learning purposes – they did not want them to be used for administrative nor social purposes. They preferred mobile chat applications such as WhatsApp to be used for these purposes.

Some students regarded digital note-taking as less efficient than writing on paper. That said, some students did consider the ability to retrieve and share digital notes to be a major benefit.

5.3.8 Question Tool

Students did not use the question tool, although they did value the role of questions with appropriate synchronous feedback in their learning. Students wanted questions to be referenced to a section of content in the EE. Contextualisation of questions is important to students – the question loses its context if it is not attached to a section in the EE.

Students needed to be able to view questions in continuum. They wanted a question view and the ability to click to the relevant section linked to the question. This would be an additional tool for finding information.

Students were reluctant to ask questions in the EE and were even more reluctant to answer questions posted by their peers. They were particularly resistant to asking questions in the EE within the whole class environment. Students indicated that they would be more likely to ask

questions if they were anonymous or if they could direct their question at a particular individual or group of individuals.

Students did not use the answer ranking functionality that allowed them to rank a peer's answer to a peer's questions with the highest-ranking answers displayed first. Students did not want their questions to be answered by their peers, but if they were, then students wanted the answers supplied by their educators (facilitators, but preferably lecturers) displayed first. Students wanted to know that the answer is correct – they want to be able to trust the information as authenticated and curated. Students needed functionality in the EE to ask educators questions directly. Some lecturer respondents requested functionality to be able to answer questions using voice notes. Students preferred to ask questions to their lecturers instead of their facilitator – they value clinical input and the clinical credentials of a lecturer.

Students actively asked questions in the on-campus PBL sessions, albeit there was a varied level of engagement by different members of the PBL group. Students requested functionality in the EE to ask questions to their group only. This intra-group question functionality was added, but students still did not use the questions tool. Some students cited barriers to using the questions tool: the lack of an organised learning opportunity centred on the questions, and the questions tool was often used for social communication and foolery. Students requested questions to be monitored and regulated by the lecturer or facilitator.

5.3.9 Linking Tool

The linking functionality of the EE enables students to access different learning resources. Students complained that they spend a considerable amount of time accessing learning resources – readers, textbooks, lectures, journal articles or OERs. Students requested the EE to include all their learning resources with applicable links to each other and to include additional learning opportunities. Students believed this centrality would greatly reduce the time spent

accessing resources. One student wrote in the final questionnaire “I just see it as a Vula equivalent where all my info is” and another wrote “At the moment I need to do a lot of integrating with other sources and it makes it very tiring”. A further respondent wrote “I think having all lectures, notes, PBL LOs, recommended readings and any related material collated into one place is fantastically efficient”.

Students preferred links to contextualise learning resources and learning opportunities in terms of learning objectives, suggesting that this would ring fence the range of learning objectives for students and inform them about how much to study for their assessments. The linking functionality helped with contextualisation.

Students valued the ability for links to contextualise to lecture slides as well as inter-eReader links that aided cross-discipline contextualisation. Students also valued intra-case links that helped contextualise the body system and discipline, as well as links to other pathology readers and non-pathology disciplines including anatomy and physiology.

Students value links to textbooks. The virology textbook is embedded in the eReader at the appropriate point in its sequenced structure, which contextualises the sections of the eReader in terms of the prescribed textbook. Students valued this functionality to “deep link” directly to a specific page in an eBook that has been included in an eReader. Textbook costs remain a barrier to accessing learning resources. Wealthier students can access a variety of prescribed and recommended textbooks. While the medical library is exceptionally well-resourced, students preferred to own their own textbooks. Students valued links to OERs.

Students requested the ability to add links themselves as well as reverse linking functionality to help navigate to a previously accessed section. They considered this helpful in the knowledge construction process.

5.3.10 Quizzing Tool

By far, the most valued functionality in the EE was the quizzing tool, as one student said: "Another really important thing to make available online are frequent quizzes!" Another wrote "I enjoy learning activities online, particularly when using quizzes designed to test your knowledge" and a further quote reads "Quite positive about learning activities online. Including formative quizzes and practice exams".

Students want to be able to self-assess their readiness for assessment. In all forms of data collection – observation, interview and questionnaire – the student responses included comments about self-assessment. Students valued the multiple-choice style questions presented by the online quizzing tools, but they also valued free-form questions. Students want self-assessment to relate to assessment, both in terms of range and in terms of question type. Some students requested feedback from educators on the self-assessment questions, particularly the free-form questions, as well as the ability for facilitators to mark these questions.

5.4 Lectures and Lecturers

Students valued their lectures the most out of all their learning opportunities. From the Group 3 SSI one student shared: "I think we need the lectures, they are quite important. Like [sic] the information is great you can get, [sic] in one day you can literally get any information on the internet but it's very difficult for us to apply that information to a context where we can understand it, you know what I mean. So, I think why we enjoy the lectures so much is because it's someone actually explaining the process and explaining how it works and putting it in context where we can understand it and like [sic] showing us the applications of all that knowledge and that's why like I enjoy the lectures". And another student wrote in the whole class questionnaire "Lectures are mostly to see what material is emphasised - the huge amount

of material out there requires some streamlining. Another purpose of lectures (which is not completely fulfilled right now) is to point out clinical correlates. It is all well and fine to know which mutations are associated with Von Willebrand's disease, but if we don't know whether PT or PTT will be affected if you take blood from the patient, I don't think we are getting the most important part of the story."

Students valued their lectures as the primary source of range and assessment guidance because they believed the lecturer sets their assessment questions. Student respondents also valued lectures because of the access to lecturers and their belief that lecturers provided the latest information and thinking for a particular discipline.

Students regarded lecturers as a source of information or demonstration of knowledge, and they valued lecture slides as a learning resource. However, they would prefer to receive them before the lecture, so they could print them and make their notes during the lecture. Most students still take notes in lectures. Students frequently mentioned their frustration at not receiving the slides in time.

Most students attended live lectures, but if the lecturer was poor they were not inclined to attend. Good lecturers were regarded as those who engaged and did not simply "read their slides"; or who "explain difficult concepts"; or who "use humour". Students preferred lecturers who "teach", as one student respondent wrote in the final questionnaire: "A lecturer that teaches the material makes the work much easier to revise as opposed to a lecturer that just speaks on the topics."

Students used recorded lectures if they were unable to attend live lectures and if the lecture was available because the lecturer had consented to record the lecture. Some students did not attend lectures and used the recorded lectures as often as possible. Not having all lectures recorded was a frustration for students.

Students valued being able to ask lecturers questions in lectures. If they want to have access to their lecturer in the EE they regard it is a key driver in digital/online learning. Having access to both lectures and lecturers within an EE was critical to students adopting and using the resource. Students would be far more inclined to use an EE if it enabled access to their lectures and lecturers. Not having that access within the EE was a barrier to using the system. Lectures and lecturers were the most highly regarded resource in undergraduate medical education at UCT.

Students wanted to see the lecturer's name in the EE so they could easily identify and find them. While students did email lecturers, they also complained that often the responses were erratic or not forthcoming. Emails were sometimes coordinated by class representatives. One student commented that there was no point in asking a question on the EE because "no-one is there". For students to ask questions in the EE, the lecturer needed to be present.

Lecturers requested functionality to see all recent questions and answers and the ability to answer with voice notes and other mechanisms to add content to the system.

Students wanted lecturers to view their notes only if the student had actively shared them.

Unequal access to lecture slides was noted. Students who had somehow accessed previous lecture slides or had accessed them early were not likely to share these resources.

5.5 Group Learning

PBL is a group learning opportunity that requires collaboration. Students collaborated inside and outside scheduled PBL sessions, online and offline and on- and off-campus.

In general, students did not like organised group learning activities. If they were not compulsory, some students would not attend. However, they would engage in group learning

activities if they had the flexibility to self-determine the composition of the group and the place and time of meetings.

Students believed the group composition influenced the effectiveness and efficiency of individual learning within group learning. Students recognised the importance of epistemological, cultural and social diversity and the balance achieved in group activities; and they believed group dynamics were an important factor in the success of learning in a group. They believed variations in discipline and dedication inhibited group performance. Students believed that sometimes a group "just does not gel". Group size played an important role – students preferred to collaborate in smaller, more intimate groups. They preferred to be members of multiple groups, as opposed to belonging to the same group for an extended period. This multiple group membership ensured they would be exposed to different peers.

Students preferred collaborating in task-splitting as opposed to task-sharing activities. They regarded task-sharing activities to be too dependent on other students' learning styles and diligence and also on softer skills such as language and social skills. Students liked collaborative activities to demonstrate knowledge, particularly from discussion, and questions and answers with peers. Students liked collaborative activities for peer benchmarking purposes.

In some groups students believed they could study more efficiently on their own. However, some students valued group learning because it increases their access to their peers' knowledge. Some students believed that group learning increases the breadth of their knowledge. Students with less epistemological advantage seemed less active in group discussion activities, and less confident students engaged less. More articulate and confident students dominated the discussion. Students were frustrated by the pace of group learning activities when the pace was set by very strong or very weak students. One student respondent wrote in the final questionnaire "Currently, many groups are dysfunctional because people are very far apart in

terms of competence. And so, an entire session of PBL could be spent revising the most basic cardiac physiology that any self-respecting first year would know instead of talking about clinical correlates and detailed pathophysiological changes and how they affect patient presentation." "Why waste an afternoon in PBL letting half the group play catch-up and half the group fall asleep". However, that same student said: "I enjoy group work when you get to aggregate the knowledge of the group and everyone brings a different perspective to the problem".

In the context of PBL, students did not value group learning when they did not like or respect their facilitator. Students believed the facilitator played an important role in PBL contact sessions, by directing and focusing the discussion, as well as contributing appropriate knowledge at the relevant time.

5.6 Sharing and Trust

Students engaging in digital learning techniques enjoyed collating learning resources collaboratively. They performed this online using Google Docs, mostly off-campus and outside of scheduled learning opportunities. Some students only wanted to share learning resources in groups of their own choosing and not necessarily in their PBL groups.

Students shared their written lecture notes, collaborated and shared questions with peers only by their own choice. Most students did not want to share and ask questions in the whole class group – they preferred to share in smaller group environments.

Trust was a central driver for student sharing and was a factor from both the giver and receiver's perspectives. The sharer desires trust that they will not be "judged" on their work nor that it will not be taken for granted. They trust that their work will only be shared further with their permission.

Privacy was important to students – they wanted the choice of what to share, when to share it and with whom to share it. The student receiving the work needed to trust that it had been curated, that any unnecessary or incorrect information had been removed and that "it is legible and coherent". Trust from staff curation is implicit. Trust from peer curation is earned. A student's shared work was trusted based on their achievement in assessment, but also from performance in group activities. Some students indicated that they would share if it was anonymous, but other students indicated that they would not use shared work if they did not know its source – students wanted to know the source of the contribution in a collaboration.

Student competitiveness and a competitive learning environment is a barrier to sharing. Students were particularly reluctant to share personal study notes that had taken time and effort to prepare. Some students indicated that they believed that the students at the "top of the class" would be less likely to share.

Sharing of learning resources constitutes a potential barrier to equal access to learning resources, both within self-directed, large group and small group learning. There were multiple reasons for this reluctance to share, including the competitive learning environment, trust, self-esteem and perceived epistemological disadvantage. Presentation, discussion and articulation skills were also potential barriers to students gaining equal benefit from group-based learning opportunities.

5.7 Learning Opportunities

Respondents were of the opinion that learning opportunities not designed to minimise overlaps and gaps in learning objectives confused their appreciation of assessable range.

Students wanted more lecturer-delivered or coordinated learning opportunities. They were not opposed to flipping the classroom in large group on-campus learning opportunities.

Most students were highly motivated for directed self-study and some regarded that as their primary learning opportunity. The main activity in directed self-study was the collation of learning resources against the particular learning objective. Collation included multiple activities including online search, textbook reference, note reference, reader reference, journal search and collaboration. Often collation generated differing views, taxonomies and classifications. This generated discussion and knowledge integration but also sometimes confusion.

Students valued face-to-face on-campus learning opportunities. They valued the synchronicity. Students criticised the lack of synchronicity in off-campus online learning opportunities.

Students valued flexible timing in learning opportunities and some students suggested that off-campus online learning opportunities provided more flexibility, and that certain organised on-campus learning opportunities were inefficient as a result of the logistics required – i.e. "wasted travel time".

Students did not like learning opportunities that included presentation learning activities, but they valued discussion activities. Students did not value information activities; they preferred to be given curated information. Students preferred tutorial-style learning opportunities; they preferred knowledge demonstration activities rather than application and integration activities.

There was no specific mention of gamification as a potential learning activity, although anatomical dissection is a highly valued learning opportunity.

5.8 Learning Resources

Students wanted consistency in their different learning resources – consistency in information, makeup and sequence. They did not want contradictions. They regarded their readers as an extremely important source of information. They wanted a contained learning resource that

covered all their learning objectives for a particular course and, ultimately, assessment of that course. The readers needed to be complete, with no overlap or duplication for the particular discipline. Contradictions in different learning resources would confuse students. Students indicated they wanted readers for every course or discipline and complained about the absence of certain readers – especially embryology and histology.

Students valued accurate, concise, curated, collated, summarised, explanatory and graphic content and images in their readers. Students valued matrices, diagrams, flow charts, mind maps, and pictographs and mnemonic elements within their readers. They valued clinical contextualisation in their readers – one said: "it makes it more relevant". Students valued interactive resources for feedback and self-assessment purposes, as well as OERs for different reasons – for humour, viewing pleasure, range, explanation, and the perceived currency and relevance. Students mentioned SlideShare, Amandohost, Kahn Academy, Meducation, Sketchy Medics and other OERs. They valued having OERs linked directly in the eReaders.

Students valued video, particularly explanatory motion graphics and conceptual video bites. "Boring video" would not be tolerated. Some students did sometimes experience OER "overload".

Students used prescribed textbooks as a primary source of information – particularly when there was no reader, or the reader was insufficient or outdated. Students do use eBooks from the library. The lack of range focus in textbooks was a problem for students. Students complained that reading packs were too time-consuming as the only learning resource for a particular discipline or topic – too often, certain disciplines simply supplied a pack of articles or textbook chapters. Students valued lecture slides as a learning resource, prizing slides from previous years. Most students did not use the PLC and some were not aware that it had been

digitised. Few students used journal articles. Students valued past assessment questions as a learning resource.

Students valued the interconnectivity of learning resources between different disciplines as facilitated by the EE because, as they said, “it adds contextualisation”. However, they regarded the absence of certain eReaders as a barrier to the fulfilment of the EE’s potential.

Students wanted the ability to access and retrieve new and previously visited learning resources effectively and efficiently. They believed this to be a major benefit of the EE. Students valued having all their learning resources “located in one place”, which applied to both distributed and supplied learning resources, as well as self-generated or shared learning resources.

Students valued the ability to contribute to learning resources – in Vula, course convenors, lecturers and the class representatives are the only users permitted to do this. Students valued being able to collaboratively add learning resources.

Chapter 5 presented the research findings under the headings of the emergent themes from the data analysis. In Chapter 6, these findings are analysed and concluded in relation to theory and the empirical evidence, and are presented under the headings of the research questions.

Chapter 6: Analysis and Conclusions of Findings

This research project addresses the problem of how to increase the number of graduates from existing medical schools in order to increase the stock of medical practitioners in South Africa, while still maintaining quality. A BLC that offers certain learning opportunities off-campus could potentially result in more students on campus, better epistemological access and an overall increase in the number of graduates. The research questions are addressed as follows:

6.1 Research Question 1

How can an EE be used in a BLC to deliver off-campus teaching and learning?

To use an EE in a BLC there would need to be pervasive faculty adoption. eLearning initiatives in the FHS are fragmented. However, while students do appreciate the entity of eLearning, they do not want eLearning to be their only learning opportunity (Bower et al., 2015). Students do not conceive eLearning in the context of a BLC. A successful BLC with an EE would require an understanding of the concepts behind blended learning and a "rebranding" exercise to change the negative perceptions to blended and eLearning that the student and faculty hold.

The level of digital learning skills is low, with disparities in technique, data and devices. For students to use an EE in a BLC, students will need to be schooled in the art of digital learning This will require pervasive faculty adoption to ensure inclusivity.

Conole et al. (2008) found that assessment preparation is important to students. Students want to know how they will be assessed. They need clear, concise, constant and well-communicated learning objectives with no contradictions, overlaps or deficiencies. A successful BLC requires tightly managed learning objectives (Balzer et al., 2016). These could to be communicated in the EE.

A successful BLC would require learning opportunities to be restructured for their suitability for off-campus or on-campus delivery. Students do not want duplicate learning opportunities. Students want access to their lecturer, both on campus and off-campus, and they want their lecturers to provide learning opportunities in which they are able to ask questions.

Off-campus learning opportunities would need to use eLearning and, in particular, would need to use a system of delivery. A successful BLC would require an EE to deliver off-campus teaching and learning. Students did not perceive the EE as a learning ecosystem, but, rather, simply as a platform for delivering electronic learning resources.

The baseline learning opportunity in a BLC would be engagement with the learning resources contained within the EE. The EE would need to contain definitive learning resources. Students want all their learning resources in one place. The resources in the EE would need to be complete and accurate, reflect assessable range, be current and contain clinical contextualisation. While students still use textbooks, definitive learning resources contained within the EE could reduce this dependency. Students want lecturers to be present in the EE.

Students value multimedia including video. Lecturers could potentially prepare bite-sized conceptual two-minute videos, either through simple screencast, or they could be professionally produced. These could aid in giving guidance on assessable range, clinical contextualisation and current developments within the field. This guidance could be included in the EE in a BLC.

Lecturers could also provide links to appropriate OERs. The role of the lecturer as a demonstrator of knowledge as delivered in traditional lectures could therefore be accommodated in the EE. Students value OER and value contributing OER. The EE needs to facilitate these contributions from faculty and students.

With the EE used for off-campus teaching and learning, a successful BLC would still require large group on-campus learning opportunities, but with lectures reimagined into large group knowledge application and integration (flipped) learning opportunities like TBL or a hybrid of TBL and PBL. Students value lectures for determining assessable range, providing clinical contextualisation and the latest developments in a particular discipline, but these could still be delivered in flipped on-campus learning opportunities or within the EE.

6.2 Research Question 2

How would students use an EE in the context of a blended problem-based learning opportunity?

Students value PBL as beneficial to the application and integration of knowledge, and beneficial to academically at-risk students (Burch et al., 2007). But students believe that the PBL experience depends on the facilitator and could be restructured to be more efficient. Some students prefer the self-study component of PBL. Attributes of the integrated PBL curriculum can still be used as a learning opportunity in a BLC and can still benefit academically at-risk students, for example, a group collaborative wiki (Woltering et al., 2009).

Students are motivated for directed self-study. Directed self-study is an important learning opportunity in a BLC as long as it is directed. Students appreciate the need for social engagement with each other. They can accept group learning with predetermined group compositions as they weigh choice against the need for social balance and the benefits to academically at-risk students. Group learning is important in a BLC – both on- and off-campus.

The EE can be used to deliver off-campus self-study components of PBL and the PBL process can be potentially be restructured to redistribute on- can off-campus elements.

6.3 Research Question 3

What learning benefits accrue from the use of the EE, and what features of the EE support learning?

If the baseline off-campus learning opportunity is engagement with and consumption of dedicated leaning resources in the EE, then the EE would need to facilitate this through tools, functionalities and activities. Learning resource engagement and consumption tools must include highlighting – an essential tool for students. Tools and functionality would need to consider pre-existing paper-based learning tools and techniques that students use, and these would need to be easily accessible.

Students need to take notes generally, and specifically for different purposes. The EE would need to have functionality for annotations or short notes recorded on a particular page. Note-taking, annotation and the ability to highlight passages of text are important notational resources for the learning experience (Anderson-Inman & Horney, 2007; Conole et al., 2008). Note-taking could be augmented with a summary tool.

Students want to be able to consume different media items, including videos and interactions, as well as to consume OERs including dictionary, YouTube and Wikipedia. Integrating links to articles, definitions, case studies and Wikipedia pages are invaluable to the millennial student (Anderson-Inman & Horney, 2007; Conole et al., 2008). Students particularly value self-assessment. This is provided in the EE through quizzing and other action activities, including case studies and short answer questions. Quizzing, along with highlighting, are two extremely important functionalities for students.

The EE needs to not only facilitate learning opportunities with tools and functionalities for engaging with learning resources, but also for students to appreciate the EE as a learning

ecosystem. The EE also needs to promote learning opportunities through engagement with peers and educators. As with all eLearning, students need to be engaged in the EE – engaged with their lecturer and engaged with their peers.

The lecturers need to be able to conduct learning opportunities within the EE, whether scheduled and synchronous and related to a particular task, or unsynchronised, unscheduled and not related to a task. Elements of PBL or TBL or any other learning opportunity can be delivered off-campus. Other learning opportunities in the EE could be centred on small group collaborative tasks.

The lecturer needs to be able to create and share information and deliver answers to questions by individuals, groups or the whole class. This will reduce psychological distance (Conole et al., 2008).

Students want to be able to engage with each other whether individually, in organised or self-organised groups or with the whole class. Students want to be able to collate, curate and collaborate with each other; but, ideally, they want to be able to choose how and with whom they communicate. The lecturer could oversee engagement between students in the EE.

To facilitate engagement with learning resources, educators and peers, the EE would need to be user-friendly and intuitive. Structure and taxonomy is important, as is search functionality, progress indication and a notification system. Easy-to-use navigation tools that provide reference in the EE would be important drivers of user-friendliness for students – they want to know where they are, where they have been, where they want to go, how to get there and how to find something when they are looking for it.

Sharing and chat functionality would need to be intuitive and aligned with their everyday digital experience. Sharing and chat functionalities reduce psychological distance (Conole et

al., 2008). Students do not like forced sharing – they need to trust first before they share. Students value the linking functionality – it is an important enabler in an integrated curriculum and a key tool in an LMS (Conole et al., 2008). The quizzing tool is essential. A question mechanism or tools is essential. Annotation and summary tools are essential.

The learning benefits of the EE in a BLC could potentially include the facilitation of social constructivism, the reduction in psychological distance in off-campus learning, and the promotion of social engagement – students are encouraged to share in a competitive environment. Additionally, the EE could facilitate the delivery of multimedia learning resources as well as potentially aid congruency between learning resources, opportunities and objectives.

6.4 Research Question 4

How is a diverse group of students supported by the EE and how can quality be maintained?

By providing definitive learning resources and promoting engagement on those resources, the EE could help academically at-risk students. Access to dictionary functionality and curated OERs could also be beneficial. In addition, access to educators could potentially be beneficial to academically at-risk students. The linking functionality could benefit academically at-risk students in the integrated curriculum. But, by far the greatest contributor to academically at-risk students could be the promotion of access to their peers without invoking group learning and sharing resistance.

Quality in the EE in the BLC would be required. This would be achieved through the curation of learning objectives – but, in particular the curation of quality learning resources. In addition, faculty would need to curate engagement with educators and peers.

6.5 Research Question 5

What other benefits accrue from the use of the EE?

A BLC is a potential solution to increasing the output of graduates from medical schools, by increasing the number of places and reducing student attrition. The number of graduates could be increased through a blended six-year MBChB, an undergraduate Bachelor of Medicine (BMed) degree or an MBChB graduate entry programme. Using an EE in a BLC has other potential non-learning benefits. Implementing a BLC could potentially reduce costs – particularly human resource costs. This could translate into lower fees for students. A BLC could potentially reduce the dependency on expensive textbooks and could potentially empower a medical school to earn revenue from the sale of intellectual property created from its learning resources.

6.6 Trustworthiness of Findings

The proposed research methodology had rigour. Triangulation was a philosophy in design. There was triangulation in multiple respondent types – the design included a questionnaire delivered to all contributors to second-year teaching and learning, including students, lecturers, facilitators and even the course convenors. There was also triangulation in multiple data collection techniques – in addition to the whole class questionnaire, the design proposed a sample of five focus groups of students and their respective facilitators. This would have amounted to approximately 50 students and five facilitators who would have been observed for seven hours each. All 50 students would have taken part in a semi-structured interview, as well as completing an additional questionnaire designed to deliver quantitative data. The proposed design also allowed for multiple iterations of data analysis in-between cycles of data collection. This would have resulted in successive improvements and adjustments to be made for subsequent data collection iterations and deeper cross-iteration searches, to identify patterns

and reveal further frames with tentative themes, concepts and relationships (Eisenhardt, 1989). This interim data analysis design lent rigour to the data collection tools. The design was proposed in this way to achieve data saturation through spending a significant amount time with a considerable number of students.

The proposed research methodology was ultimately interrupted when the academic year was cancelled due to the unforeseen and irregular phenomenon of the student protests. The termination of teaching and learning before the end of the year prevented the data from being collected from the last three of the five groups.

Nevertheless, the final methodology still had rigour. Ultimately, there was triangulation with a multiplicity of respondents, data collection techniques and data analysis, and this impacted favourably on the confirmability of the research findings. However, despite the triangulation benefits, the cancellation of teaching and learning did reduce the total amount of time spent with students.

Therefore, are the findings credible? Was data saturation achieved with the sample used and the time spent with respondents? Were the researchers hearing the same data over and over again? The answer is maybe. It is true that sample size is not the only determinant of data saturation. It is also true that a more prolific description would have been possible by spending more time with respondents. Nevertheless, the data was sufficient to give a thorough description, but the research would have benefited from the collection of more data over a longer period of time.

Are the findings transferable? Given the rigour it is likely that there is representational generalisability within the cohort of UCT medical students. But, are the findings generalisable outside the cohort of medical and BSc students at UCT? Is there inferential generalisability in the findings “generalising from the context of the research study itself to other settings or

contexts" (Ritchie & Lewis, 2003, p.263)? Would the findings be transferable into other medical schools in South Africa and transferable into other faculties at UCT, and other faculties at other universities? Due to similar selection criteria, the cohorts of medical students are largely of the same academic competency across medical schools and thus the findings are likely to be transferred into other medical schools. However, students at other faculties at UCT or other universities may be more or less academically at-risk, and other variables such as digital literacy, for example, may be present that determine whether the findings would be generalisable into those contexts.

Are the findings dependable or reproducible? The context within which the data was gathered has changed. Digital learning has become pervasive and is increasingly becoming the norm. As more and more school leavers with digital learning skills enter higher education institutions, so their expectation and appetite for digital learning will increase.

Are the findings confirmable? The researcher is both a researcher investigating the use of the EE in blended undergraduate teaching and learning at UCT with the aim of increasing the number of graduates; and also a researcher and developer of an inclusive business model innovation. While it is undeniable that inherent knowledge influences analysis and discussion, the endeavour is to report what the respondents have evidenced throughout the process of design, data collection, data analysis and findings.

The purpose and research questions of this project are aimed at trying to understand how a BLC could be implemented; how students would use an EE in a BLC; what features they would require from the EE; and whether there would be any benefits, learning or otherwise, to students, including academically at-risk students. Chapter 7 includes a discussion on how an effective and efficient blended curriculum that uses an EE could be implemented.

Chapter 7: A Blended Learning Curriculum

7.1 The Concept of Blending

Whether its objective is to increase the number of places or to decrease the attrition of students, a successful BLC for the MBChB pre-clinical programme will require reconfiguring elements of the curriculum. This would involve a holistic analysis and a potential restructuring of learning objectives; learning opportunities including lectures, practicals and PBL; potential restructuring of the learning resource compliment – materials such as textbooks, readers, journal articles, algorithms, resource packs etc. – conceived for students; and ultimately reconsidering most of the windows within Harden's (2001) curriculum.

Blended learning has gained popularity in the past 20 years. The concept of blended learning has multiple definitions encompassing multiple facets. A blend of face-to-face teaching, and online teaching is probably the most common definition (Bliuc, Goodyear, & Ellis, 2007). However, eLearning is being used in the face-to-face environment too. This project conceives blended learning in the context of the traditional geographical modes of delivery – distance and contact learning or off-campus and on-campus learning.

Distance or correspondence learning is off-campus and, in this context, blending encompasses the delivery of eLearning and traditional methods. Traditionally, students engage and submit assessments through correspondence, and teaching and learning is directed self-study. Students are presented with outline guides or "wrap around" as tools to direct study on any supplied, prescribed or recommended learning resources.

The blending of eLearning has largely assisted delivery of existing teaching and learning in the distance learning context. Methodologies have not necessarily changed but students have benefited from improved learning resource delivery, engagement and assessment. Electronic

delivery of learning resources has improved the ability to direct study for students, despite that they are still consuming off-campus and on their own. Engagement capability has also significantly improved, with multiple tools in and out of the LMS facilitating both unidirectional (webcasting) and multidirectional engagement (forum, discussion topic). In addition, eLearning has revolutionised assessment in the distance learning context. These mechanisms include document upload and marking, self-marking with immediate feedback and proctoring services for assessments with higher stakes.

In the traditional face-to-face or on-campus context, blended learning has come to mean a blend of on-campus traditional teaching and learning, and off-campus eLearning, notwithstanding the use of eLearning on campus. Blending in this context can imply different activities undertaken on and off-campus by the same cohort of students, but it can also imply different cohorts of students. Blended synchronised learning implies different cohorts of students on campus and off-campus both partaking in the same activity.

The concept of blending has been happening for years and is applicable in most of Harden's window (Harden, 2001). For example, learning objectives are a blend of objectives at different NQF levels, as well as a blend of different level descriptors such as outline, discuss etc.

Learning resources that have traditionally been presented in print form as text and static graphics have been blended with motion graphics and video learning. These different multimedia resources are delivered individually in different contexts or they can be blended for a rich multimedia delivery.

Blending occurs in learning opportunities. Activities can be delivered as problematisation, activation of prior knowledge and knowledge demonstration activities blended with knowledge application and integration activities; or they can be delivered with, for example, blends of discussion or presentation activities. The learning opportunity compliment can also be

conceived as a blend of self-study or group study, for example, and group study can be a blend of large or small group study. Assessment is also blended in multiple assessment opportunities using multiple assessment tools and instruments. Engagement is blended with students engaging lecturers, peers and learning resources.

In the context of this study, blended learning is considered the act of blending on-campus and off-campus learning opportunities. eLearning, digital learning, and online learning are considered synonymous and are systems and tools to aid the delivery of both the on- and off-campus learning opportunities.

Developing a successful BLC – that is, building off-campus learning opportunities – would require pervasive faculty and student adoption, digital upskilling of both faculty members and students, tightly managed learning objectives, restructured learning opportunities and an EE.

7.2 Successful Adoption

7.2.1 Faculty and Student Adoption

While isolated initiatives exist to offer blended learning opportunities, they do not reach their potential and often meet resistance from multiple stakeholders – possibly as a result of a lack of central direction and change management provided by faculty.

Change is difficult for most people and often a new methodology is regarded as inferior to the tried and tested one. For blended learning to be successful, the perception of eLearning as an inferior mode of delivery needs to be recognised and changed through the use of change management principles such as Kotter's eight-step change process and the ADKAR change model: Awareness, Desire, Knowledge, Ability and Reinforcement (Parlakkılıç, 2014; Quinn et al., 2012). Change management can be broken into three phases:

1. Phase one encompasses breaking down old culture and priming people for change by identifying compelling reasons for the change, and training staff and students to support change (Quinn et al., 2012).
2. The second phase is to execute the change. This requires strong communication with affected parties throughout the change process, empowering students by removing perceived barriers and demonstrating the value of blended learning to lecturers and students (Parlakkılıç, 2014). All stakeholders need to be engaged. Students, faculty members and educationalists including course convenors, professors, department heads, associate professors, senior and junior lecturers, facilitators and administrators need to be consulted in developing a BLC. The FHS needs to actively communicate and propagate its intentions to successfully implement a BLC.
3. The third and most important stage of the change model is to ensure that the change is maintained by integrating blended learning into the faculty's culture and acknowledging and encouraging further change (Parlakkılıç, 2014; Quinn et al., 2012).

7.2.2 Digital Learning Skills

eLearning is required when introducing a BLC. Part of changing the perceptions to eLearning will be to teach faculty and students how to learn digitally.

Digital or online learning is a new phenomenon to many, but not all, students – they cannot simply be expected to "pick it up". Rather, they need to be coached in the art and science of digital learning. Despite students' epistemological advantage and advances in advantaged schools that enjoy networks, iPads and multiple digital resources, most students are accustomed to paper-based learning. Part of the exercise of changing perceptions to eLearning is actively

teaching students how to learn digitally. Often the negativity associated with eLearning is a result of fear of the unknown. Students need to be actively coached to engage in digital learning – an aptitude in digital learning techniques must never be assumed. Digital learning techniques and competencies could encompasses the following topics:

1. Basics
    a. Hardware
    b. Software
    c. Learning management systems (LMS)
2. Communication
    a. Email
    b. Social media
    c. Chat
    d. Sharing
3. Learning resources
    a. Annotating
    b. Clipping from the Internet
    c. Collation/Summaries
    d. Curation
    e. File/Resource management
4. OER
    a. Internet
    b. Search
5. Library
6. Research methodology

Digital learning skills and the ability to use certain tools are a learned behaviour that needs to form part of a pervasive digital curriculum, or BLC, and which are not only addressed in introductory courses. A digital philosophy needs to form part of a greater philosophy for teaching and learning at a university as it is a critical competency for students to be able to actively engage in off-campus teaching and learning. Dependency on printed learning resources and paper-based learning techniques could be a function of poor digital learning techniques. This could act as a barrier to the uptake and adoption of digital learning.

A digital learning philosophy needs to be inclusive. Policy cannot stipulate interventions without proper student consultation and empowerment. Empowerment encompasses digital learning techniques and devices as well as data – disparity of devices and data exists, and offline availability of teaching and learning remains a problem. Without proper policy, intervention, consultation, follow-through and feedback, the implementation of a digital learning philosophy will be exclusionary.

7.3 Tightly Managed Learning Objectives

Integrated curricula, where learning objectives from different disciplines need to be brought together in the context of a series of integrated learning opportunities such as PBL or TBL that are managed by different disciplines in different semesters, are potentially more difficult to manage.

In itself, a BLC need not necessarily require greater management of learning objectives. If, for example, the anatomical pathology discipline delivers a lecture video for off-campus consumption and the microbiology discipline delivers a practical on-campus lecture, and the virology division delivers a tutorial on-campus, it is still a BLC though each discipline is managing its own learning objectives. However, because of the greater possibility for duplications and omissions of learning objectives between disciplines in an integrated

curriculum, mismanagement and, therefore, duplication of learning objectives in learning resources and opportunities could be accentuated with a BLC.

As with any curriculum, a BLC would require effective management of the learning objectives. Since assessments are designed on learning objectives, learning objectives need to be quantified, consistent and tightly managed to ensure students are adequately prepared for assessment. Balzer et al. (2016, p.369) presented "a web-based method and its interface ensuring alignment of all parts of a curriculum map". The "learning opportunities, objectives and outcome platform" (LOOOP) improved students' perceptions of defined learning objectives and their alignment with their assessment. In its curriculum project, the DP deployed Google Sheets as a tool for managing learning objectives to eliminate gaps, duplications, uneven distribution or inconsistencies.

Confusion would arise for students when learning objectives for lectures are inconsistent with those provided in PBL and the readers. Given the limited time and resources available to deliver learning resources and opportunities, it is essential that learning objectives are consistent across multiple disciplines without being duplicated. Duplication in some instances is planned for reinforcement; for example, learning objectives relating to clinical reasoning skills that appear in multiple cases, can be effective. It is unplanned duplication that is a problem.

Often duplication occurs because certain learning objectives are common to multiple disciplines and because each discipline is ultimately responsible for its own teaching and learning – for example, topics such as HIV, virology and immunology share learning objectives. Removing a learning objective from a particular discipline's domain might not be possible because it could result in incoherence in that discipline.

The linking tool in the EE helps manage duplication by enabling common learning objectives or sections in multiple eReaders to be linked and viewed and appreciated by students. If

duplication in learning objectives is planned or unplanned but cannot be avoided, it is then essential that they are consistent, particularly in terms of the depth as described by the chosen verb used to express the learning objective.

7.4 Restructured Learning Opportunities

In a BLC, learning opportunity suites would need to be crafted so that they are blended between on-campus and off-campus delivery. A multitude of characteristics in learning opportunities lend themselves suitable to off-campus and online delivery.

The purpose of a learning opportunity in the knowledge construction process influences its suitability for online delivery. Learning opportunities that are largely focused on demonstrating knowledge lend themselves to digital and, therefore, off-campus delivery. Traditionally, problematisation and activation of prior knowledge learning opportunities have been considered deliverable online. The application and integration of knowledge learning opportunities could also be delivered online and off-campus. That said, in a BLC, some of these application and integration learning opportunities would be best constructed and delivered as on-campus learning opportunities.

In reality, lectures are largely knowledge demonstration learning opportunities, despite varying lecturer competencies and the use of different activities in lectures. In a BLC, these large group on-campus learning opportunities could be redesigned to apply knowledge. Dr William B. Jeffries, the Senior Associate Dean for Medical Education at the Larner College of Medicine in Vermont, has started phasing out lectures and replacing them with active learning (Gringla & Cornish, 2017).

The traditional knowledge demonstration activities occurring in lectures could then be filmed and delivered digitally online or offline, and used as pre-watching for “flipped” large group

on-campus knowledge integration learning opportunities. Large group learning opportunities are better suited for on-campus delivery and still form part of a BLC; it is the activity within the large group learning opportunity that would change. The whole class could come together from time to time, but what they do when they are together would be different.

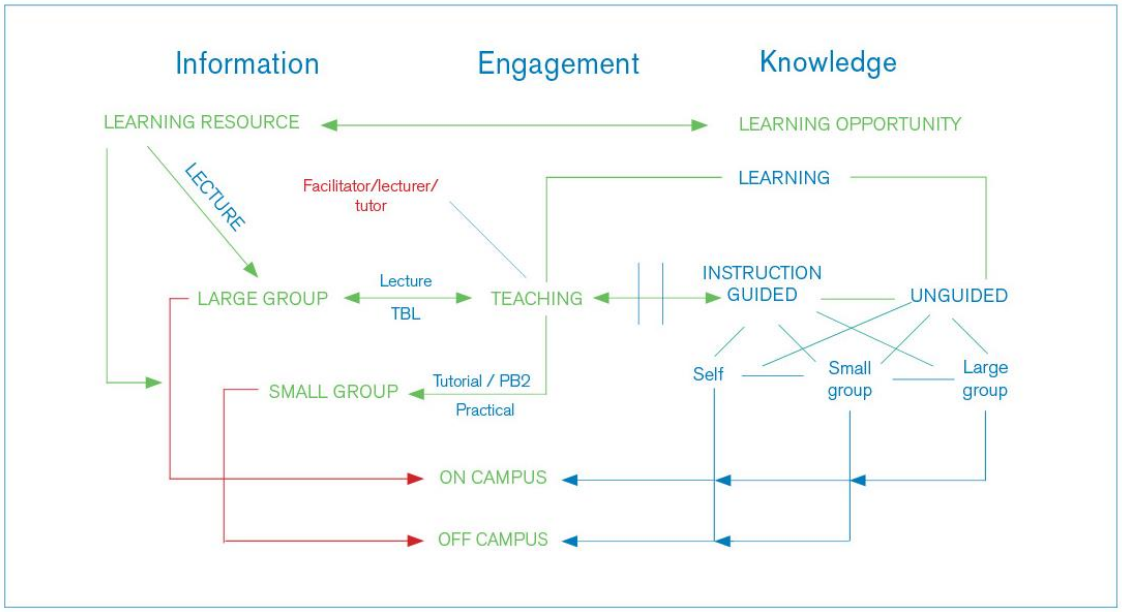


Figure 10: Possible blended learning opportunity model

Source: (EDGE Learning Media (Pty) Ltd, 2018b)

Team-based learning (TBL) is an example of an activity that could take place within a large group on-campus learning opportunity.

7.4.1 TBL

TBL contrasts with PBL in that it is a large group and not a small group learning opportunity. One teacher facilitates numerous small teams, or groups of 20 or more, and multiple teams are all present in the same venue. The cycle in TBL begins with a pre-reading activity followed by

a quiz for students. Students discuss the quiz items in their group and provide each other with feedback. The lecturer also has an opportunity to provide feedback at this stage. In the same groups, students are then presented with a complex application problem. They discuss the problem in their respective groups and present their solutions back to the other groups in a plenary session. Parmelee and Michaelsen (2010, p.119) recommend having "application activities that promote both deep thinking and engaged, content-focused discussion". The report-back presentation is delivered in a discussion context where teams "challenge the decisions of other teams and defend their own decision" (Dolmans, Michaelsen, van Merriënboer, & van der Vleuten, 2015, p.355).

TBL contrasts with PBL in that there is a pre-reading activity to activate prior knowledge, which is always followed up by a quiz and team discussion to check prior knowledge. In TBL the lecturer determines the content for discussion. TBL also embraces structured peer feedback in group discussion.

Small group on-campus learning opportunities could still exist in the BLC. Currently they are delivered in a tutorial or practical style and PBL. PBL could still be offered in a BLC.

7.4.2 PBL

PBL could be delivered as a single cohort blended learning opportunity. At the very least it could be restructured to deliver certain on-campus sessions off-campus.

A blended PBL structure could begin with an online reading activity. The reading would need to be of appropriate consumable size for the allotted time, relative to the demands on the students' time from other learning opportunities. It is imperative that the student is not overwhelmed by the size of the reading pack in relation to other demands from their timetable.

The reading pack could use existing resources within the eReader, such as OERs and journal articles, but they would need to be collated appropriately to size.

A quiz would need to accompany the reading activity – it is always beneficial to provide a completion activity after a reading activity. Students understand quizzes. They are easy to construct. The quiz would need to be designed to deliver feedback as it would be a learning activity and not an assessment activity.

Students will have gained the knowledge required before their first small group on-campus activity. The activity can take the same form as the existing PBL structure: case narration→ word identification→ SOAP→ learning objective determination. The learning objectives should not be delivered before this activity as the purpose is to elicit appropriate learning objectives from a given clinical case. The collation activity for the group representatives on the subsequent Friday could be eliminated – this is an activity only for selected representatives when the majority of students have already begun engaging in directed self-study activities.

In directed PBL self-study activities, the learning objectives provide the direction or task. The task is to research, collate and curate learning resources for a particular learning objective, to present knowledge in the next on-campus activity.

Tasks could either be split or shared. And if they are split or shared they could either be completed individually or in groups – an individual or a group of individuals completes some of the tasks. Generally, splitting is a function of the number of tasks that need to be covered. Whether completed individually or in groups, the benefit of splitting is that a greater number of tasks or learning objectives can be completed, and there are fewer per student or group of students. However, the downside of splitting is that a particular student or group of students would not construct knowledge in the research, collation and curation activity for the learning objectives they do not cover. The task is shared if students, or groups of students complete all

the tasks. Sharing ensures that a student constructs knowledge on every learning objective before attending the on-campus activities.

Groups could be constructed in an organised manner according to either group composition or the timing of engagement. Task splitting generally requires a greater level of organisation, as groups need to be created and tasks need to be split. Task splitting will generally result in scheduled off-campus engagement.

In task sharing, even if groups are not organised, students are likely to self-organise into pairs or groups with less formal or unscheduled engagement. Task sharing could promote unscheduled off-campus engagement. Even if there is no task, students are likely to self-organise to conduct free group activities.

Students prefer to self-determine the composition of their group, particularly in the online environment which is not traditionally the domain of scheduled learning opportunities. However, group learning activities are necessary for epistemological parity. Organised group activities need to be present to balance the epistemological playing field. If small group online learning opportunities allow for students to self-determine the composition of their groups, a regulation mechanism is required to ensure the equitable and inclusive distribution of group members or scheduled organised small group activities.

Scheduled learning requires a greater logistical challenge and students are resistant to inherent inefficiencies.

The next activity in the blended PBL cycle could be based on assessment questions and delivered off-campus and online, with residence students or permanently “on-campus” students completing it online. This assessment question activity would always follow the preceding “all” learning objective self-study activity. Each student within the PBL group would be

allocated a series of assessment questions that they would be required to answer online. Their answers to these questions would then be available for all students in the group to see. A group on-campus presentation and discussion activity would follow two iterations of the directed self-study and assessment question activities. The PBL cycle per case could then be as follows:

1. Reading activity (off-campus/individual/online)
2. Quiz activity (off-campus/individual/online)
3. Prior knowledge and problematisation activity (on-campus/small group/face-to-face)
4. Directed self-study activity 1 (off-campus/all-learning objective/self-organising groups)
5. Assessment question 1 (off-campus/individual/online)
6. Directed self-study activity 2 (off-campus/ all-learning objective /self-organising groups)
7. Assessment question 2 (off-campus/individual/online)
8. Directed self-study activity 3 (off-campus/ all-learning objective /self-organising groups)
9. Assessment question 3 (off-campus/individual/online)
10. Presentation and discussion (on-campus/organised-small group/split-learning objective/social engagement)

Dolmans et al. (2015) believe that the opportunity exists to optimise PBL by combining the best of both worlds:

1. TBL with initial group discussion before a pre-reading assignment or testing
2. TBL with students generating their own learning issues.

Or by optimising PBL:

3. PBL with structured peer feedback
4. PBL with study teams

7.4.3 Social Engagement in BLC Learning Opportunities

On-campus learning opportunities are not only opportunities to apply and integrate knowledge. They are also opportunities for social engagement and development, particularly, but not exclusively, in the context of small group learning opportunity. All students require confidence and skills of articulation, discussion and debate. While these skills are essential to being a doctor, students often underappreciate their importance.

Social development activities in on-campus learning opportunities can be overt, such as making posters, but often they are covert, such as when they occur in lectures, tutorials, practicals and PBL. Overt narration and presentation are key activities for developing these skills, and in PBL the facilitator plays an important role in guiding and developing students. Students often seem to prefer covert activities such as question and answer sessions, especially when the questions are the catalyst for discussion. Discussion needs to be structured or directed on a topic, activity or task.

The lack of social engagement has been the traditional criticism of online learning and distance or off-campus learning. Activities in the online environment are often constructed as individual self-study assignments. However, it is possible to nurture social and collaborative skills online and off-campus in small group opportunities, provided they are purposefully designed around an activity, task or discussion where the task can be split or shared. In particular, collation and curation activities lend themselves to collaborative off-campus online small group learning opportunities. Collation and curation in collaboration are functions of sharing, and sharing is a function of confidence and trust.

Sharing, both on-campus and off-campus, requires trust. In the on-campus environment, trust is built up by spending time together and through specific activities designed to encourage students to develop relationships and engage and share. However, in some cases, some individuals cannot build trust within the large group on-campus learning opportunity. This is often the result of a more competitive, less supportive educational environment (Harden, 2001). A supportive and collaborative educational environment is more conducive to developing trust between students and opening the doors to active sharing and collaboration.

Off-campus or online trust is a function of on-campus trust – if trust is built in the on-campus environment, by extension trust will be present off-campus. Therefore, sharing in a purely off-campus online environment requires activities to build trust and induce sharing. Online sharing requires a balance between the giver's confidence and desire to trust and the receiver's trust in the quality of the shared information. Often the online environment provides greater confidence to share but less confidence to receive. An online presence or persona encourages transparency and helps to build trust, and also transparency in other inducers of trust including student rank and performance.

Sharing is also a function of confidence arising from the acquisition of knowledge. At the outset, academically at-risk students are less confident, but as their knowledge grows so does their confidence, their trust in themselves and, consequently, their level of engagement, sharing and collaboration. Students want to work together to collate and curate learning resources collaboratively.

7.5 The Blended Medical Degree

A BLC needs to be considered in the context of the South African Qualifications Framework (SAQA) qualifications that are accredited by the Council on Higher Education.

A BLC could be achieved by blending the current six-year MBChB qualification, by simply delivering certain existing pre-clinical on-campus learning opportunities off-campus.

Blended off-campus pre-clinical training could be also achieved by re-crafting the six-year MBChB pre-clinical training into two years of off-campus teaching and learning opportunities, preceded or followed by a one-year intensive on-campus experience. Having an initial period to form social relationships can often help reduce possible psychological distance experienced in the ensuing off-campus learning opportunities (Bower et al., 2015).

The number of graduates could also potentially be increased, by offering a three-year Bachelor of Science (Medical) degree solely off-campus blended with graduate entry into a three-year clinical programme. The medical degree in South Africa is primarily a direct school entry medical degree. Conversely, graduate entry programmes admit students to a medical degree after they have completed another undergraduate degree.

The University of the Witwatersrand (WITS) has a direct school entry programme with its associated admission criteria. WITS has a Bachelor of Health Sciences programme for those who do not get into medical school (Carte, 2012). Students are then able to apply for entry into their Graduate Entry Medical Programme (GEMP), joining in the third year. The admissions criteria are an undergraduate degree at a bachelor's or Bachelor of Technology level with an average of at least 60% over the final two years. Interestingly, it is not only students from the Bachelor of Health Sciences programme who can apply. To qualify, students from other programmes are required to have first-year human biology, including anatomy, physiology, zoology, or life sciences and physics and chemistry. They are also required to meet mathematics and English requirements – they need maths and science in the same way as direct school entry students. They do not need to complete the National Benchmark Tests (NBTs) for school leavers. If students meet these criteria, they are eligible to join in the third year.

The University of Limerick Graduate entry programme is two years of on-campus study, coupled with a two-year clinical programme (Finucane et al., 2009). Splitting the MBChB, which is already two bachelor's degrees (Bachelor of Medicine and Bachelor of Surgery), into a pre-clinical Bachelor of Health Sciences or Bachelor of Medical Sciences (BMed) is an option for UCT to deliver a BLC. The BMed could be offered with the first two years delivered entirely off-campus, followed by a third year on campus. Alternatively, the BMed could begin with students on campus for the first year followed by a year off-campus.

Ideally, students would then enter a clinical fourth year. To illustrate, assuming, then, that each of the existing pre-clinical years has 300 students, there are currently 900 students on campus with 300 students entering the clinical phase of training every year. However, in a blended model, the 900 on-campus capacity could all be students having already completed two years off-campus. Every year, therefore, 900 students would progress to clinical pre-service training. Of course, this threefold increase is a mathematical possibility. In all likelihood, in reality, it would be considerably less. Furthermore, the increase would place a burden on clinical training posts, which are already under pressure in South Africa. This constraint is one of the fundamental challenges faced in medical education – finding clinical placements for a growing number of students. More innovation is required to solve this problem.

Off-campus teaching and learning will be required for a successful BLC. This would require off-campus learning opportunities that do not just provide learning resources for off-campus consumption, or a redirection of elements of existing on-campus learning opportunities to off-campus directed self-study; rather, the delivery of learning opportunities must be properly conceived for the delivery of a blended learning medical degree. An EE could be used to deliver these learning opportunities. Chapter 8 includes a discussion on how the EE could be used in a BLC.

Chapter 8: The eLearning Ecosystem (EE)

A successful BLC would require effective and efficient managed implementation, tightly managed learning objectives and reconceived and appropriately mixed on-campus and off-campus learning opportunities. The EE used in off-campus learning opportunities will also need to have tools that facilitate and promote engagement with learning resources, engagement with educators and engagement with peers.

8.1 Engagement with Learning Resources

8.1.1 Merging the Learning Resource and the Learning Opportunity

Engagement or interaction differentiates a learning opportunity from a learning resource Harden (2001). Engagement encompasses a student's own engagement with a learning resource and engagement with peers or educators. A learning resource in itself is only a learning opportunity when a student engages with it. A learning resource is, in its own right, a learning resource. The student's engagement with that learning resource is the learning opportunity. Interaction or engagement with the learning resource and, therefore, the learning opportunity can occur on campus or off-campus and online or offline.

In a BLC, students would use the EE to engage with in situ learning resources as a learning opportunity. In the digital era the conception of learning resources and learning opportunities could be merged. Harden's (2001) curriculum windows separate learning opportunities and resources into different windows through which to view the curriculum. But, the windows are only viewpoints or nodes in the curriculum and need to also show the complex relationships between windows. For example, certain assessment elements are regarded as learning opportunities in addition to assessment opportunities. The relationships between the windows are vast and are in a state of flux, mainly due to the influence of technology. Technology is changing the relationship between learning resources and learning opportunities.

Traditionally, the relationship between learning resources and opportunities is through the bridge of the learning objectives. Both resources and opportunities need to be aligned to the objectives. In the traditional on-campus learning environment, students are supplied with course outlines, readers, references and prescribed and recommended textbooks as their learning resources; and their learning opportunities are constructed separate from those learning resources.

Ideally, to focus a lecture, it could overlap a textbook chapter on the same topic, rather than the learning objectives bridging the two. Invariably, the learning resources are either excessive, deficient or inconsistent with the learning opportunities, and the bridge that is the learning objectives is incomplete.

Technology is merging the learning resource and the learning opportunity. Digital or online learning opportunities are centred on student engagement with learning resources. Typically, PDF documents are uploaded to learning management systems for students to read. The learning resources wrap the learning objectives and the learning opportunity wraps the learning resources.

In digital or online learning, engagement with learning resources is the baseline learning opportunity and, as such, the design and delivery of the learning resource needs to be carefully considered.

8.1.2 Definitive Learning Resources

The learning resources in the EE need to fulfil the role of a definitive high-quality learning resource that bridges the divide between the learning resource and the learning opportunity. The EE could contain the learning resources that the student needs and be augmented with reference to textbooks, online libraries' academic databases and OER (Anderson-Inman & Horney, 2007; Conole et al., 2008). Any eReader or volume deployed in the EE needs to be

structured to match the logic of the design principles of the particular curriculum. In the UCT MBChB context, the EE could contain a single eReader per teaching or specialisation division. While there is value in a student learning to critically appraise the usefulness of a myriad different resources available on the Internet, the eReader could still contain collated, contextualised and curated learning resources that are chunked, sequenced and paced on the learning objectives applicable to that division. This could help academically at-risk students.

Too often, whether online or not, learning resources are simply delivered as repositories with no categorisation or separation. The eReader could be definitive in its coverage of all learning objectives for the particular discipline without excess or deficiency, and definitive in providing the appropriate depth of information. The individual discipline eReaders can be the baseline for determining the learning objective range for preparation for assessment. Students need learning resources to correctly reflect assessable range, particularly in the study of medicine. In theory, assessable range is described by the learning objectives, but in practice, it is probable that students experience assessable range in the learning resources and opportunities.

The eReaders or volumes in the EE deploy in-line multimedia including text, PDFs, eBooks, video, OERs, images and interactions. By including multimedia elements in-line, students have access to the appropriate resources at the appropriate location in the sequenced taxonomy. The media is delivered as a linear progression in the same way as a book. It is likely that most students have been exposed to textbooks at school and are likely familiar with the structure of chapters and sections. By including all multimedia elements in-line, students could experience a coherent learning experience and spend less time searching for resource items. Coherent multimedia learning resources could also aid the development of understanding. Sometimes text can be sufficient. In other cases, video may be more appropriate to aid a particular type of

understanding (Mayer, 2014). These media elements might also serve other purposes such as motivation, interest and concentration.

Pure learning resource search could possibly be differentiated from knowledge construction. Assimilating, contradicting, comparing, collating and curating are all activities within the knowledge creation process and in particular, in the consumption of learning resources and engagement in learning opportunities. While search is the pathway that connects these activities, it is probably not a knowledge construction activity in and of itself.

The individual media items need to be considered in terms of their overall contribution to learning hours and cognitive load – the eReader is not a purely video learning resource.

8.1.3 Lectures as a Learning Resource in the BLC

With large group on-campus learning opportunities dedicated to knowledge integration and application activities, and the traditional lectures digitised as learning resources, lectures will need to be included in the EE either as a separate volume or included within a particular discipline's eReader volume. If the lecture is for a single discipline, it would be more easily included inline or included at a modular or section level within an eReader. Lecture recording is relatively simple: most universities have "recording enabled" auditoria with varying degrees of sophistication. Recording practices range from a simple video and audio recording of a lecturer at a lectern, to more sophisticated systems that capture slide presentations and auditorium audio and video.

Many universities do record their lectures. At UCT FHS, this often depends on whether the lecturer grants consent. In many cases lecturers withhold this consent for either personal or teaching and learning reasons. Some lecturers at UCT FHS, and even whole divisions and departments, believe that the on-campus lectures are essential to teaching and learning, and

believe that lectures should not be recorded at all. Not having all the lectures available online within the EE, in whatever form, is a barrier to the deployment of the EE in the BLC.

In the BLC, there is an opportunity to examine the appropriateness of delivering lectures recorded in their current form. If lectures have been replaced by TBL as the large group on-campus learning opportunity, and the EE is delivering multimedia in the form of video, interactions, OERs etc., the question arises of whether it is necessary to deliver 45-minute video lectures for students to consume. Would these knowledge demonstration videos be best served as small bite-sized videos on specific concepts or teaching moments within a discipline?

The argument against instructionally designed videos is usually the cost of production. However, simple screen recordings, or even the deployment of OERs might be more appropriate to deliver these "nugget" teaching moments. In all likelihood, a blend of longer and shorter videos could be more appropriate. Certain concepts such as the cardiac cycle are long and may therefore be better served by a longer video.

Learning resource delivery can benefit from a greater adoption of OERs. Invariably there is a resource on the Internet that has been crafted to demonstrate a particular point or concept. A curriculum or learning experience designer's role is to collate and curate these resources and deliver them in the appropriate place, sequence and context.

Recording lectures offers a significant opportunity for the reallocation of human resources. A large portion of a lecture is repeated every year, particularly in the basic sciences in pre-clinical training. Even if lectures are delivered in their current 45-minute form, they can be separated into "static" elements that are then augmented with "latest development" elements.

8.1.4 Learning Resource Engagement and Activities

If engagement with learning resources in the EE is to become the baseline off-campus learning opportunity; and the knowledge construction process requires engagement; and engagement requires activity, then in the BLC, the EE and the learning resources themselves will need to promote activity both on-campus and off-campus.

Activities could therefore be conceived as consumption activities or action activities – both would require the student to be active and engaged. Action activities are invariably promoted by learning resources and consumption activities are promoted by tools or mechanisms within the EE. Consumption activities would occur in the consumption or demonstration of information and action activities would require the student to complete a task.

The term "interaction" in eLearning is potentially confusing because too often instructional designers create consumption activities as "clicks" without providing action activities. Consumption activities can be conceived as forced or facilitated. Clicks are an example of forced consumption as a mechanism of delivering learning resources and examples of facilitated consumption activities are those that are facilitated by the tools provided within an EE. Examples of facilitated consumption activities are signalling, summary, playlist and reference tools.

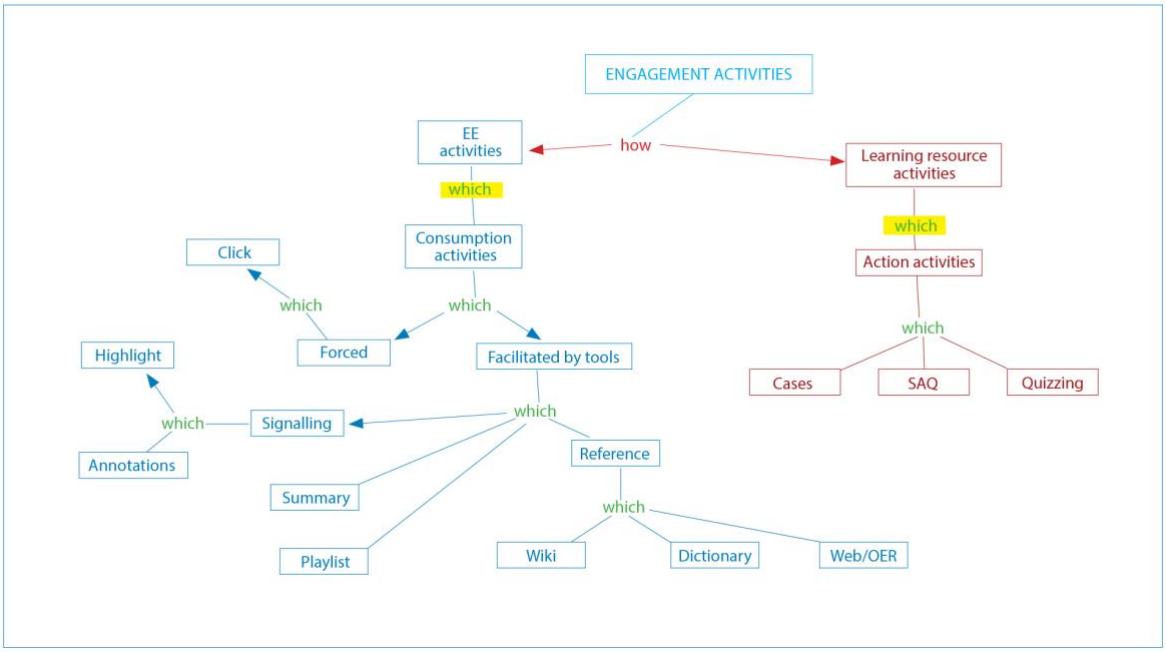


Figure 11: Engagement activities

Source: (Derived from the analysis of findings)

As far as possible, EE tools or mechanisms that promote consumption activities will need to consider traditional paper-based learning techniques.

Highlighting or self-signalling is a consumption activity which could be promoted in the process of the knowledge construction. Students expressed that the lack of a highlighting tool was by far the greatest shortcoming of the EE. Many students requested the highlighting tool and expressed that highlighting is a widely used paper-based activity for signalling in the consumption of text or static graphics. Highlighting may be a paper-based technique, but signalling is a learning technique pervasive to paper and digital learning.

However, at UCT, and presumably at school, students are not specifically taught why, how nor what they should be signalling using highlighting or other methods; whether there should be any methodology to highlighting; or if the methodology should be self-determined. Another

technique not taught is how to highlight or use signalling on video media; if this is even possible. If a tool within the EE is promoting and enabling highlighting as an activity, the technique to using the tool should be included as a requirement for digital learning literacy. The lack of a highlighting tool in the EE was a potential barrier to using the system.

The notes tool also facilitated annotating as a signalling consumption activity. Students did not seem to readily understand the purpose of the notes tool. While students appreciated the difference between a note for signalling and a note for summary purposes, this lack of tool differentiation was a potential barrier to using the system. The notes tool was presented in the form of an annotation – it was in-line and had reference to a specific paragraph or graphic. This reference possibly prevented the tool from being used for summary purposes. The EE could have two such notes tools – one for signalling and one for summary purposes. The summary tool could be provided at the level of a unit or chapter within an eReader and, as far as possible, should simulate paper techniques.

The lack of drawing tools could also be a barrier to longer, more extensive note-taking necessary for summary purposes, as well as easy-to-use drawing tools, particularly concept mapping tools which are frequently used in the study of medicine. Most online data input tools have, at the very least, rudimentary "what you see is what you get" (WYSIWYG) tools, but these could be considered insufficient for uninhibited knowledge construction.

Playlist and reference tools are also desirable facilitated consumption tools within the EE. A playlist tool allows a student to select specific multimedia types they wish to consume.

Certain media types are potentially more conducive to being demonstrated and consumed in a mobile environment. Video, HTML, audio and quiz media are easily consumed on a phone. A barrier to using the EE in the mobile environment is the inability to efficiently deliver these media items. While the items are included in line with text in the EE, a playlist tool that presents

the different media types as an aggregation and that allows a student to consume that particular media in isolation, could possibly facilitate mobile use. For example, audio can easily be consumed in the mobile environment.

Reference tools are equally important. While the EE could be a definitive learning resource for a particular discipline, reference and extension can facilitate knowledge construction. One of the more difficult elements of reading a new field is learning the language and jargon of the field. Reference and vocabulary in medical studies is a case in point. The EE can facilitate accessibility by engaging dictionary resources and OERs in real time.

The dictionary needs to be a contextualised (medical) dictionary that could be enhanced with audio – pronunciation is an important learning activity. Glossary functionality can be considered an extension of the dictionary functionality. Through access to a dictionary, and other OERs, the EE can facilitate on-demand learning and be used for synchronous feedback – if a student wants to know something, all he or she must do is "Google it".

The key to presenting OERs, including dictionary functionality, is embedding them within the system. The risks of going online include potential distraction or "rabbit-holing" which is one of the potential disadvantages of online learning (Baron, 2015). Distraction from email and social media are potential digital distractions. Rabbit-holing is a phenomenon in which a student goes off-topic as a result of linking functionality, as is experienced in wikis, for example.

The solution could be to strip the application programming interface (API) and display only the necessary data within the EE. This would likely keep the student within the EE. This technique could ensure that students are only presented sufficient information to contextualise what is contained within the EE without distraction from the instructionally designed learning experience. However, this need not exclude any curiosity-driven or free learning, or even any

scheduled learning opportunities that actively engage additional learning resources. The learning opportunities need to be balanced. The consumption or engagement with learning resources within the EE need only be one of a multiple of learning opportunities in the BLC.

Action activities are a learning resource in their own right. The activity in the action activity is the learning resource and the engagement or completion of the activity is the learning opportunity. Action activities can be conceived as traditional activities in which students are required to complete a task for which a solution may or may not be provided. In the EE, these action activities could look more traditional, such as exercises, integration tasks, case studies and short answer questions; or more digital, such as quizzing technology.

In its simplest form, digital quizzing technology delivers selection-based and free-form quiz questions. Multiple choice questions (MCQ) are the most basic form of selection-based quiz questions. Most technologies can deliver numerous forms of this selection-based quizzing – drag and drop, hotspot selection, drop-down and extended matching items (EMI) quiz questions. Selection-type quiz questions can be used to present evidence of consumed demonstrated knowledge, as well as the application of knowledge. Free-form SAQs are also particularly valuable to students. All forms of quizzing are valuable for self-assessment to measure their progress an ultimate readiness to perform in a summative assessment.

Receiving feedback for self-assessment can reduce psychological distance. To reduce psychological distance in the BLC, the student needs to feel part of the class but also part of the classroom. The EE helps to create the classroom in the off-campus BLC and feedback helps to create the class. The student needs to feel the presence of both their peers and their educators. Students need to feel part of the collective endeavour that is to become effective and safe doctors.

The dilemma in the BLC is balancing the financial need to reduce the human resource requirement for the educator, or at least to maintain the current human resource requirement with an increased number of students, without increasing psychological distance. Various technologies can be used to enable students to engage with their peers and educators, including stack technology.

This technology is the same employed within help desks. For example, the Apple help forum receives many questions daily which are invariably solved or answered by the answer from a previous question, or someone within the community will answer the question. The answers are voted on and then stacked according to their popularity and effectiveness. 'Chat bots' are also increasingly used in the customer service industry. They use artificial intelligence autoresponders to answer customers' questions. This could potentially be extended to education to answer questions posed by students.

Aside from the application and integration of knowledge, providing feedback and reducing psychological distance, probably the most important reason for learning resource or action activities within an EE is their innate propensity to be used as off-campus learning opportunities – particularly in group scheduled synchronised off-campus learning opportunities. For example, a case study can be used as the narrative for a collaborative collation curation action activity that culminates in a digital task. In another example, a PBL case narrative can be provided with a collaborative template or canvas on which students can task split, and collate and curate SOAP responses. The task can be presented individually as an audio or video file upload of a student's explanation of a particular learning objective.

In summary, an essential component of off-campus teaching and learning in the BLC is the scheduling of collaborative collation/curation action activities to reduce psychological distance. This could be the key mechanism in which learning is supported off-campus.

Bridging psychological distance could be achieved by facilitating engagement with educators and peers as an essential component to the successful implementation of a BLC. These will be discussed within the following two sections.

8.2 Engagement and Communication with Educators

The EE had two mechanisms or tools to engage with educators and peers. Communication could take place through the notes tool and through the question tool.

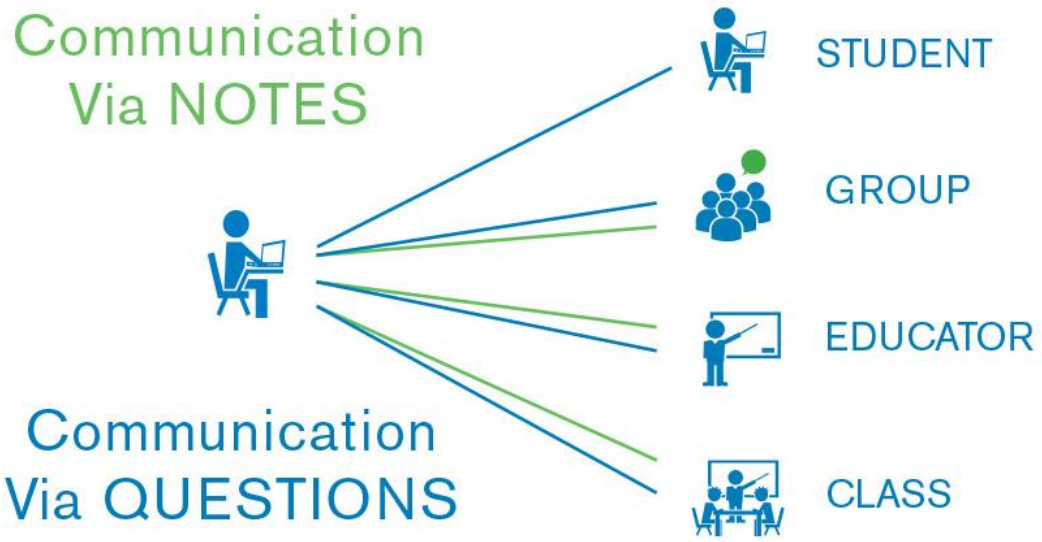


Figure 12: Student communication through the EE

Source: Adapted from (EDGE Learning Media (Pty) Ltd, 2018b)

Access to educators including lecturers, facilitators, tutors and other educators in the BLC is essential. Having access to lecturers in particular, is critical for off-campus learning – students need to be psychologically connected. If the EE is going to be conceived as a learning ecosystem and not just a learning management system, especially as an ecosystem where actual teaching and learning opportunities can take place, rather than being administered, then the

system will need to facilitate engagement with educators while maintaining or reducing the number of required educators.

The need for educators can be contained by capturing educator output once, sharing it and allowing it to grow as a cumulative learning resource. If lectures are being recorded as basic principles and new development components, a large portion of educator time can be freed up for delivering teaching and learning within the EE. Part of self-assessment and feedback is the ability to ask questions. Part of teaching and learning is being available to answer questions. Educator responses to questions can also become a cumulative learning resource to reduce the question and explanation load on a single lecturer and also reduce the need for more resources. Students ask the same questions from one year to the next – lecturers do not need to reformulate these answers each year. Rather, they need to be able to direct students to the answer to a particular question or – better yet – the student could be empowered with the ability to find the answer to that question themselves.

The lecturer needs to be able to efficiently create answers to questions and share them with students when it is necessary. Here, audio will be an efficient tool: a lecturer could record a voice note answer to a question and share this question and answer to the whole class. There is a need for easy group delineation to facilitate sharing – a lecturer needs to be able to communicate with the whole class or only with an individual within the EE.

The system requires efficient notification functionality that empowers the lecturer to be active within the system. It should not be a burden on the lecturer – they need to see a question and be able to easily direct or create the answer. A lecturer has the knowledge to bring clinical contextualisation to the basic sciences in both on and offline learning opportunities and this could be captured and disseminated in their engagement and communication in the EE.

Potentially, engagement with educators within the EE could be extended beyond the capability for asking and answering questions, to engagement within group scheduled synchronised or asynchronous off-campus learning opportunities. Synchronous interaction gives immediate feedback, but often asynchronous interaction allows for intensive and ongoing or extended interaction. The educator could take an oversight, curation and clinical contextualisation role within the EE. As is the case with TBL, one lecturer can fulfil this role to multiple groups at the same time and reduce the demand for multiple expensive facilitators. Again, the EE needs to empower the educator to do this through the use of notification, capturing and sharing tools. The key to the role of the educator within the EE in off-campus teaching and learning is presence with oversight intervention.

8.3 Engagement and Communication with Peers

In the BLC, educators would need to oversee student engagement with peers in the EE. Students will need to be actively coached to understand that the EE is not just for the consumption of their learning resources. Students often view online learning as a distribution channel for learning resources and not necessarily as an environment for learning to take place, and, consequently, as an environment for engagement and collaboration.

Students will engage with whom they choose, when they choose and about what they choose – students are likely to do it anyway, even if considered undesirable in certain circumstances.

The problem with allowing complete flexibility in engagement with peers is that academically at-risk students suffer. In the BLC, off-campus teaching and learning needs to include scheduled group learning opportunities in which the group composition has been predetermined to balance stronger and weaker students, and the educator oversees the social output arising from a collaborative collation sharing activity. Predetermining the composition

of groups for scheduled learning opportunities need not prohibit students from establishing ad hoc groups and conversations.

In addition, a BLC can consider a scheduled off-campus group learning opportunity where students are able to determine the composition of their groups. An additional problem with self-organising groups is that they require an element of familiarity and relationship between students. In the BLC, this familiarity is promoted through the on-campus learning opportunities. If the BLC requires off-campus learning opportunities before students come to campus, then activities to "break the ice" may need to be purposefully created and delivered online before students embark on activities in learning opportunities. In addition, the EE needs to actively facilitate group formation, made possible by chat applications such as WhatsApp. It is interesting to note that WhatsApp is currently facilitating an enterprise version that can integrate into the EE and allow students to communicate in a familiar manner utilising a familiar platform.

Although sharing is promoted through the choice of collation collaboration activities in scheduled off-campus learning opportunities, ad hoc self-organised groups are typically the main sharing channel for students. Sharing needs to be promoted outside these ad hoc groups by facilitating a supportive, inclusive, collaborative and socially aware learning environment. A competitive learning environment could be a barrier to sharing. Sharing is pervasive in the Web 3.0 culture and students are familiar with sharing application functionality – especially on mobile devices. Tools in the EE can facilitate ways of creating a socially inclusive environment. By creating a class-wide communication channel, students would be able to share and collaborate within the whole group environment. The EE needs to contain the necessary tools for students to collaborate with each other and with educators – but more importantly,

they need to be able to easily access and use these tools and the learning resources contained within the EE.

8.4 Usability of the EE

For students to adopt the EE as their preferred system in a multiverse of systems, it needs to be user-friendly. Collins English Dictionary defines user friendliness for a system as one that is "well designed and easy to use" (User-friendly, n.d.-a), and the Oxford English Dictionary defines it as a machine or system that is "easy to use or understand" (User-friendly, n.d.-b). PC Magazine defines it as "a system that is easy to learn and easy to use" (User-friendly, n.d.-c). In digital learning, user friendliness encompasses best practice, user-experience design, an appreciation of paper-based learning techniques, and intuition of how students engage digitally in their daily non-learning lives.

Best practice and learning experience design can be considered as a context of reference, where reference is the ability for the student to find what they want when they want it and the ability to find it quickly. Reference is an important enabler in a digital learning ecosystem.

Presenting courseware with a logical and sequenced structure that is easily referenceable could improve the learning experience and make it easier for students to access information. It could provide students with the means to access and consume learning resources in a linear methodology which is consistent with the logic of the particular discipline. At the same time, it could use linking functionality to integrate this linear courseware through integrating learning opportunities such as case studies etc. The learning resource or the particular discipline may be presented in a linear fashion aligned to the logic of the discipline, but multiple discipline learning resources could then be integrated through connecting learning opportunities. These connecting learning opportunities would then augment linear reference, access and

consumption with “parachute” access – the ability for a student to skip on to, or directly access a section within a linear resource.

In learning resources, reference also applies to the type of media. In a multimedia environment, some students prefer to consume different forms of media in different contexts and at different times. For example, a student may wish to consume only video in a mobile environment. The student may, for example, be driving in a car and may be able to listen to audio – the EE can facilitate this playlist usability functionality.

Reference also applies to consumption history and informatics. A student needs to know at a glance what they have already consumed and engaged with. The EE needs to facilitate this progress indication.

Reference applies to linking functionality. A student could want to know if the unit, section or subsection that is currently being consuming relates to any other units, sections or subsections that he or she still has to consume or has consumed already. This is a tool for the integrated curriculum.

Reference is facilitated by search. Search reduces the amount of time spent on accessing, but also organising information. Search can be facilitated in many ways – by word, phrase, label and tag search, as well as search on the basis of metadata (date and times accessed, posted by whom, which learning objective etc.). Powerful and multifaceted search reduces the need for organising information. Students traditionally spend a considerable amount of time organising their learning resources for primarily accessibility purposes. Powerful search functionality can reduce the needs for digital filing and organisation.

Navigation and visualisation capability supports reference. A common complaint in a digital learning ecosystem is the lack of visual reference, which is the ability to see multiple learning

resources concurrently, as is possible with desk and book consumption. Functionality needs to use and be responsive to screen size or offer multiscreen/multiwindow or toggling/tab functionality as the tool to view alternate learning resources almost instantaneously. The passage from one snippet of information to another has to be seamless, and the EE navigation needs to consider mobile, keyboard and mouse navigation and consumption.

User-friendliness can also embody an intuition of how students engage digitally in their daily, non-learning lives. People consume digitally all day. Their consumption patterns are dictated by digital applications, whether on their cellular telephones using Facebook and WhatsApp or on their computers using office applications such as MS Word and MS Excel, and when using Internet browsers such as Apple's Safari and Google's Chrome. Students are unlikely to adopt a learning ecosystem that forces them to consume in a different manner. And they are also unlikely to adopt an EE if it is not geared to reproduce, mimic and replicate existing learning consumption patterns and techniques. Of course, there will be a migration to digital learning, but, as far as possible, the system needs to provide the necessary tools digitally to facilitate this migration.

8.5 Quality

To ensure that this harmony is designed into the system and maintained over time, quality assurance processes will likely be integral to the success of the EE within the BLC.

Through their rubrics and standards, Quality Matters (QM), a non-profit organisation delivers a "faculty-centred, peer review process that is designed to certify the quality of online and blended courses" (Shattuck, Alicia Zimmerman, & Adair, 2014, p.25). QM has eight general standards and 43 specific review standards delivered in a rubric scoring system. The standards that have the highest point values are essential for a course to meet QM standards overall (Shattuck et al., 2014). Hoffmann et al. (2016) interpret the standards to advocate the following:

1. Measurable competencies, essential outcomes, and evidence-based practice
2. Active engagement with the student
3. Encouragement to seek mentorship and the support of peers
4. Interactive strategies to accommodate the multiple learning styles, skills, and students experiences
5. Time on task
6. High expectations for students
7. A variety of authentic assessment techniques
8. Prompt feedback
9. Consistent faculty support

The creation and provision of high quality learning resources is central to the EE in the BLC. "Creating quality web-enhanced educational materials requires more than simply uploading materials from a pre-existing face-to-face class onto a web-based course management system" (Hoffmann et al., 2016, p.4). Learning resources need to be designed for digital consumption.

QM's specific review standards for the fourth general standard for learning resources describes the need for learning resources to be positioned at the appropriate level covering the designated learning objectives (4.1) while being current, authoritative (4.3), cited (4.5) and with sufficient range (4.4). Students need to be made aware of the relationship between learning objectives, learning resources and learning opportunities (4.2) and the educator needs to be able to customise and add content to the course (4.6, 4.7). The standards are listed in the table below.

Number	Type	Standard
4.1	Content	The instructional materials in the publisher course contribute to the achievement of the stated course-level and unit-level learning objectives.
4.2	Content	The relationship between the instructional materials and the learning activities is clearly explained to the student.
4.3	Content	The instructional materials are current and authoritative.
4.4	Content	The instructional materials have sufficient breadth and depth for the student to learn the subject.
4.5	Content	All resources and materials in the publisher-provided learning environment are appropriately cited.
4.6	Template	The instructor is able to customise publisher content.
4.7	Template	The instructor is able to add content to the publisher course.

Table 5: Instructional materials standards from the QM Publisher Rubric

In this and the previous chapter, the BLC has been discussed as a possible solution to increasing the output of medical practitioners from existing medial schools. The successful implementation of a BLC will require many elements and projects to work in harmony. The faculty will need to adopt a pervasive policy. Students will need to be schooled in the art and science of digital learning and the learning objectives for the curriculum will need to be tightly managed. Learning opportunities will need to be restructured, crafted and differentiated as on-campus or off-campus learning opportunities.

The EE is central to the BLC as a possible tool for facilitating and promoting engagement with learning resources by conceiving this engagement as a learning opportunity. The EE will need to have tools and functionalities, such as highlighting and reference that promote and facilitate

engagement with learning resources. The EE will also need to have tools, functionalities, mechanisms and activities that promote engagement with educators and peers alike that potentially facilitate and deliver small group collaborative learning opportunities for active off-campus teaching and learning.

To deliver a BLC, universities may potentially need help to maintain their curricula, publish and create additional digital learning resources and deliver them through an EE that facilitates learning opportunities. Universities have internal departments that oversee eLearning, but often the production of learning resources is left to the particular department or person in the department to self-publish those learning resources. Often, universities do not have the expertise or the capacity to produce digital learning resources.

The next chapter introduces a potential business model innovation, which is discussed as a possible solution to helping medical schools deliver a BLC, accommodate more students and increase their number of graduates.

Chapter 9: A Business Model Innovation

Innovation exists in multiple forms and needs to be understood in the context of social innovation, inclusive innovation, product innovation and business model innovation.

The Oxford English Dictionary describes innovation as the "action or process of innovating a new method, idea, product etc." (Innovation, n.d.). Product innovation needs to be distinguished from business model innovation. Businesses often innovate products without changing the business model of an organisation – "Procter & Gamble, for example, developed a number of what it calls 'disruptive market innovations' with such products as the Swiffer disposable mop and duster and Febreze, a new kind of air freshener" (Johnson, Christensen, & Kagermann, 2008, p. 64). A business model innovation on the other hand needs to be understood in our understanding of a business model.

The term business model gained popularity in the dotcom boom and has received further attention from inclusive innovation. It only begins to appear in the literature around the year 2000 and there seems to be no academic consensus on the elements for a successful business model (Sanchez & Ricart, 2010). However, business models underlie all business plans and ventures (Jing & Jiang, 2013) and are an expression of a business's strategy to earn profits by creating value for customers through the use and expression of its resources (Sanchez & Ricart, 2010). Johnson et al. (2008, p. 60) view the business model as having "four interlocking elements that, taken together, create and deliver value". These include the customer value proposition, a profit formulae, key resources and key processes. Jing and Jiang (2013) then go on to describe business model innovation as relevant to all businesses to be at the forefront of competition, while "assuring economic validity or sustainability of operations".

All businesses need to constantly innovate their business model or business models within their business. A business model innovation is an innovation that changes the way a business

delivers value for its customers or future customers that will have a successful profit formula, by using key resources and processes. Halme, Lindeman, and Linna (2012, p.5) introduce the concept of "intrapreneurial" bricolage which they define as "entrepreneurial activity taking place in large organizations in contexts of resource scarcity and characterized by creative bundling of resources at hand". Intrapreneurial bricolage is a business model innovation in the large organisation.

On its website, the Global Research Alliance President, Dr Mashelkar (2014) defines inclusive innovation as "any innovation that leads to affordable access of quality goods and services creating livelihood opportunities for the excluded population". An inclusive innovation can therefore be a product or market innovation without being a business model innovation; and the corollary, an inclusive innovation can be a business model innovation without being a product innovation.

An inclusive business model innovation within an organisation is therefore an expression of a business's strategy to creatively bundle existing resources, to give access to high value goods and services to customers to create economic opportunities for excluded populations.

The traditional business models exist within the higher education academic market. It is centred on three industries – the education provider, EdTech, and publishing industries.

9.1 The Education Provider Industry

This industry, which comprises both public and private educational institutions, is large, and in a state of flux. The public providers of education are under pressure to accommodate more students and are under cost and revenue pressure.

The private education industry in South Africa is also substantial in size. The post-school market comprises a number of education groups, which include the following:

1. ADvTECH Group
2. Educor Holdings (Pty) Ltd
3. Stadio Holdings Ltd
4. Boston Education Group

The private education industry is growing, and public institutions are under austerity pressure. The education provider industry is supplied by the publishing and EdTech industries.

9.2 The EdTech or eLearning Industry

The EdTech industry is still relatively young and has traditionally been dominated by international technology companies. It was established through the development and delivery of self-paced eLearning, which initially took the form of corporate training products in particular. Its adoption into the academic market only occurred much later, and began to gain traction in the UK and USA around 2005/2006. The eLearning market has traditionally been considered in the context of self-paced eLearning. Adkins (2016) describes three product categories for self-paced eLearning:

1. Packaged content
2. Services
3. Platforms

On the whole, the market for self-paced eLearning is predicted to decline for various reasons, including product substitution, increased number of suppliers, low economic growth, and pricing pressures. The most important of these is product substitution. The traditional model of self-paced eLearning tends to focus on the activation and demonstration learning phases, while disregarding application and integration. This model is now being replaced by newer

learning technologies, including augmented and virtual reality tools, which combine the knowledge and learning transfer processes. The eLearning market is changing.

9.3 The Publishing Industry

The publishing industry is well-established in South Africa and has typically been dominated by large international publishing houses. The Publishers' Association of South Africa (PASA) comprises three sectors:

1. Academic – i.e. publishing within the higher education sector
2. Education – i.e. publishing within the school, technical and vocational training (TVET), and adult basic education (ABET) sectors
3. Trade – i.e. publishing books or other media that are likely to be found in retail bookshops

According to PASA's annual book publishing survey conducted in 2014, the education sector accounts for 67.93 per cent of the revenue share, while the academic sector counts for 12.68 per cent. Relative to the education sector, the academic sector is small, despite showing an increase of 29 per cent, from R358 million to R462 million (Publishers' Association of South Africa, 2016). Possible reasons for this include the growing number of post-school students, as well as the increased opportunity and availability of digital learning resources. Overall, student enrolment in higher education grew by 32.5 per cent – from 700 000 in 2006, to almost one million in 2015. Non-book products reflected an increase of 15.73 per cent from 2013 to 2014, while eBook sales rose by 200 per cent, from R8 million to R25 million (Statistics South Africa, 2014). Within the higher education market, the demand for printed books, eBooks and non-book products, remains on a steady upward trajectory.

9.4 Disruption and Innovation

Given its unattractiveness for investment in its current form, the academic publishing sector is potentially primed for disruption. The sector is characterised by high competition and rivalry among incumbents, a low threat from new entrants and high threat of substitute products. With high bargaining power of buyers and low bargaining power of suppliers, the market is potentially complacent. Innovations are certainly present but are limited to product innovation and they could be considered shallow. Customers are frustrated with obvious pain and tension points.

Luke Williams, the author of "Disrupt: Think The Unthinkable to Spark Transformation in Your Business", describes tension points as frustrations that are not major problems and therefore are not being focused on (Williams, 2011). He identifies four type of tension points:

1. "Workarounds" – address the symptoms of the problem and not the problem itself
2. "Values" – address conflicts between peoples' values and the product and service
3. "Inertia" – addresses customers who feel trapped by a product or service that they feel they cannot get out of
4. "Shoulds versus wants" – addresses customers' perception of products as wants and not needs

Tension points in educational publishing include the price of textbooks, particularly internationally priced textbooks; non-local or "decolonised" content; poor student throughputs and epistemological disadvantage; a lack of appreciation of the entire learning experience as well as the students' life experience.

Williams's (2011) methodology requires identifying the tension points and then challenging product, customer interaction and pricing clichés to arrive at a disruptive hypothesis. The

product cliché in the academic publishing sector is that the product of the sector is at best only a multimedia-enhanced textbook. A disruptive hypothesis could be that businesses within the publishing sector can contribute to the whole learning experience.

In its report on the digital disruption of the education publishing industry, the Boston Consulting Group (BCG), a global management consulting firm and the world's leading advisor on business strategy, identifies an erosion of previously high barriers to entry as a result of a shift in reliance from the printed textbook to digital learning resources; a proliferation of new content sources from OERs; online courseware creators; digital native and self-publishers; and a shift in sales and distribution channels away from a catalogue-style sales methodology to a full-service model (Boston Consulting Group, 2014).

The BCG predicts that a new business model exists, in which publishers are rethinking their value proposition to consider the entire educational experience through partnerships with education providers that deliver content in a digitally integrated offering, focusing on improved student output. BCG predicts that publishers will be able to use their assets in instructional design, testing, content classification systems, organised content, their understanding of teachers and students, and their widespread institutional relationships to create a new business model. The BCG paint four pathways to the future:

1. Transformation of textbooks into whole course solutions – a "closed-loop instructional system" from learning objectives, to instruction, to delivery platforms
2. Movement into adjacent markets including learning management systems
3. Revamping the product and geographically-based sales model to a full solutions model
4. Student outcomes at the core

While the publishing and EdTech industries are merging, education providers are struggling to move into the 21st century, grappling with a lack of confidence in educators and often subpar technology. The cost for higher education and educational resources is high and there is a general distaste for the stagnant system. Innovation is needed.

Educational innovation is the creation and implementation of transformative ideas to improve learning (Sheninger, 2017). There is a significant demand for pedagogically and academically sound learning resources, which function as learning opportunities, and to blend the knowledge and learning transfer phases. This presents a noteworthy opportunity – and one that is ever-increasing. With time, a growing number of education providers will require integrated curriculum and instructional design services, with learning resource creation, integration, and delivery in an off-campus capacity. In addition, customers are likely to require more from eLearning in general – i.e. more than unitised, self-paced learning modules. In addition, there will likely be a shift in focus – specifically, from learning resources to learning opportunities. As such, holistic educational services will become the norm.

9.5 The Existing Model

The traditional industries in the market revolve around Harden's (2001) windows of learning resources and learning opportunities. Typically, learning resources have been the domain of publishers and EdTech companies, while learning opportunities have been the responsibility of education providers. Academic staff (i.e. the course convenors, lecturers etc. of particular courses) are the link between learning resources and learning opportunities – or publishing/EdTech companies and universities. It is the prerogative of academics to determine how learning resources should be made available. In most cases, these learning resources consist of prescribed textbooks, which are produced by publishing companies and sold at

bookstores. Often, the relevant academics will have authored these prescribed textbooks, and have a royalty agreement with the publishing company which holds the copyright.

Managed publishing is a business model innovation and is potentially a disruption of the existing business model.

9.6 A New Model: The Managed Publishing Business Model

To be able to effectively administer a BLC, a university would need to effectively manage their curriculum, manage their learning resources and manage the delivery of off-campus teaching and learning. The managed publishing model has been constructed to add value in these three areas.

Managed publishing adds value by allowing education providers to manage their resources, own their copyright, and build meaningful off-campus learning opportunities based on their existing learning resources. Additionally, education providers are able to translate their learning resources into learning opportunities in an online format. This, in turn, allows them to tailor delivery for a blended learning or even a distance learning curriculum. Ultimately, this presents an opportunity for the university to generate revenue.

Publishing companies understand education and know how to integrate pedagogical content and platforms to enhance students' learning experiences. They can create and deliver rich media in both digital and print format covering numerous subject areas, across a variety of disciplines. They can tailor learning resources to meet education providers' specific needs, as well as the needs of their students. Many education providers have collected learning resources over decades. The aim of the managed publishing business model innovation is to enable these education providers to not only publish their resources, but also to augment them with newly-created, bespoke and up-to-date digital resources.

9.6.1 Curriculum Design

The process of publishing any learning resource begins with curriculum design. The curriculum design service focuses on Harden's (2001) learning objective window. The other elements or windows of the curriculum, particularly the BLC, are the domain and responsibility of the education provider. The process is managed as a collaboration between the education providers' subject matter expert (SME) and the publishing companies' department of academic content specialists. They can consult on the drafting, scaffolding, chunking, sequencing and pacing of potential learning objectives, which are then translated into a coherent outline. In the process of mapping the learning objectives, the education provider is able to identify links to other departments within a curriculum. The process also allows learning objectives to be allocated to specific learning opportunities and thus mitigate the risk of duplicating learning opportunities, or alternatively, creating gaps and consequently failing to adequately address the particular learning objectives.

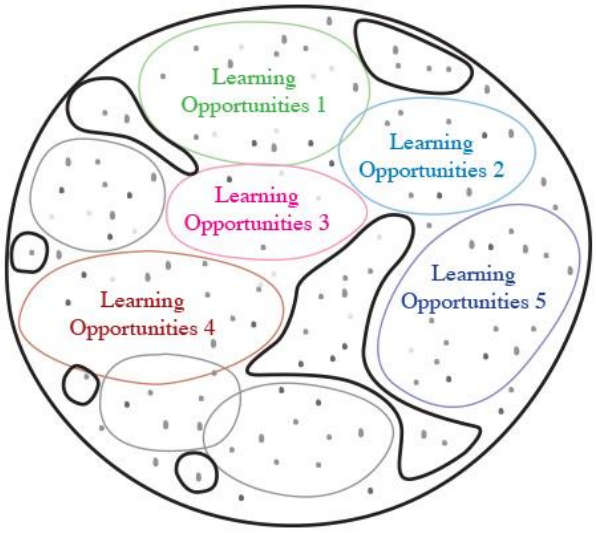


Figure 13: Mapping learning objectives and learning opportunities

Source: Adapted from (EDGE Learning Media (Pty) Ltd, 2018b)

Google Sheets is the primary tool used for this mapping exercise. Another web-based platform such as the dynamic learning opportunities, objectives and outcome platform (LOOOP) can also be used (Balzer et al., 2016). Both platforms are data tools that facilitate collaboration between the publishing company and the education provider. The end result is a matrix of learning objectives for a particular discipline or department, shown as records demonstrating their relationship to other fields, including overlap in other disciplines; inclusion in learning resources, opportunities and assessments; and other metadata including search tags as well as tags relating to the presentation of the learning objectives and the lecturer responsible etc.

The learning objective mapping exercise is first conducted in a mapping platform and not directly in a content management system (CMS) because the data relationships are more easily displayed, particularly when there are disciplines within a department and multiple departments within a faculty. A global view allows staff to perceive the "core-curriculum blueprint and so eliminate overlap and ensure that all relevant issues are addressed" (Burch et al., 2007, p.349).

9.6.2 Content Management

The outline is then captured in a web-based CMS. All staff members at both the education provider and the publishing company are able to access this CMS at any time and from anywhere. It is user-friendly and designed to continue the appreciation of the global relationships between multiple disciplines.

Imbue Partners, a management consultancy that collaborates with clients to drive profitable and sustainable growth, produced a report on publishing leaders' perspectives on the digital transformation journey. The leaders they spoke to identified five areas or capabilities "of transformation in terms of importance to the business and current capability" (Imbue Partners, 2017, p.2):

1. Storage
2. Metadata
3. Content agility
4. Discoverability
5. Collaboration

Content agility and discoverability are key benefits of a CMS. The CMS outline has the following taxonomy:

1. Learning area – the subject, course or discipline learning resource or learning opportunity
    a. Unit – the chapters or units within the learning area
        i. Section – the sections within the unit
            - Subsection – the subsections within the section

The visual presentation of the taxonomy allows users to easily distinguish the different levels, as well as move or "drag and drop" levels to various points. This manipulation becomes necessary because as content is added to the system, the educator will gain a deeper appreciation of the relationships between units, sections and subsections.

Depending on the requirements of the education provider's department, the outline can be built on book or reader learning areas, or as a learning opportunity volume – for example, the presentation of all lectures for a particular semester. At its core, it is an outline or taxonomy for the presentation of content.

Any staff member is able create a new learning area at any point in time. They are also able to change the structure within a learning area – for example, by adding or deleting new units, sections or subsections. Additionally, they can reorder units by simply dragging and dropping

them. They can also use sections and units, and even whole learning areas for delivery in other courses. This flexibility will offer the education provider an opportunity to "sweat" resources by using pre-packed learning resources and opportunities in other courses, in existing courses or even in the delivery of short courses.

Educators will also be able to record any metadata relating to any level in the outline, such as the applicable learning objective or links to other learning areas, units or sections. They can also add search tags, which are words that students are likely to search on. This will help the student to find the necessary resource when he or she needs it. Metadata is key prognostic indicator of the digital readiness of the publishing business. "In aggregate, metadata was chosen as the top business priority and greatest gap in current organizational ability" (Imbue Partners, 2017 p.2).

9.6.3 Instructional Design

The next step in the business model will be to source, collate, curate, create and aggregate resources to be included in the relevant location in the CMS. Resources in a digital system can take many forms including:

- Instructionally designed text
- Images
- Video
- Animation
- HTML based Interactive Learning Artefacts (ILA) including games
- ePUB eBooks
- Links to proprietary or open online resources

The key to managed publishing is the use of the education provider's existing content. The content that education providers, universities in particular, have is a vast untapped resource. Its form, nature, structure and purpose are multiple and diverse:

- Notes
- Lecture slides
- Tutorial packs
- Presentation slides
- Course readers
- Question banks
- Student assignments
- Essays
- Theses
- Activities
- Exercises
- Cases studies
- Algorithms
- Diagrams
- Photographs

While vast, the problem is that these resources are generally not centrally managed, which would enable them to be effectively used; nor are they published professionally for distribution and use by students. Managed publishing can address these issues by facilitating capture and storage, and also content discoverability and agility.

The outline makes the sourcing process easy. The more expanded the levels of the outline, the easier it is to source content to populate the outline. A key driver for sourcing content is its

appropriateness for its delivery in the different steps or phases of the scaffolded sequence. Problematisation, activation and demonstration content are typically sourced from sources such as readers, notes and lecture slides, while – to a certain extent – integration content can be sourced from activities, exercises, cases studies and algorithms.

The exercise of sourcing, collating and curating reveals holes or gaps in the content. In this, the SME acts as author. As with any authored content, the content will need to go through a professional publishing process.

The existing resources are focused towards on-campus provision. They are therefore heavily text-based and not necessarily digital or conducive to instruction in the context of a learning resource being presented for the purpose of providing an off-campus learning opportunity. Nor does the education provider or university typically possess libraries of their own digital resources. These will need to be created or sourced.

The art of digital instructional design is taking content and manipulating it graphically and delivering it in an engaging way. Being able to augment text with digital learning media is a key element of the business model but is not a limiting step. It can be expensive to digitise learning resources, particularly depending on the level of animation required. But digitisation need not be complex nor expensive. Often the university has significant graphic material in one-dimensional images that can easily be converted to two-dimensional interactions. Resources are often available online as OERs. All content can only be included when it has been vetted to be instructionally sound and aligned to the first principles of instruction (Merrill, 2002).

A key barrier to online content capture and delivery for instruction is styling, particularly styling for print output. While the CMS interface will allow novice users to capture and style their own content, the process will be managed by publishing personnel who "professionalise"

the presentation, particularly of content items such as tables that are notoriously hard to style. The CMS aims to replace content styling software applications. Such applications use separate capture and output mechanisms where output is exported in the desired format. Content in the CMS will be captured in HTML and digital output, ready for delivery on an online learning ecosystem. Print readiness will require further action, but this is easily harmoniously achieved.

9.6.4 Delivery on the Online Learning Ecosystem – the EE

The purpose of an eLearning ecosystem is to ensure that the ecosystem, as a whole, is a learning opportunity. The key to delivering effective off-campus teaching and learning is the ability to provide off-campus learning opportunities. To achieve this, an understanding is needed of what exactly a learning opportunity is – and more importantly, at what point a learning resource becomes a learning opportunity. The watershed is engagement. If students read a book by themselves, this is a learning opportunity – they are engaging with the learning resource. Therefore, the definition of a learning opportunity is engagement with learning resources.

Engagement can take place alone and without direction, as in self-directed learning, or it can take place with direction or in small, medium or large groups. It can also take place on or off-campus. To ensure that learning has taken place, the EE has been built around a few principles:

1. A learning opportunity is engagement with a learning resource. A learning resource becomes a learning opportunity once there is engagement – or the corollary, a learning opportunity occurs with engagement on learning resources. By ensuring that all the designated learning objectives are demonstrated as learning resources, individual student engagement with these learning resources constitutes the very base level learning opportunity.
2. A learning opportunity may be considered as either teaching, instruction or free. By definition, teaching requires the presence of a lecturer, facilitator or tutor.

Presence can be physical or online. The teacher is present to provide synchronous feedback and communication is bidirectional. Teaching can be distinguished from instruction: instruction is unidirectional, and the individual is not present, but the student is still guided or directed through other means. Free learning occurs when there is no guidance.

3. By definition, teaching and instruction are guided – the purpose is engagement with learning resources. Teaching and instruction can take place in large groups, in small groups or by individuals by themselves.
4. Learning can take place on campus or off-campus

If the learning objectives are covered in the learning resources, engagement then needs to be promoted. The EE has been designed to facilitate engagement with learning resources. The engagement can take place with or without a facilitator, tutor or lecturer present; and the engagement can take place on or off-campus. The key is engagement with the content.

Engagement in the prototype EE was facilitated through different mechanisms:

1. Quizzing
2. Interactive learning artefacts
3. Linking
4. Case studies/activities

Engagement in the prototype EE was further enhanced through two types of communication:

1. Notes
2. Questions

The key to a successful learning ecosystem is for learning to actually take place. This raises an important question: how does one measure whether learning has taken place? The traditional method involves some kind of assessment tool. However, does such an assessment determine whether learning has truly taken place, or merely whether a student can master the assessment tool itself?

The term "assessment" or "to assess" originates from the Latin verb *assidere* or *adsidere*, which means "to sit beside". This notion of "sitting beside" could aid the process of gaining "deeper, collective understandings about the learning that students are experiencing" (Huba & Freed, 2000, p.77). The question, then, is how to "sit beside" in the scalable delivery of assessment services? By recording the engagement, an analysis could possibly determine whether learning has taken place. This, in turn, could be augmented with a proctored assessment.

9.7 Summary

Managed publishing is an inclusive business model innovation. It potentially creates value for universities by helping them manage their curricula; as well as by helping them publish their own learning resources and delivering them through an EE that could help them "teach" their students off-campus; and allow them to reallocate their human and infrastructure resources to accommodate more students on campus; and, therefore, potentially help them increase their graduate numbers. The business model could potentially create value for students by reducing their dependency on textbooks as a primary source of information and therefore helping to reduce the overall cost of education for students.

The managed publishing business model innovation also potentially creates value for students by assisting academically at-risk students to remain at university and complete their degree.

Chapter 10: Research Contributions and Conclusions

10.1 Theoretical Contribution

This research contributes to the conceptual understanding of Harden's (2001) curriculum windows. Whilst Harden conceptualises the interconnectedness of the windows in a model where learning resources are chosen to be appropriate for the learning objectives, and similarly the learning opportunities are constructed to be appropriate to the learning objectives (Figure 14); this research conceives the learning resources constructed on the learning objectives, but more importantly it considers the baseline learning opportunity to be engagement with those learning objective dedicated learning resources (see Figure 15).

Figure 14: Traditional relationship between learning objectives, resources and opportunities
Source: (Derived from the analysis of findings)

Figure 15: Digital relationship between learning objectives, resources and opportunities

Source: (Derived from the analysis of findings)

10.2 Empirical Contribution

This research was designed to be a longitudinal study that would have immersed the researcher in the students' teaching and learning. Whilst time was cut short and only two of the five data collection iterations were possible, the two iterations allowed the researcher to thoroughly describe and analyse the findings.

10.3 Practical Contribution

A requirement of this Master of Philosophy in Inclusive Innovation was to develop a business model innovation. By far, the largest contributions of this research project are of a practical nature.

This research project contributes practically to the understanding of what students will need out of an eLearning ecosystem so that it can be used to deliver off-campus learning opportunities as a cornerstone of a BLC.

This research contributes by proposing practical considerations for the implementation of a BLC as a solution to increasing the output of graduates from medical schools.

This project contributes further by practically proposing the managed publishing business model innovation as a solution to enabling universities to develop and deliver a BLC.

10.4 Conclusion

An effective and efficient BLC will require multifaceted blending, pervasive faculty adoption, students that are literate in digital learning, changed attitudes to online learning, tightly managed learning objectives and learning opportunities that are structured for on- and off-campus delivery.

Off-campus learning opportunities will require an EE that facilitates engagement with high-quality learning resources as a baseline off-campus learning opportunity. The EE can be used for off-campus engagement to collaborate, collate and curate as further off-campus learning opportunities. Engagement in the EE can facilitate social constructivism by supporting engagement with peers and educators, and by providing a user-friendly learning experience. This research contributes by offering answers on how learning opportunities can be delivered off-campus by using the EE.

The EE can also facilitate high-quality learning objective and resource management.

The academic publishing industry is incumbent and social pressures are pushing the need for inclusive innovation. A business model that professionally publishes, and instructionally designs the university's existing resources into digitally-ready learning resources, managed in

a content management system and delivered in the EE are the components of the managed publishing business model innovation.

The innovation is inclusive because of its potential to increase graduates from medical schools through a BLC that increases the number of available places, and through the EE that supports academically at-risk students. The business model is also inclusive because it can potentially reduce textbook prices for students and reduce the dependency of medical schools on expensive human resources. It can potentially also enable the university to earn fourth stream income.

Chapter 11: Research Limitations and Future Research Directions

The research sample was second-year medical students studying pathology in integrated health sciences in the case-based integrated PBL learning opportunity.

The research was limited in that it did not propose to research whether the students' knowledge and skills were improved as a result of using the EE. The research problem is the shortage of medical graduates and the ultimate solution is an increased number of medical graduates. Given this, the research did not focus on improving students' results. There is a need to research medical education and the actual effect of a BLC on student throughput and hence the number of medical graduates. This will need to be a longitudinal study that investigates whether a BLC does result in better knowledge, skills and attitudes or values of students. This research into blended medical education can look at what type of tasks and activities are best suited to deliver off-campus learning opportunities that are conducted in an EE. Additionally, future research can investigate the type of learning opportunities that are best suited to on-campus delivery, particularly in the context of teaching more students while facing further austerity pressure. The research could look at how traditional models of delivering knowledge application and integration learning opportunities, such as PBL and TBL, can be modified for a BLC.

The purpose of this research was to explore and critically evaluate the implementation of the EE as a key component in delivering a BLC that can potentially help increase the number of graduates from medical schools, and supply South Africa with the physicians it needs. The research questions focus on the use of the EE by students as a key driver in the success of a blended learning curriculum. Blended learning has been explored in the context of PBL as a blended learning opportunity and has been discussed in the context of a BLC. Students have multiple learning opportunities, of which PBL is only one. But, there are many factors in a

BLC that will need to be further understood – particularly the financial, infrastructure and human resource implications.

Due to the tiered selection criteria and academic ability of medical students, further future research is required to focus on the cohort of academically at-risk students to determine how they are specifically supported by an EE in a BLC.

Future research is required to determine the effectiveness of the EE in a BLC in other faculties and at other universities.

Further research is also required to integrate research on learning objective management systems with the management of learning resources and opportunities within the BLC.

The EE is critical to the delivery of blended and electronic learning. Further research is required to understand and keep abreast of changing student requirements in terms of learning resources, learning opportunities and the engagement with peers and educators. This research could unpack the concept of eLearning being provided in a holistic ecosystem or virtual campus.

Another avenue of research in medical education, and even in higher education across multiple faculties, could be to research the best mechanisms to instil a culture of digital learning and how best to upskill students to be able to actively take advantage of the wealth of OERs in the Internet. Access to OERs offers the greatest potential to level previous epistemological disadvantage created by the failing school system. If students can be taught how to teach themselves, this could be their greatest advantage.

This research is limited in that it does not address the impact of a BLC on clinical training. Increasing the number of pre-clinical places at medical schools will create the need for an increased supply of clinical training places for both pre-service and in-service students and clinicians respectively. UCT has already initiated partnerships with regional hospitals,

including the George Regional Hospital, as a way of increasing pre-service clinical training placements. More places will still be required. Stellenbosch medical school is already using a potential solution to this, by deploying medical students within the private clinical setting, and using private human and infrastructure resources. Research is required into whether this is effective.

A limitation related to the business model innovation is whether other departments, faculties and universities would be interested in deploying such a business model. Although the DP is, it remains to be seen whether other departments at UCT would be interested in the managed publishing business model and whether there are other prospective clients for it. Universities' appetite for managed publishing could increase as fees and funding crises increase austerity pressure, and as students begin to pressure them for cost-effective inclusive solutions.

Future inclusive business model innovations in education will arise that address many links in the service provision chain of higher education. The pressure points in higher education are price, duration, purpose and relevance, resources, quality, and throughput. Technology in education is an extensive industry, with new innovations aimed to disrupt this industry constantly evolving. A steady focus to disrupt the industry with inclusive business models is required. Future research needs to be directed at inclusive disruption of all the links in the higher education chain – particularly those associated with the greatest pain points. The price of higher education has been topical in South Africa for almost a decade. Research is required to understand the relationship between price, quality and time in higher education. Does a lower price lead to a fall in quality? Does a lower price imply that a student will take longer to achieve their higher education? Is higher education necessary in a changing job market? These are all potential research questions for the future.

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Appendices

Appendix 1: Topics for discussion in the Group 18 SSI

Topics

1. Content in a BLC
    - Video vs. text
    - Images vs. text
    - Readings
    - PLC
    - Clinical content
2. Other learning systems
    - Paper vs. digital
    - Other platforms (Google + Dropbox)
    - Where do you collate your answers to the learning objectives?
3. The EE as a learning ecosystem
    - Note taking functionality in a BLC
    - Question-asking functionality in a BLC
    - Other functionality
    - Are you using the notes – what other features in the notes would you require?
    - Are you using the questions?
    - What would it take for you to share your personal notes?
4. Lectures in a BLC
    - What do you prefer in your day – lectures, practicals or tutorials?
    - Where does most of your learning take place?
    - Where do you get their information?
5. PBL

- Do you like PBL?
- Do you think PBL benefits your learning?
- Do you like working in groups?

Appendix 2: Enquiry questions for Group 18 questionnaire, grouped around elements of the research questions

Elements of the research questions

1. How would students use an EE in a BLC?
    a. Which is more important for receiving your material – lectures, tutorials, practicals, eReader or textbooks?
    b. Are you able to access the eReader off-campus?
    c. When did you access the eReader most?
    d. How did you access the eReader the most? UCT computer lab – desktop at home, laptop at home, tablet device or mobile smartphone?
    e. Did you access the eReader during lectures, tutorials, PBL sessions or breaks? Please elaborate and use examples.
    f. Did you use the eReader mostly inside or outside your PBL sessions?
    g. Does having the eReader mean that you can study more off-campus or on-campus?
    h. When you are studying at home, do you rely on the eReader?
    i. When you are studying at home, how do you use the eReader? Please explain.
2. What features of an EE would support blended learning?
    a. Which of the features or tools on the eReader system support your learning off-campus?
    b. What features would you like on the eReader system to support more learning off-campus?
    c. How does the eReader support what you have learned in PBL sessions, lectures, practicals and tutorials? Does the EE support learning? What you have learned in tutorials?
    d. Does the EE support learning/what you have learned in PBL sessions?
    e. What aspects of the EE did you find most relevant and beneficial?
    f. When compared to Anatomical Pathology (not available on the eReader) how did you find your learning experience with Virology?

g. How satisfied were you with the eReader content?

3. What are the learning benefits of an eReader?

   a. Did the eReader benefit your learning in any way – and if so, how?

   b. How does the eReader compare to other online resources that you access?

   c. Are there any aspects of the eReader that assisted your learning experience that lectures/tutorials/PBL sessions did not provide? Please explain your answer.

   d. Did the eReader assist or hamper your learning experience? Please elaborate and use specific examples?

   e. Would you like other disciplines to be included in the eReader? Please explain your answer?

   f. Does the eReader assist/improve your understanding of the course content?

4. Does blended learning support a diversity of students?

   a. Does using the eReader off-campus help you in your PBL sessions?

   b. Does using the eReader help you in your learning?

   c. Please explain what your level of experience is with computers and online systems such as apps?

   d. Did you find the EE user-friendly?

5. What are the other benefits that accrue from the EE and how?

   a. Aside from having the eReader online – are there any other benefits you received from using the eReader?

Appendix 3: Group 18 student questionnaire

Group 18 Student Questionnaire

Thank you for participating in the UCT Pathology eReader research project . We hope you enjoyed the online interaction.

We want to hear your feedback on how you used the system. Please complete this quick questionnaire and let us know your thoughts (your answers will be anonymous).

*Required

1. **Name**

2. **Are you able to access the eReader off campus?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No

3. **Please indicate the ways in which you accessed the eReader and the frequency in which you used it.** *
   Mark only one oval per row.

	Very often	Often	Sometimes	Seldom	Very seldom	Never
UCT computer lab	◯	◯	◯	◯	◯	◯
Desktop at home	◯	◯	◯	◯	◯	◯
Laptop on campus	◯	◯	◯	◯	◯	◯
Laptop off campus	◯	◯	◯	◯	◯	◯
Ipad/Tablet on campus	◯	◯	◯	◯	◯	◯
Ipad/Tablet off campus	◯	◯	◯	◯	◯	◯
Smartphone on campus	◯	◯	◯	◯	◯	◯
Smartphone off campus	◯	◯	◯	◯	◯	◯

4. **Please indicate the methods in which you acquire the necessary knowledge for this semester in levels of importance.** *

Mark only one oval per row.

	Extremely important	Very important	Average importance	Not very important	Not important
Lectures					
Tutorials/Practicals					
eReader					
Textbooks					
Printed reader					
Online resources					
Dissection					

5. **Did you use the eReader mostly before, during or after your PBL sessions?** *

Mark only one oval.

- Before
- During
- After

6. **When did you access the eReader the most?** *

Mark only one oval per row.

	Very often	Often	Sometimes	Seldom	Very seldom	Never
Lectures						
Tutorials/Practicals						
PBL sessions						
Breaks on campus						
On my own off campus						
In study groups off campus						

7. **Please explain the reasons for your above answers.**

8. **Is the eReader more conducive to your on campus or off campus studies?** *

Mark only one oval.

- On campus
- Off campus
- Both
- Neither

9. **Please explain your above answer.** *

10. **When you are studying at home, what do you use as your main information source?** *
Mark only one oval.

- ◯ eReader
- ◯ Lecture slides
- ◯ Your own notes you have taken
- ◯ Textbooks
- ◯ Online resources
- ◯ Printed reader
- ◯ Other: _____

11. **Which of the features/tools on the eReader system support your learning?** *

_____
_____
_____
_____
_____

12. **What features would you like on the eReader system to support more off campus learning?** *

_____
_____
_____
_____
_____

13. **How does the eReader support what you have learnt in PBL sessions, lectures, practicals, tutorials and other learning activities?** *

_____
_____
_____
_____
_____

14. **Does using the eReader off campus improve your inclination to learn during your PBL sessions?** *
Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Neither

15. **Please motivate your above answer.** *

_____
_____
_____
_____
_____

16. **When compared to Chemical Pathology (not available as an eReader) how did you find your learning experience for Virology?** *
Mark only one oval.

- ◯ Easier
- ◯ More difficult
- ◯ No difference

17. **Please explain your above answer.** *

18. **How satisfied were you with the eReader content?** *
Mark only one oval.
- ◯ Very satisfied
- ◯ Quite satisfied
- ◯ Neutral
- ◯ Not satisfied

19. **Please explain your above answer.** *

20. **Apart from the eReader, do you readily access other online resources to improve your knowledge?** *
Mark only one oval.
- ◯ Yes
- ◯ No

21. **If you answered Yes to the question above, which resources do you access and how does the eReader compare with them?** *

22. **Are there any aspects of the eReader that added to your learning experience that lectures, practicals/tutorials and PBL sessions did not provide?** *
Mark only one oval.
- ◯ Yes
- ◯ No
- ◯ Neither

23. **Please explain your above answer.** *

24. **Did the eReader assist or hamper your learning experience?** *
Mark only one oval.
- ◯ Assisted
- ◯ Hampered
- ◯ Neither

29. **Please explain your above answer.** *

30. **Aside from having the eReader online - are there any other benefits you received from using the eReader?** *

31. **Please provide suggestions on how you think the eReader could be improved.** *

25. **Please provide two examples illustrating how it assisted or hampered your learning experience.** *

26. **Would you like other disciplines to be included in the eReader?** *
Mark only one oval.
- ◯ Yes
- ◯ No

27. **Please explain your above answer.** *

28. **Does the eReader assist / improve your understanding of the course content?** *
Mark only one oval.
- ◯ Yes
- ◯ No

Appendix 4: Topics for the Group 3 SSI

Topic

1. Lectures in a BLC:
    a. Do you need lectures?
    b. Do you want lectures?
    c. How do you want lectures?
    d. What would you like to see in lectures?
2. The EE as a learning ecosystem:
    a. Are you using the system?
    b. What is stopping you from using the system?
    c. What would make you more likely to use the system features?
    d. Could you use the system instead of a Google document?
    e. What other tools would you like to see in the system?
    f. Would you use the system instead of WhatsApp?
3. Online/blended learning:
    a. What features of a system would help you to learn online?
    b. How is online learning better?
    c. How could you use the system in a BLC?
    d. Could you do PBL online?
    e. What would you need to do it online?
4. Learning resources/content in a BLC:
    a. Is the content in the Readers good enough, is there enough?
    b. Do you like the animations/videos/diagrams/quizzes, access to textbooks, access to the PLC?
    c. Do you still need your textbooks?
    d. What about other online resources – where do you get most of your content from?

5. Sharing:
    a. Do you like sharing your notes and asking questions?
    b. What would you use the notes for?
    c. What would you use the questions for?
    d. What conversations do you want to have on the system?
    e. Who do you want to communicate with?
    f. How do you want to communicate with them?
6. PBL:
    a. Do you like PBL?
    b. Do you feel PBL helps you learn?
    c. How could PBL be done better?
    d. Where and how do you learn the most?

Appendix 5: Questions for the final questionnaire

	Question
1.	How do you feel about doing certain learning activities online – which ones would you prefer and how would you like to do them?
2.	What tools would you need (notes, questions, links etc.) in an eLearning ecosystem to make studying parts of your course online possible?
3.	What for you is the purpose of lectures and how do they influence your studies?
4.	What learning material in your eReaders (like text, activities, videos etc.) would be most helpful to make learning online possible? What else would you like?
5.	How do you use the notes and questions in the eReader – what is stopping you from sharing your notes and questions with others?
6.	What part of group work do you like? What is stopping you from engaging in group work and what group activities would you like to have available online?
7.	How could we improve PBL and how could parts of it be done online?
8.	What makes studying in first and second year difficult? What barriers are there? How could we use the eReaders to make the transition from school to university easier for you?
9.	Please provide suggestions on how you think the eReader could be improved.

Appendix 6: Codes for interim data analysis iteration 1

	Code
1.	Chair
2.	Clinical
3.	Email
4.	Epistemological
5.	Facilitator
6.	Feature enhancement
7.	Feedback
8.	Google
9.	Groups
10.	Learning process
11.	Lectures
12.	Linking
13.	Learning objectives
14.	Notes
15.	Outdated
16.	Paper
17.	PBL
18.	Pictures
19.	PLC
20.	Questions
21.	Range
22.	Readings
23.	Scribe
24.	Search
25.	SOAP

26. Tables
27. Usability
28. WhatsApp

Appendix 7: Fields for interim data analysis iteration 2

	Field
1.	Note
2.	Group (student whole class; student training group 1,2,3,4; facilitator; PBL Group 18; PBL Group 3)
3.	Session (PBL observation session 1,2,3,4; SSI; Questionnaire)
4.	Date
5.	Researcher
6.	Method
7.	Tool (Observation; interview; questionnaire)
8.	Variety (transcription; reflection)
9.	Timing (intra or post the session)
10.	Initial Code 1
11.	Initial Code 2
12.	Initial Code 3
13.	Initial Code 4
14.	Initial Code 5
15.	Initial Code 6
16.	Initial Code 7
17.	Category/ies

Appendix 8: Codes for interim data analysis iteration 2

	Code
1.	Barriers to use
2.	Case task
3.	Chair
4.	CHH
5.	Clinical
6.	Curriculum
7.	Devices
8.	Digital literacy
9.	Dissection
10.	eReader system
11.	Email
12.	Epistemological
13.	eReader
14.	eReaders
15.	Error
16.	External learning resources
17.	Facilitator
18.	Feature enhancement
19.	Feedback
20.	Ftf
21.	Google Docs
22.	Google
23.	Group dynamics
24.	Group dynamics

25. Highlighting
26. Informed consent
27. Knowledge construction
28. Learning resources availability
29. Learning resources in reader
30. Learning resources quality
31. Learning resources range
32. Learning resources sources
33. Lecture availability
34. Lecturer
35. Lectures
36. Linking
37. Lo
38. LO allocation
39. LO range
40. Ms OneNote
41. Ms word
42. N/a
43. Note-taking
44. Notes
45. Online blended learning
46. Online group activities
47. Online learning resources
48. Outdated
49. Outdated learning resources
50. Paper
51. PBL process

52. Pharmacology
53. Photographing
54. Picture
55. Pictures
56. Plc
57. Practical
58. Presentation
59. Print readers
60. Pronunciation
61. Protest
62. Questions
63. Range
64. Readers
65. Reading
66. Reading total
67. Safety
68. Scribe
69. Scribing
70. Sharing
71. Slide share
72. Soap
73. Symptom approach
74. Tables
75. Technology
76. Textbooks
77. Uptodate.com
78. Usability

79. Video
80. Vula
81. WhatsApp
82. White board

Appendix 9: Categories for interim data analysis iteration 3

	Category	Description
1.	Barriers to studying	Anything that presents a potential barrier to studying
2.	Content in eReaders	Anything to do with the content in the eReaders
3.	Contextualisation	Anything to do with contextualisation
4.	Curriculation	Anything to do with the curriculation process
5.	Device	Anything to do with devices
6.	Digital/Video	Anything to do with digital or video
7.	Facilitator	Anything to do with the facilitator
8.	Feedback	Anything to do with feedback
9.	Groups	Anything to do with groups
10.	Learning opportunities	Anything to do with learning opportunities/activities
11.	Learning resources	Anything to do with learning resources
12.	Learning styles	Anything to do with an individuals' learning style
13.	Learning theories	Anything to do with the different learning theories, prior knowledge, activities
14.	Lectures	Anything to do with lectures
15.	Linking	Anything to do with linking as a tool for enabling learning opportunities
16.	Notes	Anything to do with note taking, summery taking and curation
17.	OER	Anything to do with OER
18.	Off-campus vs. On-campus	Anything to do with studying on-campus or off-campus

19.	Online/blended	Anything to do with the act of studying online
20.	Paper	Anything to do with paper-based learning
21.	PBL	Anything to do with PBL as a learning opportunity
22.	Presentation	Anything to do with presentation, articulation and soft skills
23.	Questions	Anything to do with asking questions
24.	Search	Anything to do with the ability to search
25.	Sharing	Anything to do with sharing, social, collaboration, competitiveness, soft skills and communication
26.	Synchronicity	Anything to do with the synchronicity of feedback, learning opportunities
27.	Textbook	Anything to do with traditional textbooks
28.	The eReader system	Anything to do with system - functionality, tools etc.

Appendix 10: Themes and categories for the final data analysis

	Theme	Category
I.	Barriers	1. Barriers/Access to studying
II.	Functionality in the EE	2. Dictionary 3. Functionality in the eReader system 4. Linking 5. Navigation in the eReader system 6. Notes 7. Notifications in the eReader system 8. Questions 9. Search 10. Synchronicity 11. The eReader system
III.	Groups	12. Groups
IV.	Learning opportunities	13. Curation/Collation 14. Discussion 15. Feedback 16. Learning opportunities 17. Lecturers 18. Lectures 19. Presentation 20. Summarising 21. Teaching
V.	Learning resources	22. Content in the EE 23. Contextualisation 24. Google 25. Journal articles 26. Learning resources

Theme	Category
	27. OER 28. Textbook 29. Video
VI. Learning theories	30. Activation of prior knowledge 31. Collaborative learning 32. Curriculation 33. Learning efficiency 34. Learning styles 35. Learning theories 36. Sequencing and pacing
VII. Online	37. Device and data 38. Digital 39. Off-campus vs. On-campus 40. Online/blended 41. Paper
VIII. PBL	42. Facilitator 43. PBL
IX. People	44. Sharing 45. Social/Communication 46. Trust
X. Range	47. Assessment 48. Learning objectives 49. Range 50. Linking 51. Navigation in the eReader system 52. Notes

EDGE
LEARNING MEDIA
Enriching Learning Experiences

BUSINESS PLAN

MANAGED PUBLISHING
AS A BUSINESS MODEL IN ACADEMIC PUBLISHING

EDGE Learning Media (Pty) Ltd
Ground Floor, Bell House 2, Bell Crescent, Westlake Business Park 7945

MANAGED PUBLISHING
AS A BUSINESS MODEL IN ACADEMIC PUBLISHING

KEY ACRONYMS

CMS – Content Management System

ELE – EDGE Learning Ecosystem

EXECUTIVE SUMMARY

The problem

Both students and universities face significant financial pressure, as the cost of higher education is substantial and ever-increasing. Additionally, a growing number of students are seeking higher education opportunities; however, many public universities lack the capacity and revenue to respond to this increasing number, and are therefore unable to provide services to these students. This has impacted the provision of higher education overall. Concurrently, there have been noteworthy advances in technology, as well as shifts in teaching and learning practices. Although these changes have allowed for a greater number of teaching and learning opportunities to take place remotely, most local universities currently do not have a curriculum that is suited to off-campus delivery.

Our intention

In order to respond to this need, we endeavour to offer universities a full-curriculum service. This includes publishing their existing content (currently contained in face-to-face learning resources), creating new digital learning resources, capturing these in an online content management system (CMS), and delivering them in an e-learning ecosystem.

Our rationale

We seek to disrupt the learning resource / learning opportunity relationship, by enabling education providers to own and manage their learning resources. By providing a system that facilitates engagement around these resources, both teaching and learning opportunities can be accessed in a remote, off-campus capacity.

Our goals

1. Universities can upscale their service provision to a greater number of off-campus students, thereby growing their own revenue, as well as increasing the number of students receiving higher education.
2. EDGE can become the preferred supplier of learning resources and learning opportunities, to public higher education institutions in South Africa.

Who is EDGE?

What is our vision?

Our vision is to create and deliver both online and offline learning media, in order to enrich students' learning experiences.

What is our purpose?

Our purpose is to provide a wide range of high-quality learning media solutions – both online and offline – that will improve student throughput.

How do we accomplish this?

- We are passionate about education, and knowledgeable about the education industry at large. Moreover, we possess a broad range of skills and expertise about diverse subject matter, as well as e-learning technologies. These characteristics provide the foundation for all that we do.
- We take the student's perspective as our starting point. This student-centric view – based on their needs, desires and challenges – informs *what* we do, *how* we do it, and *why* we do it. In other words, we focus on the learning experience. This forms our ultimate measure of success.
- We follow our distinctive methodologies and processes, apply the relevant subject matter, and use the best available technology to develop high-quality learning media solutions. These are both effective and efficient, from the following two perspectives:

    1. An *education provider perspective* – collaborative, comprehensive, cost-effective, compliant, flexible, and up to date.
    2. A *student perspective* – user-friendly, easily navigable, and engaging.

Why do we do this (what drives and motivates us)?

- We believe in the power of education to enhance individuals' lives, and to improve the community at large.
- We are passionate about lifelong learning, and 'learning to learn'. Possessing these skills is like having a 'passport to life'.
- We believe that *how* and *why* you learn is as important as *what* you learn, and that students deserve high-quality, innovative and professional learning media. As such, we strive to create effective content and enriching learning experiences, in order to improve student outcomes.
- We understand the challenges inherent in off-campus learning – overall, student throughputs are inadequate. As such, it is neither effective nor sustainable to simply replicate content in an online environment, when it was originally intended for an interactive, face-to-face, classroom-based context. We wish to address this challenge by tailoring education, so that the outcomes for on-campus and off-campus learning are aligned, and quality is not compromised.
- These factors are especially relevant in light of the crises being faced by our educational institutions. If these continue, online learning is likely to become an even more viable alternative, and can ease the transition from classroom-based learning to blended learning.

For whom do we do this?

Our vision focuses on the following three audiences:

1. *Academic*: Public and private higher education institutions and vocational education providers (both on-campus and off-campus learning), awarding bodies and schools.
2. *Non-academic*: Corporates (providing training to employees) and learning media suppliers.
3. *Other*: National and international audiences.

What are our clients' needs, and how do we meet these?

Client needs	How we meet these
• Confidence and peace of mind with regard to the quality and relevance of the content • A single offering and point of contact for the complete learning experience, right through to assessment • Flexibility to customise the content/course/platform • Saving time on non-core operational functionalities, such as installing or maintaining a platform • A cost-effective solution that leverages the current business capability and available technology • Improved performance and pass rate among students • Better learning experiences and improved motivation among students (thereby also reducing the frequency of queries, and preventing issues that compromise results) • A reliable, long-term education partner who understands the unique needs and challenges of the client/business	• Our team possesses a broad range of subject knowledge, pedagogical expertise, academic integrity, teaching experience, student insight and technological skills. This ensures that we produce high-quality, relevant content that is optimally packaged. • We are familiar and up to date with all the regulatory requirements of educational authorities. • We offer an end-to-end solution that covers all four aspects of the student experience: curriculum, content, learning opportunities/activities, and assessment. • We can develop, customise and integrate the content and delivery of the clients' learning media. • Client relationships and collaboration provide the foundation for how we work. We take the time to clarify expectations and identify ideal outcomes upfront. • We are passionate about both teaching and learning. As such, we are invested in achieving optimal outcomes and improving pass rates. We measure our own success according to the success of the students who engage with our solutions.

Client needs	How we meet these
• High-quality content that is pitched at the right level • Familiarity with the latest curriculum requirements • Relevance to the South African market – both from a student perspective and an industry/ vocational perspective • Student-centricity – addressing key student needs, desires and challenges • Inclusion of practical assessment tools to test learnings • Customisability to the client's or business's specific requirements, as well as to the student, institution and type of qualification	• Based on our academic and pedagogical experience, we integrate the educator's perspective with the first-hand experience of the student, taking the various needs, desires and challenges into account. • We do not simply produce educational content, but also ensure that it is accessible and easy to use, in order to facilitate learning and enhance student throughput. • We place value in the 'how' of education – both how learning happens, and how content is packaged. This is why we strive to provide accessible, easily navigable content. • By using best practice instructional design, we repackage content, in order to present it from a student-centric perspective. • Based on our student-centric approach, we implement a range of tools that facilitate learning and improve outcomes. These include assessments (with both questions and answers), case studies, activities, practical examples, videos, and many more. • We offer seamless integration of offline and online content. • We are proudly South African.
• Integration with existing systems • Simple structure/architecture that enhances the learning experience (by providing guidance, minimising queries, and improving outcomes) • Streamlined functionality that offers variety • Functionality that fills the gap of on-campus lectures (for off-campus learning, specifically) • Facilitated collaboration, with the flexibility to control/customise • Technological support and troubleshooting	• For us, technology is the great enabler. Through this, we are committed to providing new and better ways to educate. • We are experts in e-learning technology and instructional design. We possess the required technical and subject expertise to create effective, interactive learning media, thereby enhancing the learning experience. • Our e-learning system serves as a content repository, as well as a tool for facilitating student collaboration. • By focusing on the learning experience, we use the best-suited technology, and combine this with the core content and system requirements. • We can tailor the system to suit clients' unique learning requirements – whether on-campus/ face-to-face, off-campus/online, or blended. • We can integrate the system with the client's existing learning management system (LMS), or make it available as a standalone system.

Client needs	How we meet these
	• Our system enables students to draw connections and understand how the content interrelates. • The transition from offline to online content is seamless, as students can still print copies from the digital system. • We mitigate students' risk of 'missing out' in an off-campus context, by offering them more assistance and points of contact, compared to the average distance-learning experience.

Table 1: Clients' needs, and how we meet these

EDGE's approach, expertise and experience: How do we contribute to improved student outcomes?

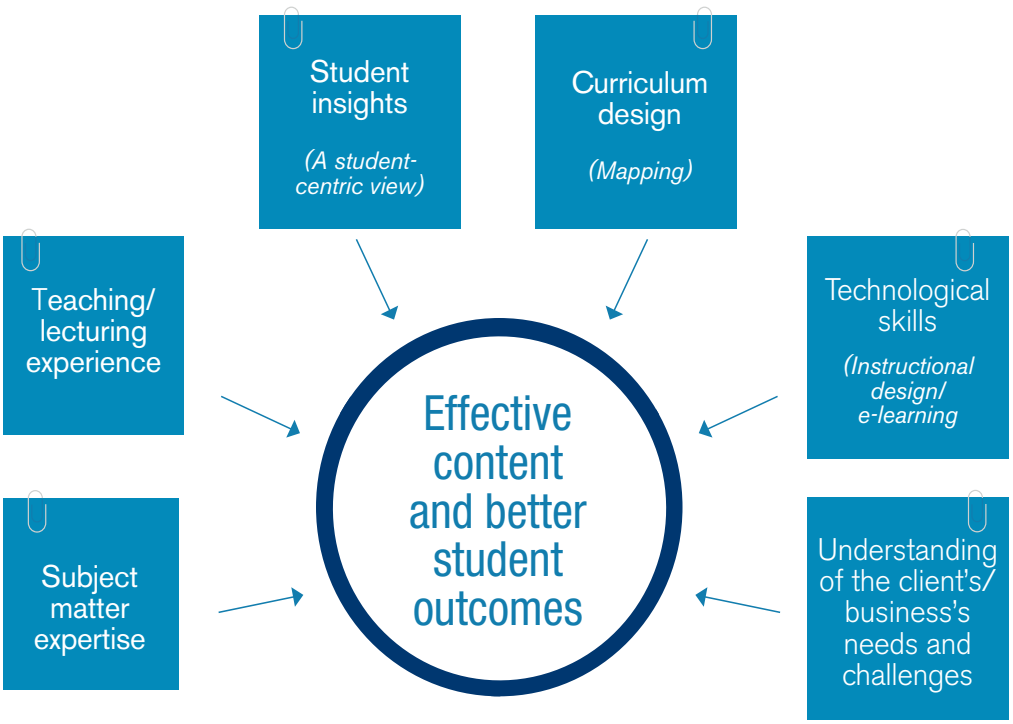


Figure 1: EDGE's approach, expertise and experience

What are our solutions?

Catalogue

Type	Who	What
PRODUCT CATALOGUE Textbooks, digital books, courses and e-learning courses	• Private and public education providers • Awarding bodies • Corporates	• EDGE Learning Media produces learning material across a broad range of tertiary-level disciplines. • Our products include textbooks, e-learning courses, study and solutions guides, workbooks, and more. Our primary subject areas cover the humanities and social sciences, commerce, media, law, and management and business studies. However, we also create bespoke content. • EDGE Learning Media is the exclusive publisher of ICB textbooks. • **Humanities and social sciences** – Our humanities and social sciences catalogue currently features textbooks on applied research, applied psychology, industrial psychology, human resource development, public relations and HIV counselling, among others. Although these learning materials have firm theoretical foundations, students are also drawn into the practical applications of these subjects – within both global and local contexts. • **Commerce** – Our commerce catalogue offers practical and comprehensive guides to the basic, intermediate and advanced principles of commerce. Currently, our textbooks cover the areas of financial accounting, financial management, cost and management accounting, economics, taxation, business mathematics and statistics. These learning materials are invaluable to those seeking both foundational and advanced knowledge of the current principles, theories and practices underpinning these subject fields. • **Media** – The global media landscape is changing rapidly. Our textbooks on advertising, marketing, integrated marketing communication and digital media – to name but a few – reflect this global dynamic. These learning materials are designed to unpack the core theoretical components pertaining to these fields, and to hone the competencies required of media practitioners in the digital age.

Type	Who	What
PRODUCT CATALOGUE Textbooks, digital books, courses and e-learning courses	• Private and public education providers • Awarding bodies • Corporates	• **Law** – In business, it is crucial to possess basic knowledge of the legalities that underlie the world of commerce. Our textbooks endeavour to make South African law accessible to students, and to answer common questions about the law. Topics covered in our law collection range from the basics of the South African legal system, to commercial laws involving contracts and litigation. Our catalogue also features textbooks on media law, law for tourism and sports law. • **Management and business studies** – Our textbooks on management and business studies have strong theoretical and practical components, and endeavour to frame academic content from a uniquely South African perspective. Our current titles include the areas of business management, entrepreneurship, marketing management, human resource management and project management, among others. Additionally, our event management titles are colourful explorations of global and local events, and reflect current developments in the fields of event management, hospitality studies and the creative industries. • **Bespoke** – Your content, your way. Utilising our years of educational publishing experience, we work with clients to develop bespoke content that meets their unique curriculum and subject needs.
E-LEARNING Instructional design / course design	• Private and public education providers • Awarding bodies • Corporates	• EDGE Learning Media has the expertise, skills and experience to bridge the gap between resources and real-world knowledge and competency. We develop courses, enrich content and transform it into a digital format, in a way that is effective, engaging and easy to understand – helping students to succeed. By combining extensive research, a deep understanding of educational models and pedagogies, and digital leadership, we create effective e-learning experiences that transcend the challenges associated with traditional online distance learning.

EDUCATIONAL VIDEO PRODUCTION Enrich your learning	• Private and public education providers • Awarding bodies • Corporates	• EDGE Learning Media has a library of over 1 000 videos to supplement and enhance the learning experience, including videos to prepare students for assessment. Our videos are 'hand in glove', meaning that they have been developed in-house and integrated with our learning materials by technical and subject experts. From accounting to corporate strategy, public relations to marketing, event management to advertising, we can formulate, script, record and produce videos to enrich the learning experience.
MANAGED PUBLISHING Your content, your way	• Private and public education providers • Awarding bodies • Corporates	• We understand education, and we know how to integrate pedagogical content and platforms, to enhance students' learning experiences. We publish rich media, develop e-learning platforms, produce and advocate online learning, develop courseware, and provide technical and academic support to our clients – in a variety of different subject areas, and across a broad range of tertiary-level disciplines. We are an African business with international scope, and are able to tailor materials to meet the specific needs of our clients, as well as those of their students, wherever they are situated in the world.
LEARNING MANAGEMENT SYSTEMS We support you	• Private and public education providers • Awarding bodies • Corporates	• EDGE Learning Media provides support in managing content and courseware on major LMS platforms, including Blackboard, Sakai, Moodle and many more. Our academic expertise and technical proficiency mean that we can integrate our learning media into the client's LMS, thereby ensuring that their students have a seamless, enriched learning experience.
CORPORATE E-LEARNING Down to business	• Corporates	• We assist businesses with the creation and digitisation of training materials and systems. We customise clients' existing resources, or develop bespoke versions, to meet their specific needs. In so doing, we work closely with subject matter experts to deliver a tailored solution. • Additionally, we provide experience and expertise in learning design. We ensure that the client's business requirements are met through the delivery of expertly developed material. As specialists in instructional design – ranging from e-learning to video production – we ensure that the employee remains engaged and focused, while developing tangible skills and competencies.

INTERNATIONAL OUTSOURCING Send it our way	• International corporates • International training companies • International e-learning companies • International public and private education providers • International awarding bodies	• With more than ten years' experience, EDGE Learning Media is well-positioned to service all international clients and projects. With an exceptionally qualified and experienced team located in South Africa, as well as account management based in the United Kingdom (UK), we provide a complete set of services to all our international customers, while offering competitive offshore pricing. We take pride in our team and in what we deliver – always ensuring that our clients' requirements are met with the greatest care and finesse, wherever they are situated in the world.
DIGITAL E-READER SYSTEM **CONTENT MANAGEMENT SYSTEM** **EDGE LEARNING ECOSYSTEM (ELE)**	• Existing clients – currently use a link from their LMS to ELE, but will eventually utilise an LMS plug-in version • New clients (academic and non-academic) – use ELE as their key system from the start	• We are experts in e-learning technology and instructional design. • Our e-learning system serves as a content repository, as well as a tool for facilitating student collaboration. It focuses on the learning experience, rather than on unnecessary administration. • We can develop, implement or manage courseware in the client's chosen LMS (we can work on all major platforms, including Blackboard, Sakai and Moodle). Alternatively, we can develop courseware in our system, which can then be integrated into the client's LMS with a simple plug-in, or utilised in a new tab. • We can tailor the system to suit the student's unique learning requirements – whether on-campus/face-to-face, off-campus/online, or blended. • We are experts in instructional design – developing systems that support and enhance the student experience.

Table 2: EDGE Learning Media's product catalogue

Who are our founders?

Andrew Hibling (Chief Executive Officer)

Andrew holds BCom and MBChB qualifications from the University of Cape Town (UCT). Diverging from his Capetonian roots, he began his career in London, where he worked in the banking sector. Three years later, he returned to South Africa to study medicine. Throughout this period, Andrew lectured accounting and finance at Damelin Education Group. In his third year of studying medicine, he started his first business, which offered assessment services to professional bodies, as well as to further and higher education providers. In 2006, he co-founded EDGE, together with business partner, Janse Maritz.

Andrew has a passion for educational technology (EdTech). Over the past ten years, he has travelled the globe, attending numerous EdTech conferences. In addition, he is a member of The eLearning Guild, as well as of Learning LandsCAPE in South Africa. Andrew has extended his expertise to many education providers throughout the country, by providing consultation on how to set up e-learning systems. He is currently also completing an MPhil in Inclusive Business Model Innovation in Education, through UCT's Graduate School of Business. Andrew resides in Cape Town with his wife and three children.

Janse Maritz (Chief Academic Officer)

Janse holds an MCom in Finance, and a PGDip in Education (cum laude) from Rand Afrikaans University (RAU). His academic profile comprises years of experience as an educator, facilitator and video learning specialist. Janse's credentials can be attributed largely to his tenure as facilitator at Ekurhuleni East TVET College, lecturer at Technikon SA, and senior lecturer at the University of South Africa (Unisa). In 2006, he co-founded EDGE, in partnership with Andrew Hibling. At this time, Janse also managed a successful client portfolio at Old Mutual, adding to his distinctive sales and commercial acumen.

Janse has extensive pedagogical insight, and has established significant rapport with educational leaders in South Africa. As EDGE Learning Media's Chief Academic Officer, he has a distinct appreciation for best practice in curriculum design, the development of suitable learning content, and sound teaching and learning discourse. Janse currently lives in KwaZulu-Natal with his wife and two children.

Who is our executive team?

Paul Hobden (Managing Director)

Paul leads EDGE Learning Media's management team. He holds BSocSci and HDE qualifications from the University of KwaZulu-Natal, as well as an MBA from the Edinburgh Business School at Heriot-Watt University in the UK. Paul has extensive national and international experience, which includes his tenure as Head of Content for DG&G Travel Information in the UK (a subsidiary of Reed Elsevier), now known as Travel Weekly Group Ltd. As an integral member of the leadership team, he guided DG&G to become the first subsidiary to successfully migrate all publications from hard copy to digital format. During his time abroad, he also led the creation and management of Gazetteers.com – an industry-leading, multi-award-winning website. Paul's local experience includes his roles as Portal Manager and Head of Small Business at MWEB, where he spearheaded a number of key projects and initiatives.

Paul has been recognised as a confident, articulate and commercially astute business leader, with an outstanding track record in delivering innovative, high-quality digital products and services. He is passionate about education and technology, and has presented at numerous conferences and industry events. As an avid sportsman, he has also completed numerous marathons and ultramarathons over the years. Paul currently resides in Cape Town with his wife and three children.

Nicola Bothma (Operations Executive)

Nicola holds BBA and BCom (Hons) qualifications in Business and Financial Management, attained through Unisa. Nicola began her working career at Insinger de Beaufort in 2010, where she gained invaluable experience in fund and market analysis. In 2011, an opportunity presented itself at EDGE Learning Media. Following her passion for education, she accepted the offer, and has since remained at EDGE. During this time, Nicola has successfully developed and implemented new systems and processes, which assist with business efficiency. In addition, she has contributed to expanding the business's network, by adding new clients and business opportunities to the EDGE portfolio.

Nicola is a focused and driven individual, whose analytical and organised nature adds value to any task at hand. Over the years, she has gained a vast amount of experience in the industry, while also fostering outstanding customer relationships. One of Nicola's greatest strengths is communication – she quickly builds rapport with everyone she encounters, whether they are colleagues or customers. Nicola is a great asset to EDGE, and epitomises everything that the company stands for. She will continue to play an integral role in achieving our objectives for the future. As a lover of sports and the outdoors, Nicola has completed numerous cycling and running events, including the Comrades ultramarathon. She lives in the seaside village of Fish Hoek in Cape Town, with her husband.

Kim Cruickshank (Talent Executive)

Kim is responsible for talent management at EDGE. As such, she plays a vital role in attracting experts to the business, and has built an extensive network of professionals (including authors and content specialists), who contribute to EDGE's wide-ranging textbook offerings. After completing her BA through Unisa, she worked as a Sub-Editor for Independent Media, before moving to the UK. Kim devoted the next eight years to offender management at the National Probation Service in Cheshire. Here, she applied her cognitive behavioural modification training, along with her sincere belief in people's capacity to change. Throughout this time, she witnessed the profound impact that education could have in the lives of disadvantaged people. While employed as Treatment Manager, Kim was also responsible for facilitator training, as well as 'train the trainer' services.

Kim continues to value her role as mentor, and is well-known for her service leadership. As someone who is passionate about the outdoors, she is also a dedicated trail and road runner. She currently lives in Durban with her husband and two daughters.

Patrick Manthey (Finance Executive)

Patrick is a born and raised Capetonian. He holds a BAccSci qualification from Unisa, as well as a Diploma in Management Accounting from the UK-based Chartered Institute of Management Accountants (CIMA), where he is currently still a student member. Patrick started his career as Trainee Accountant, under a three-year training contract with the South African Institute of Chartered Accountants (SAICA). For the last eight years, he has worked in both small and large private sector companies, extending his career profile from Junior Accountant to Financial Manager.

Since joining EDGE in 2017, Patrick has become a key member of the team, and enjoys contributing to all aspects of the business. He is currently also working toward the ACMA/CGMA designation at CIMA. At present, he resides in Cape Town with his three rescue dogs.

Whom do we employ?

At EDGE, we strive to invest in highly qualified and talented individuals, who are equally passionate about education. Our teams are dedicated to creating the best learning media, and ensuring that these resources will enrich the learning experiences of our end users.

What are our achievements?

EDGE was established in 2006. The founders recognised a need for learning resources that were tailored to the local market – i.e. relevant to the South African context, content and student.

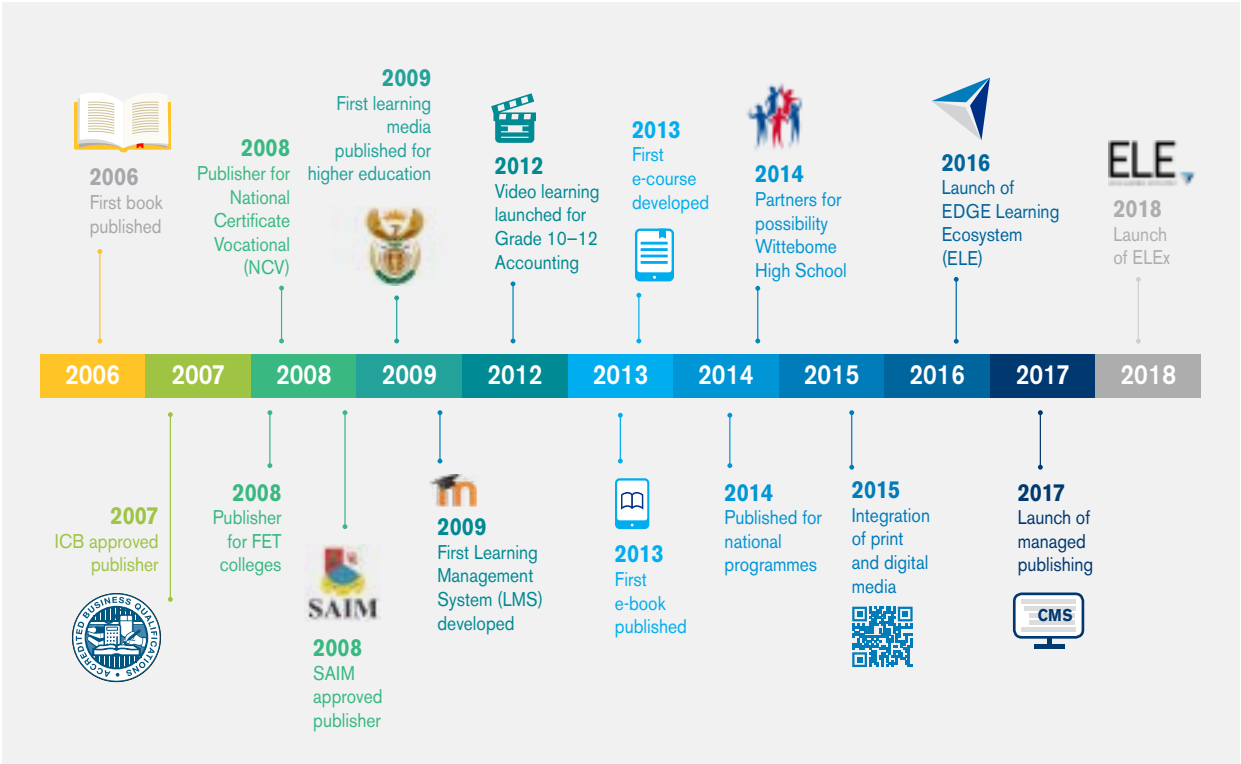


Figure 2: The history of EDGE Learning Media

THE MARKET

What is the industry?

This opportunity encompasses three industries, namely the EdTech, publishing and training provider industries.

The publishing industry

The publishing industry is well-established in South Africa, and has typically been dominated by large international publishing houses. The Publishers' Association of South Africa (PASA) comprises three sectors:

1. *Academic*: Publishing within the higher education sector.
2. *Education*: Publishing within the school, technical and vocational training (TVET), and adult basic education and training (ABET) sectors.
3. *Trade*: Publishing books (or other media) that are likely to be distributed in retail bookshops.

EDGE Learning Media primarily focuses on the academic sector. According to PASA's annual book publishing survey conducted in 2014, the education sector counts for 67.93 per cent of the revenue share, while the academic sector counts for 12.68 per cent. Relative to the education sector, the academic sector is small – despite showing an increase of 29 per cent, from R 358 million to R 462 million (Publishers' Association of South Africa, 2016).

Possible reasons for this include the growing number of post-school students, as well as the increased opportunity and availability of digital learning resources. Overall, student enrolment in higher education grew by 32.5 per cent – from 700 000 in 2006, to almost one million in 2015. Non-book products displayed an increase of 15.73 per cent from 2013 to 2014, while e-book sales rose by 200 per cent – from R 8 million to R 25 million (Statistics South Africa, 2016). Within the higher education market, the demand for printed books, e-books and non-book products, remains on a steady upward trajectory.

The EdTech industry

The EdTech industry is still relatively young, and has traditionally been dominated by international technology companies. It was established through the development and delivery of self-paced eLearning, which initially took the form of corporate training products, in particular. Its adoption into the academic market only occurred much later, and began to gain traction in the United Kingdom and the United States around 2005/2006.

Adkins (2016) describes three product categories for self-paced e-learning:

1. Packaged content
2. Services
3. Platforms

On the whole, the market for self-paced eLearning is predicted to decline. This is outlined in the tables that follow.

Product category	2016	2017	2018	2019	2020	2021	Five-year compound annual growth rate (CAGR)
Packaged content	$ 12 466.96	$ 12 090.74	$ 11 428.00	$ 10 704.99	$ 9 927.65	$ 8 914.10	- 6.5%
Services	$ 5 650.68	$ 5 673.97	$ 5 719.53	$ 5 764.00	$ 5 751.76	$ 5 730.92	0.3%
Platforms	$ 8 732.35	$ 2 568.00	$ 2 380.54	$ 2 096.33	$ 1 666.93	$ 1 217.87	- 14.9%
Totals	**$ 26 849.99**	**$ 20 332.71**	**$ 19 528.07**	**$ 18 565.32**	**$ 17 346.34**	**$ 15 862.89**	**- 5.3%**

(Source: Adkins, 2016)
Table 3: 2016–2021 US revenue forecasts for self-paced e-learning products, by product category

US buyer segment	2016	2017	2018	2019	2020	2021	Five-year compound annual growth rate (CAGR)
Consumer	$ 494.10	$ 482.60	$ 457.00	$ 421.00	$ 381.40	$ 285.80	-10.4%
Federal government	$ 2 592.90	$ 2 411.50	$ 2 327.00	$ 2 240.90	$ 2 053.50	$ 2 035.70	- 4.75
State and local government	$ 1 205.60	$ 1 169.90	$ 1 086.50	$ 944.30	$ 802.30	$ 853.10	- 6.7%
PreK-12 academic	$ 4 611.00	$ 4 560.30	$ 437.10	$ 4 168.80	$ 3 814.40	$ 3 736.50	- 4.1%
High education	$ 5 694.70	$ 5 499.90	$ 5 449.50	$ 5 241.10	$ 4 894.50	$ 4 658.20	- 3.9%
Corporations and businesses	$ 6 251.80	$ 6 108.40	$ 5 837.00	$ 5 549.20	$ 5 400.30	$ 4 293.70	- 7.2%
Totals	**$ 20 850.00**	**$ 20 232.70**	**$ 19 528.10**	**$ 18 565.30**	**$ 17 346.30**	**$ 15 862.90**	**- 5.3%**

(Source: Adkins, 2016)
Table 4: 2016–2021 US revenue forecasts for self-paced e-learning products, by buyer segment

Various reasons have been proposed for this decline, some of which include product substitution, increased number of suppliers, low economic growth, and pricing pressures. The most important of these is *product substitution*. The traditional model of self-paced e-learning tends to focus on the activation and demonstration learning phases, rather than on application and integration. This model is now being replaced by newer learning technologies, including augmented and virtual reality tools, which combine the knowledge and learning transfer processes.

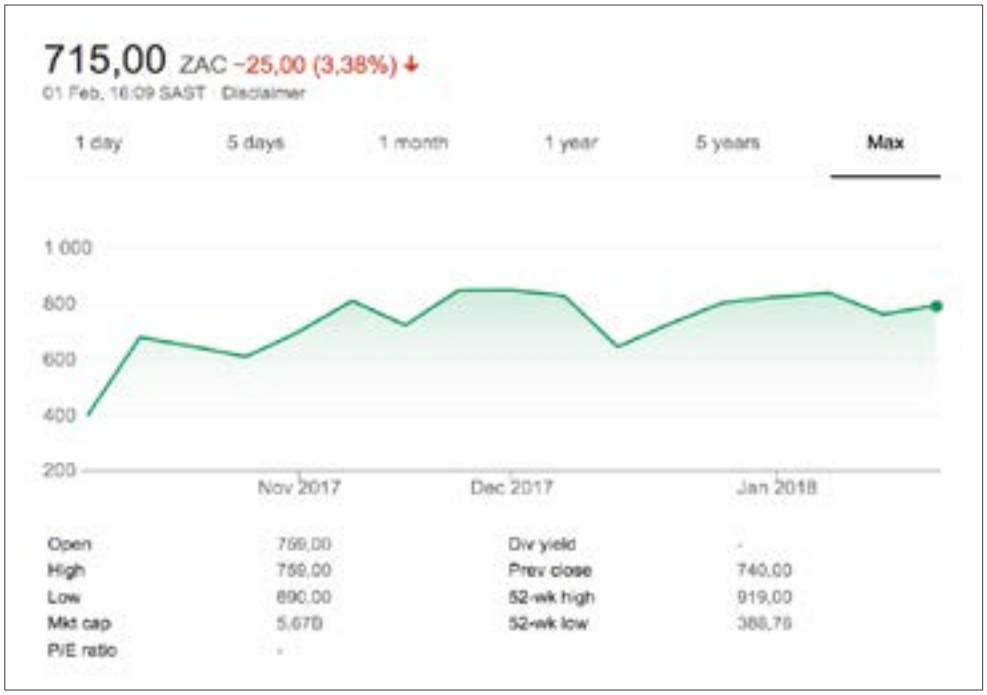
The training provider industry

The publishing and EdTech industries supply the training provider industry. This industry is large, and in a state of flux. In addition, there are both public and private educational institutions. South Africa's private education industry is also substantial in size. The school and post-school markets comprise a number of education groups, which include the following:

1. ADvTECH Group
2. Educor Holdings (Pty) Ltd
3. Stadio Holdings Ltd
4. Boston Education Group

The private education industry is growing, as evidenced by the ADvTECH Group and Stadio Holdings Ltd share prices.

(Source: Google, 2018)
Figure 3: ADvTECH Group's market summary



(Source: Google, 2018)
Figure 4: Stadio Holdings Ltd's market summary

Are the three industries (collectively) structurally attractive?

In the current education landscape, the nature of technology is changing – as is the demand for a particular *type* of technology. Moreover, the publishing and EdTech industries are merging. As such, there is a significant demand for pedagogically and academically sound learning resources, which function as learning opportunities, and blend the knowledge and learning transfer phases. This presents a noteworthy opportunity – and one that is ever-increasing.

With time, a growing number of education providers will require integration of curriculum and instructional design services, with learning resource creation and delivery in an off-campus capacity. In addition, customers are likely to require more from e-learning in general – i.e. more than unitised, self-paced learning modules. Furthermore, there will likely be a shift in focus – specifically, from *learning resources* to *learning opportunities*. As such, holistic educational services are predicted to become the norm.

Is the market ripe for disruption?

In its current form, the academic publishing sector is unattractive for investment. This can be attributed to the following factors:

- *High* competition and rivalry among incumbents
- *Low* threat of new entrants
- *High* threat of substitute products
- *High* bargaining power of buyers
- *Low* bargaining power of suppliers

Overall, the market is complacent, and innovations are shallow. Customers are frustrated, and clear tension points exist. In the educational publishing context, these tension points include:

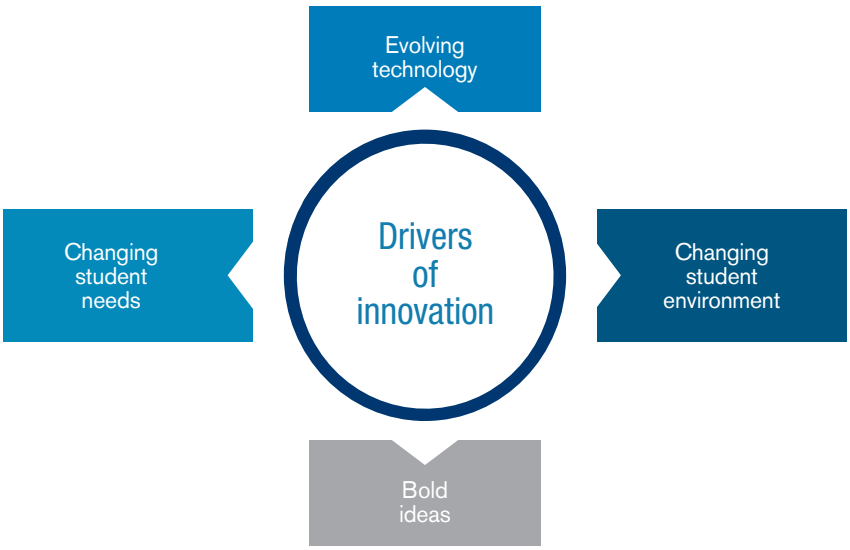
- The cost of textbooks (particularly internationally priced textbooks)
- Lack of local or 'decolonised' content
- Poor student throughputs
- The academically disadvantaged
- Lack of appreciation for the entire learning experience
- Students' individual life experiences

By identifying tension points such as these, and then challenging clichés related to the product, customer interaction, and pricing, it is possible to arrive at a disruptive hypothesis (Williams, 2011). In the academic publishing sector, this may mean shifting away from a traditional 'catalogue style' sales methodology, to a full-service model (Bailey and Davis, 2014). In other words, businesses within the publishing sector can contribute to the learning experience as a whole. This is achieved through partnerships with education providers that deliver content via digitally integrated offerings, in order to improve student output.

The Boston Consultancy Group (BCG) – a global management consulting firm, and the world's leading advisor on business strategy – predict that publishers will be able to create a new business model, by utilising their assets in instructional design, testing, and content classification systems, as well as through an improved understanding of teachers and students, and widespread institutional relationships. They illustrate four pathways to the future:

1. Transformation of textbooks into whole-course solutions – a 'closed-loop instructional system', from learning objectives, to instruction, to delivery platforms.
2. Movement into adjacent markets, including LMSs.
3. Revamping the product and geographically based sales model into a full-solutions model.
4. Placing student outcomes at the core.

From this perspective, the academic publishing sector is ready for disruption. Furthermore, as a substitute product with high potential for disruption and innovation, EDGE's 'managed publishing' model places the company in an optimal position to take hold of these opportunities.



(Source: Sheniger, 2016)
Figure 5: Drivers of innovation

Who is the customer?

The providers of higher education are either public or private institutions. For our service offerings, the customers are primarily universities or public higher education training providers. In South Africa, there are universities, comprehensive universities, and universities of technology. These are currently made up as follows:

- *Eleven (11) universities:* Cape Town, Stellenbosch, Western Cape, Fort Hare, Rhodes, KwaZulu-Natal, Free State, Limpopo, North West, Pretoria and Witwatersrand.
- *Eight (8) comprehensive universities:* Unisa, Johannesburg, Mpumalanga, Venda, Zululand, Nelson Mandela, Walter Sisulu and Sol Plaatjie.
- *Six (6) universities of technology:* Central, Cape Peninsula, Durban, Tshwane, Vaal and Mangosuthu.
- *One (1) health sciences university:* Sefako Makgatho.

The University of Cape Town is an existing customer of EDGE Learning Media.

Which potential barriers to entry can we create?

- We have established contracts with UCT, with a proven track record of providing this service.
- We have strong relationships within the academic sector, throughout South Africa.
- We have proven methodologies, as evidenced through our case studies.
- A research study has been conducted.

Who/what is the competition?

The competition is vast, and can be divided into the following categories:

- *Traditional publishing houses* – e.g. Van Schaik, Juta and Company, Oxford University Press and Pearson Education.
- *Traditional technology companies* – e.g. Adobe, Intel, Google and Apple Inc.
- *Dedicated learning companies* – e.g. Smart Education Solutions, Lynda.com, Articulate and Cisco Learning Network Space.
- *Open educational services* – e.g. Moodle and Sakai.
- *Open educational resource providers* – e.g. Khan Academy.
- *Massive open online course (MOOC) platforms* – e.g. Coursera and Udemy.

These companies are multinational, and control extensive resources. EDGE Learning Media combines the strengths of these different competitors. Our competitive advantage is to move quickly, in order to produce high-quality, professionally published learning resources. Because our competitors are likely to respond with vigour, we will need to move rapidly.

What is the effect of the macro-economic environment?

Public higher education institutions face significant threats. In the South African context specifically, the challenges are double-edged. On the one hand, student applications are increasing, as is the expectation for these institutions to take on more students. Simultaneously, public higher education institutions are faced with an unstable financial climate: funding is steadily declining, and government support is questionable. As such, they are under pressure to generate fees from the so-called 'third stream'. Consequently, they may need to turn to the private sector, in order to pursue public-private partnership.

South Africa's economic growth outlook is flat. We have already encountered the reality of downgrade from investment status, by international ratings agencies. Over the past five years, the rand has experienced a steady decline in value against major international currencies, and remains sensitive to emerging market investor sentiment, as well as political instability.

(Source: XE.com, 2018)
Figure 6: Five-year rand-dollar exchange price

International economic growth remains flat, and emerging market economies have experienced significant growth revisions. Both the US and Europe (including the UK) are also largely experiencing flat growth, despite being at the bottom of the credit cycle, with interest rates expected to rise.

At a global level, we are undergoing noteworthy political transition. The UK has elected to remove itself from the European Union, while the US has elected a new president with potential right-wing conservative economic, foreign and domestic policy. It is a time of instability and volatility – but also of opportunity.

THE OPPORTUNITY

What is the business model?

In discussing the nature of curricula, Harden (2001) has described 'windows' through which a curriculum can be viewed. Three of these windows are briefly described as follows:

1. *Learning objectives:* What the student should know and do.
2. *Learning resources:* The resources or materials that are given to the student to consume.
3. *Learning opportunities:* The activities that allow the student to engage with the learning objectives and learning resources.

Traditional business models revolve around the responsibility centres of learning resources or *learning opportunities.* This varies among different industries. Typically, learning resources have been the domain of publishers and EdTech companies, while learning opportunities have been the responsibility of training providers. The link between learning resources and learning opportunities – or publishing/EdTech companies and universities – is academic staff (i.e. the course convenors, lecturers or facilitators of particular courses). It is the prerogative of academics to determine how learning resources should be made available. In most cases, these learning resources consist of prescribed textbooks, which are produced by publishing companies and sold at bookstores. Often, the relevant academics will have authored these prescribed textbooks, and have a royalty agreement with the publishing company, which holds the copyright.

EDGE proposes a different business model, namely *managed publishing.* This service allows education providers to manage their resources, own their copyright, and build meaningful off-campus learning opportunities, based on their existing learning resources. Additionally, they are able to translate their learning resources into learning opportunities, in an online format. This, in turn, allows them to tailor delivery for a blended learning or even distance-learning context. Ultimately, this also presents an opportunity for revenue generation, on the university's part.

What is 'managed publishing'?

EDGE Learning Media is a publishing company. We understand education, and we know how to integrate pedagogical content and platforms, to enhance students' learning experiences. We create and deliver rich media, in both digital and print format. Since 2006, we have published a wide range of textbooks, which cover numerous subject areas, across a variety of tertiary-level disciplines. These resources are made available for purchase, by students enrolled at various educational institutions and training providers.

Importantly, we are able to tailor materials to meet clients' specific needs, as well as those of their students. Many education providers have collected decades worth of learning resources, which are contained in the form of lecture notes, presentation slides, course readers, question banks, and so on. Our aim is to enable these education providers to not only publish their resources, but also augment them, with newly-created, bespoke and up-to-date digital resources. The process of publishing any learning resource begins with curriculum design.

Curriculum design

The curriculum design process is managed in collaboration with our team of academic content specialists. We consult on the drafting, scaffolding, chunking, sequencing and pacing of potential learning objectives, which are then translated into coherent textbook/course outlines. In the process of mapping the learning objectives, the respective department (e.g. Economics) is able to identify links to the learning objectives of other areas/departments within a curriculum (e.g. Accounting). It also allows them to allocate specific learning opportunities to the learning objectives. This mitigates the risk of duplicating learning opportunities, or creating gaps (i.e. failing to address the learning objectives adequately). The primary tool used for this mapping exercise is Google Sheets.

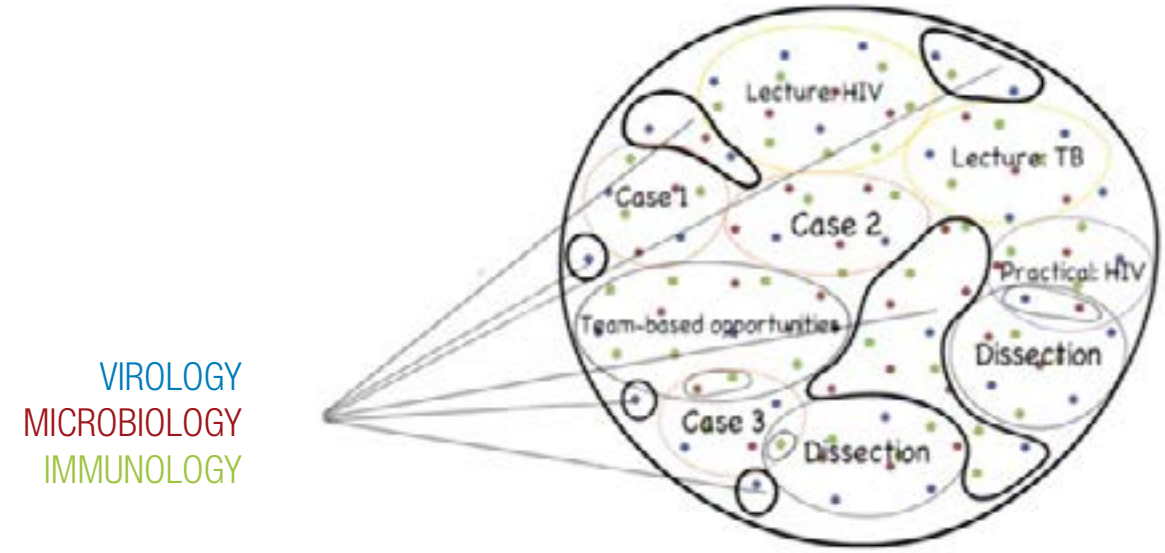


Figure 7: Mapping learning objectives and learning opportunities

The outline is then collated in an online content management system, which can be accessed by all staff members at any time. This system is classified as follows:

- *Learning area* – the subject, course or discipline
  - *Unit* – the chapters within the learning area
    - *Section* – the sections within the unit
      - *Subsection* – the subsections within the section

Depending on the requirements of the department, the subsequent structure or skeleton can be viewed as an e-book, e-reader or learning area, for each learning opportunity or activity. Any staff member can create a new learning area at any point in time. They can even change the structure within a learning area; for example, by adding or deleting new units, sections or subsections. Additionally, they can reorder units by simply dragging and dropping them. They can also record metadata relating to any level within the outline; for example, applicable learning objectives, or links to other learning areas, units or sections. Furthermore, they can add search tags (i.e. keywords that students are likely to search for). This aids the student in finding the necessary resource, as and when they need it. The CMS is depicted below.

Figure 8: Content management system (CMS)

Instructional design: Publishing existing resources and creating new resources

The next step in the process is to source, collate, aggregate and create resources, which are then included in the relevant space in the CMS. In a digital system, these resources can take many forms, including the following:

- Instructionally designed text
- Images
- Videos
- Animations
- HTML-based interactive learning artefacts (ILAs), including games
- e-PUB e-books
- Links to proprietary or open online resources

In many cases, these are based on existing 'legacy' resources. Moreover, because they are typically designed for on-campus delivery, they tend to be heavily text-based, and are therefore not conducive for instructional purposes. The art of instructional design involves taking text and manipulating it graphically, so that it can be delivered in an engaging online format. The instructionally designed text is then augmented by digital learning resources. Often, these are made available by the education provider in the form of one-dimensional images, which can be converted to two-dimensional form. However, they can also be created from scratch, if needed. In some cases, resources are also readily available online. These are only included if and when they have been vetted, to ensure that they are instructionally sound. Learning resources are deemed instructionally sound when they are aligned with the first principles of instruction, as provided below (Merrill, 2002):

1. The learning resources are based on relevant, engaging and contextualised real-world problems and scenarios.
2. The learning resources activate prior knowledge.
3. The learning resources require a demonstration of knowledge.
4. The learning resources require an application of knowledge.
5. The learning resources require an integration of knowledge.

The EDGE Learning Ecosystem (ELE): Delivery in an online learning platform

What is learning? What is teaching? What is a learning resource, and what is a learning opportunity? When does a resource become an opportunity?

The key to effective delivery of off-campus teaching and learning, is to provide learning opportunities. This is the overarching purpose of a successful e-learning ecosystem; at a holistic level, it functions as a learning opportunity. To achieve this, one first needs to determine what exactly a learning opportunity is – and, moreover, at what point a learning resource becomes a learning opportunity.

The watershed is *engagement*. If students read a book by themselves, this is a learning opportunity – in other words, they are engaging with the learning resource. In this way, the definition of a learning opportunity is *engagement with a learning resource*. This engagement may take place in a standalone capacity, without direction (e.g. in the case of self-directed learning); alternatively, it can occur in small, medium or large groups, with direction. In addition, it can take place in either an on-campus or off-campus context.

To ensure that learning takes place, ELE has been built around a number of key principles. These are briefly outlined below:

1. A learning opportunity is defined by engagement with a learning resource. Therefore, if all the designated learning objectives are addressed by the learning resource, a student can attain the very base-level learning opportunity.

2. A learning opportunity may be regarded either as teaching, instruction or free. By definition, teaching requires the presence of a lecturer, facilitator or tutor. This presence can be physical (i.e. face-to-face) or virtual (i.e. online). The teacher is present to provide synchronous feedback, and communication is bidirectional. From this perspective, teaching can be distinguished from instruction. Instruction, in contrast, is unidirectional: while there is no instructor present, the student is still guided or directed through other means. Free learning occurs when guidance is entirely absent.

3. Teaching and instruction are, by definition, guided. Their core purpose is to facilitate engagement with learning resources. They can take place both individually and in groups.

4. Learning can take place in either an on-campus or off-campus context.

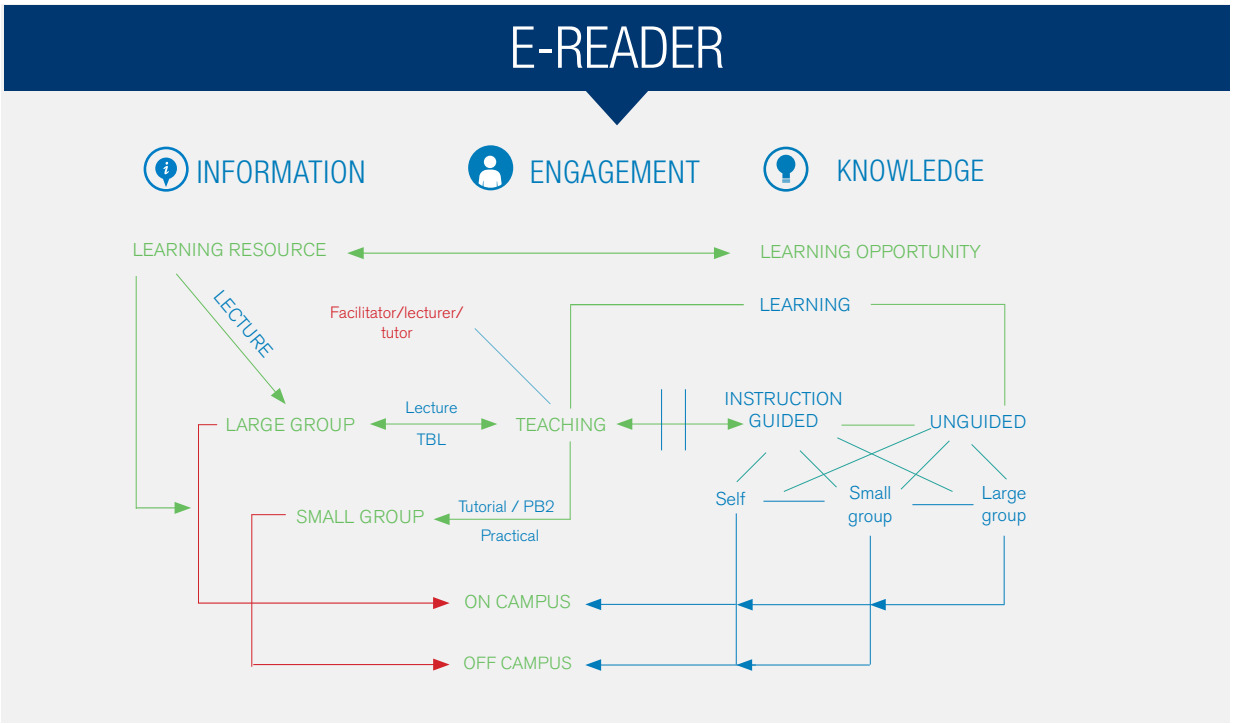


Figure 9: Learning opportunity model

Even if the learning objectives are addressed by the learning resources, engagement must still be actively promoted. ELE has been designed to achieve this. As suggested in the preceding key principles, engagement can be facilitated with or without the presence of a lecturer or tutor; moreover, it can take place in either an on-campus or off-campus environment. In all cases, engagement is key.

ELE facilitates engagement through various mechanisms, including the following:

1. Quizzes
2. Interactive learning artefacts
3. Linking
4. Activities and case studies

This process is further enhanced through two types of communication:

1. Notes
2. Questions

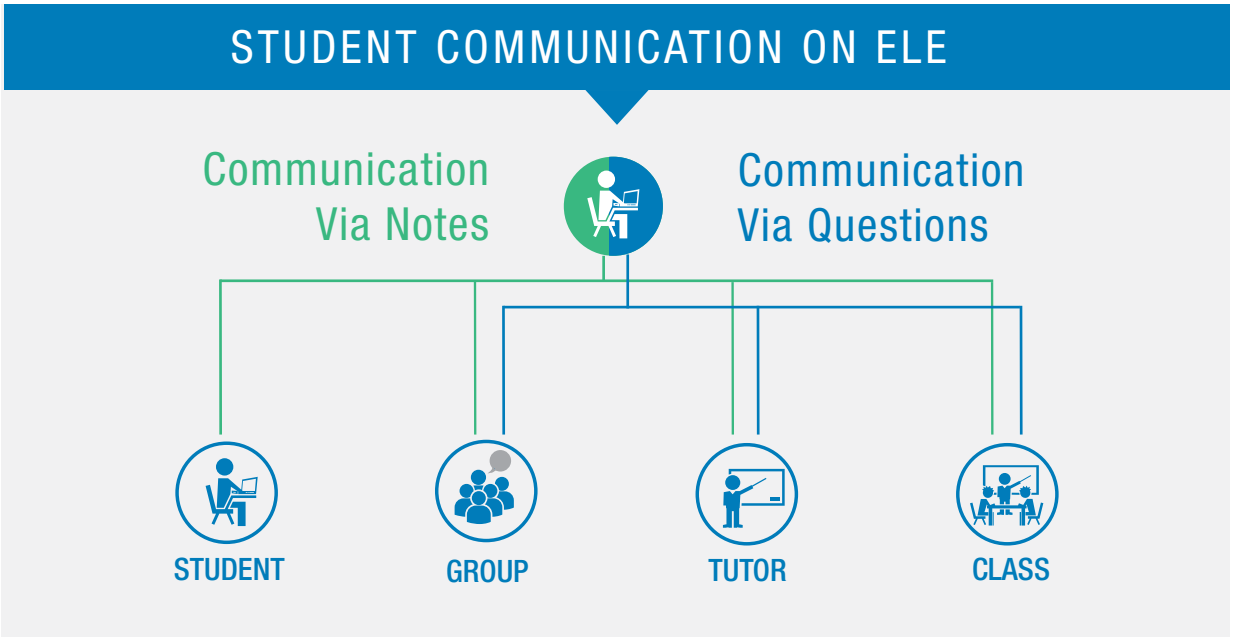


Figure 10: Student communication through ELE

The key to a successful learning ecosystem is for learning to actually take place. This raises an important question: How does one measure whether learning has taken place? The traditional method involves some kind of assessment tool. However, does such an assessment determine whether learning has truly taken place, or merely whether a student can master the assessment tool? The term 'assessment' or 'to assess' originates from the Latin verb *assidere* or *adsidere*, which means 'to sit beside'. This idea of 'sitting beside' describes the process of gaining a 'deep understanding of what students know, understand, and can do with their knowledge as a result of their educational experiences' (Huba and Freed, 2000). The question, then, is how we can 'sit beside' in the scalable delivery of assessment services. Our suggestion is that, by recording the engagement, we can analyse whether learning has taken place. This, in turn, can be augmented by a proctored assessment.

What does the prototype look like?

Figure 11: ELE login screen

Figure 12: ELE bookshelf

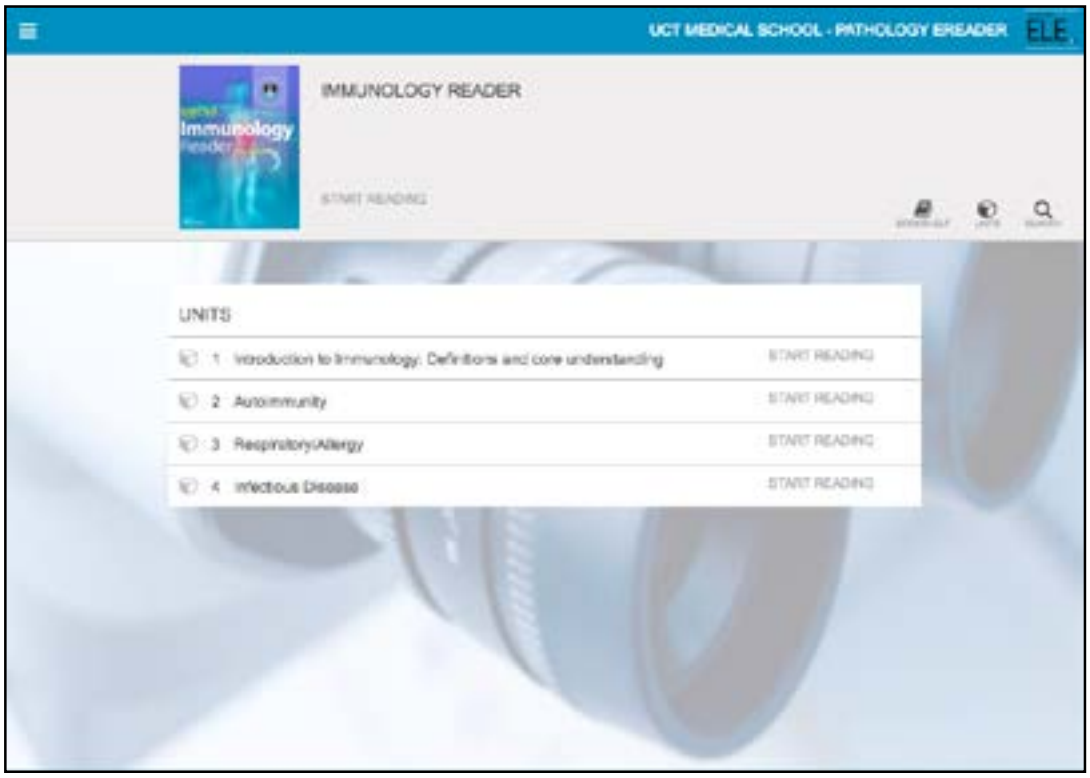


Figure 13: ELE units

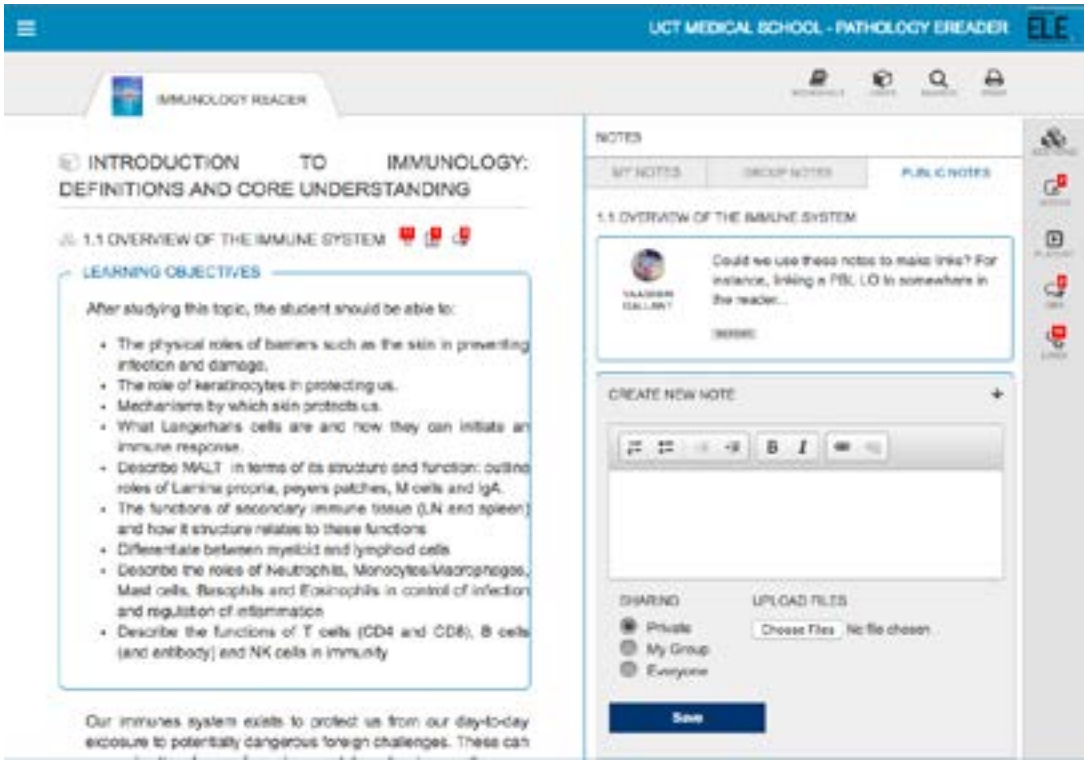


Figure 14: ELE e-reader

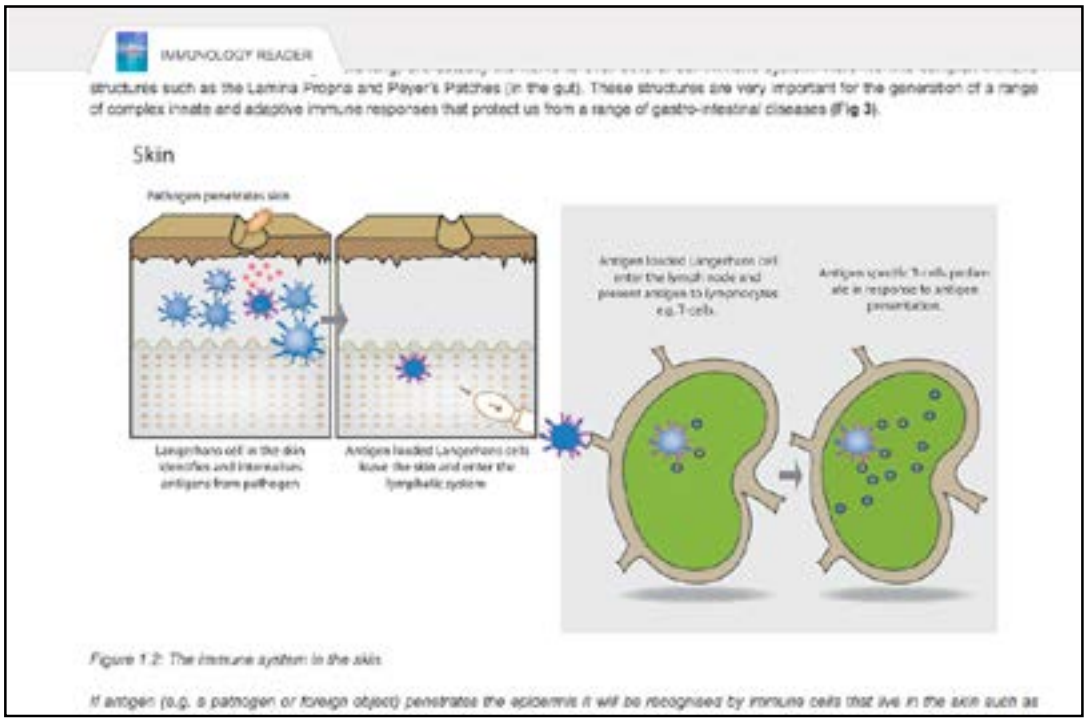


Figure 15: ELE learning resources

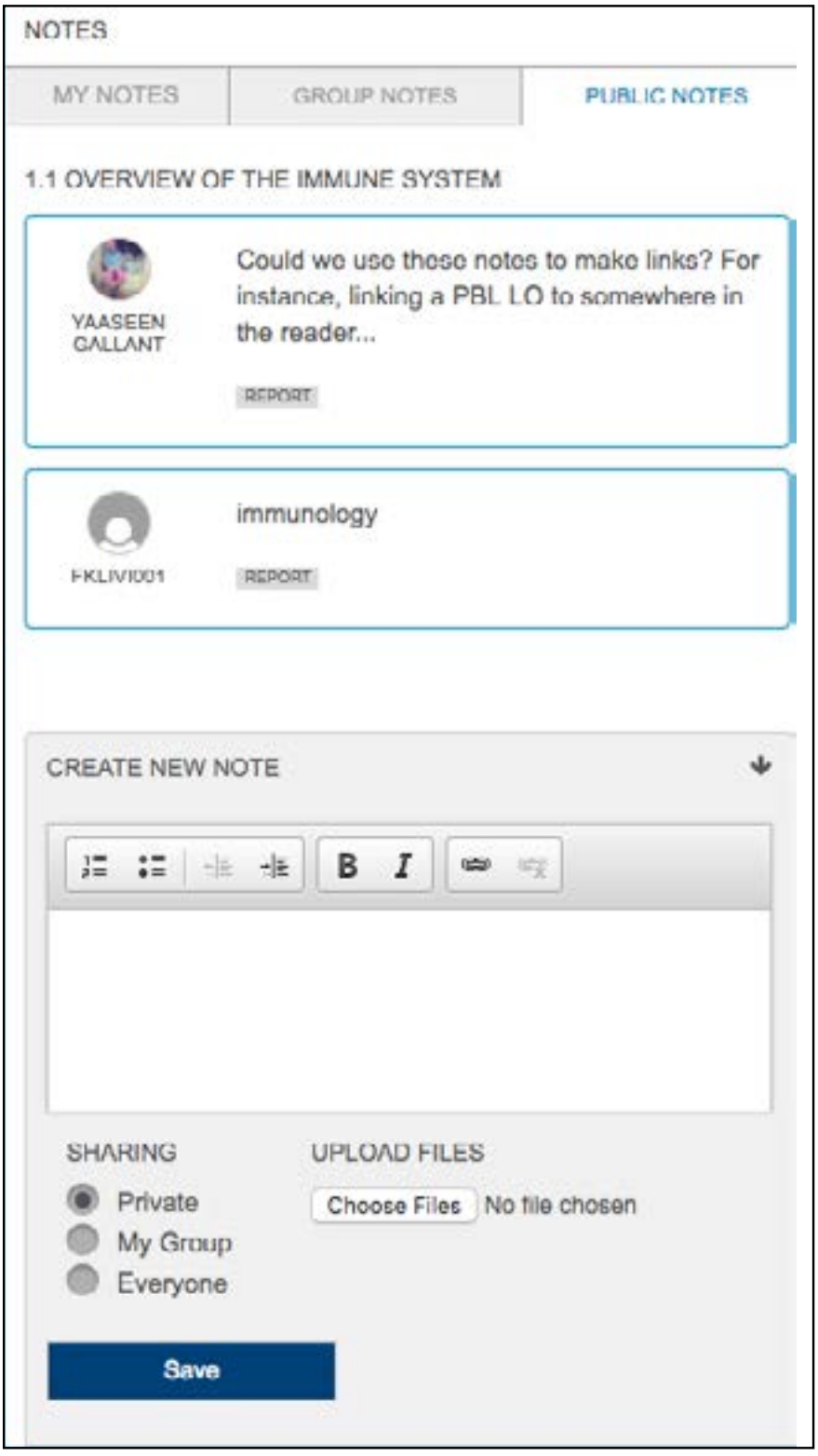


Figure 16: ELE notes

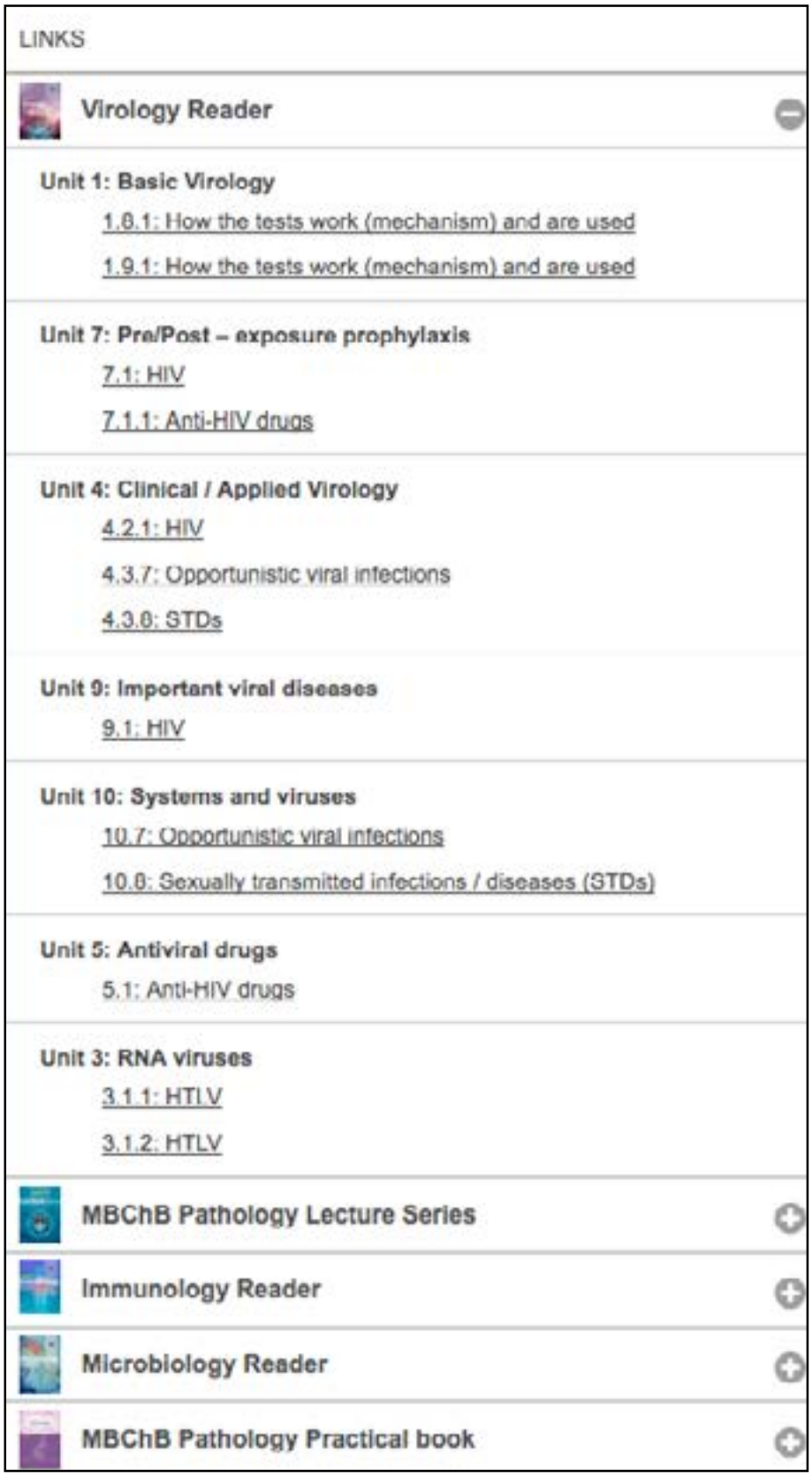


Figure 17: ELE links

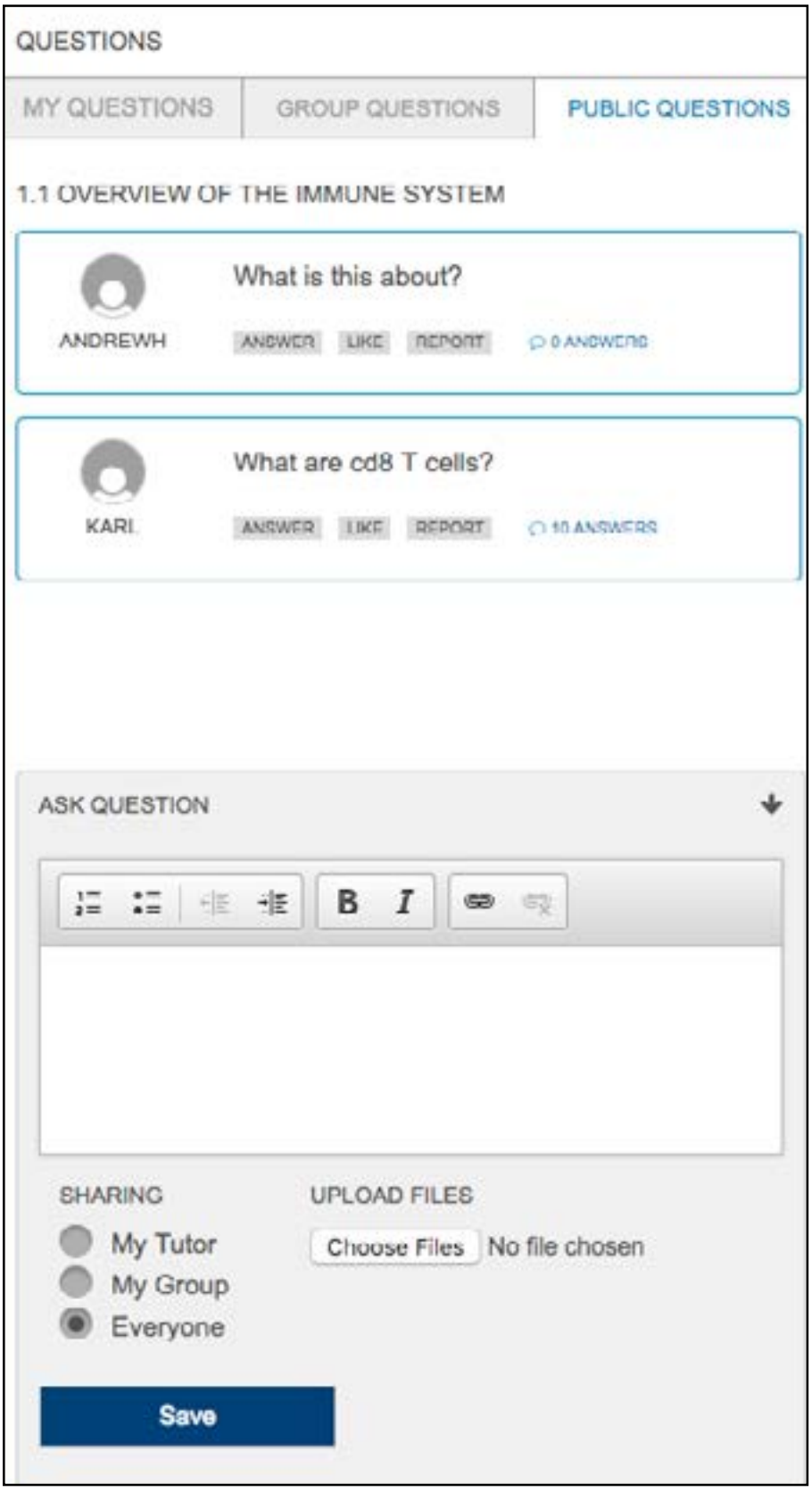


Figure 18: ELE questions

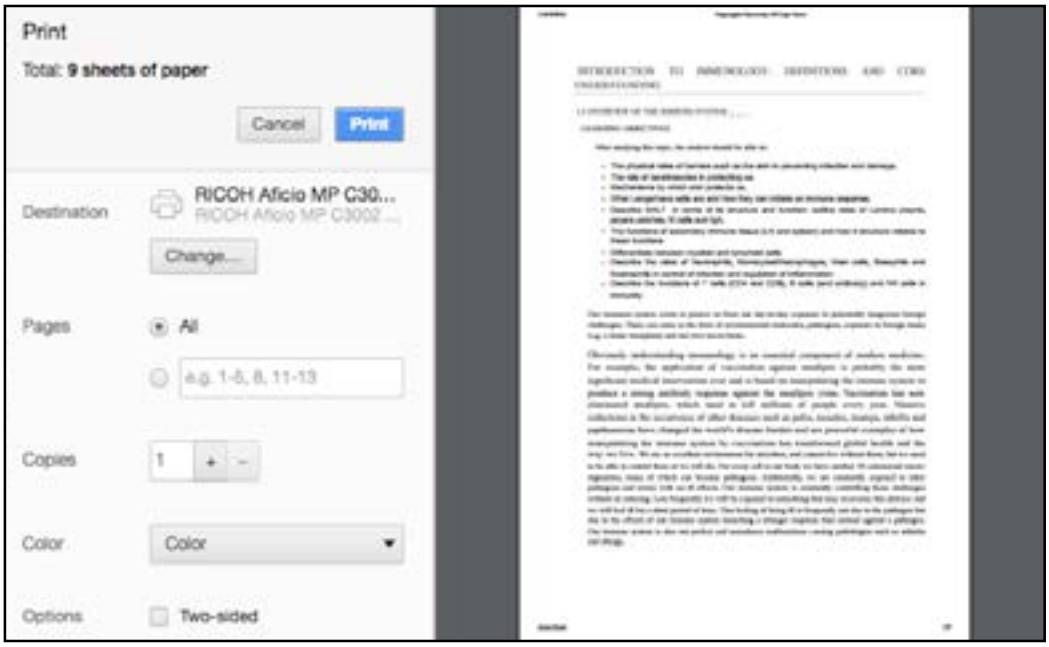


Figure 19: ELE printing

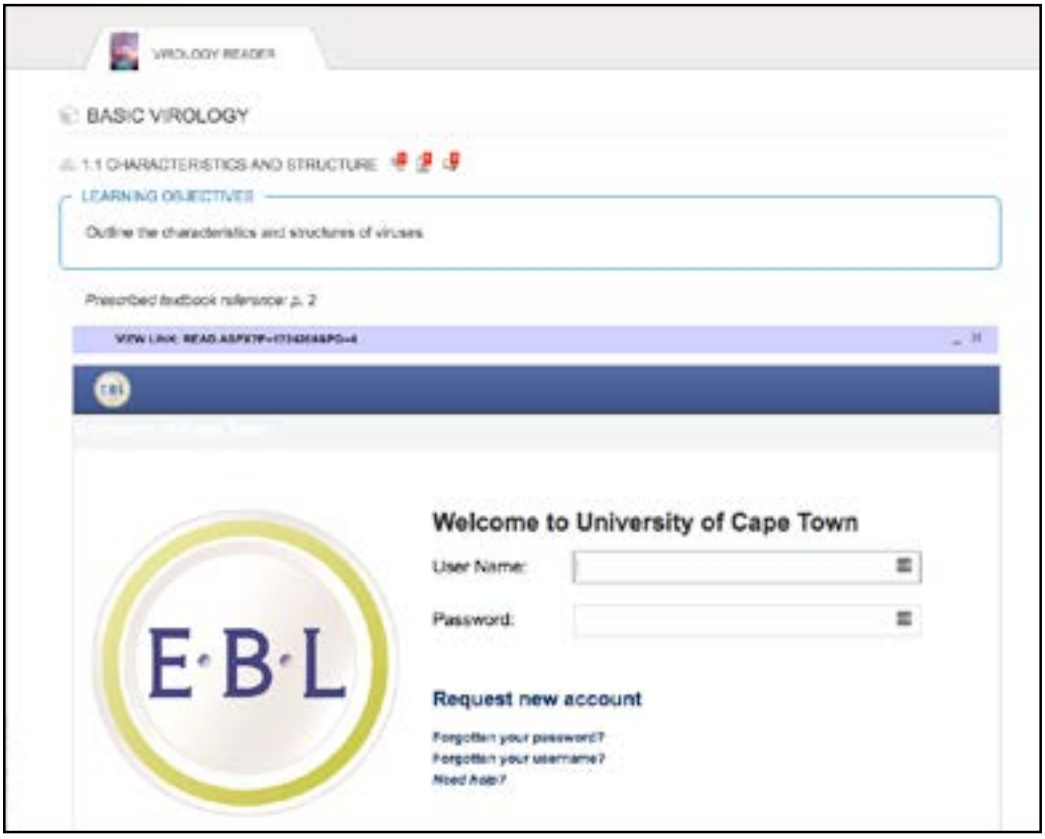


Figure 20: ELE link to e-book

Figure 21: ELE animations and sections

THE STRATEGY

How will we promote the service?

EDGE has established relationships with key individuals in private and public higher education institutions. In private higher education institutions, these individuals have frequently emerged out of public higher education institutions. At its core, this business opportunity is centred on relationships, as well as on mutual trust. It entails working closely with these institutions, and providing them with assurance that their academic and financial integrity will be upheld.

Our plan is to expand on our 'beachhead' project at the University of Cape Town's Faculty of Health Sciences. Over the past three years, EDGE has worked in partnership with the Department of Pathology. During this time, we have successfully developed seven e-readers, as well as three teaching and learning areas. This project was piloted with the department's fourth-semester students, during the second semester of 2016. It also formed part of an academic research project undertaken by the company's founder, Andrew Hibling. The preliminary data has been advantageous. As such, the promotional plan involves securing another department. EDGE is currently in the process of negotiating with the Department of Human Biology – their Embryology e-reader is being used as a demonstration of proof of concept.

Our strategy is ultimately to pursue departmental promotion. The organisational structure of universities includes the senate, council, and leadership team, who together comprise the university leadership. Curriculum management is structured according to faculties, departments and committees. Our strategy is to drive promotion at both the leadership level, with the Vice Chancellor and Financial Director, as well as at the curriculum level, with the Deans of Faculties and Heads of Departments.

Promotion will revolve around the UCT beachhead, and will primarily rely on word of mouth (WOM) promotion. This will be supported by public relations (PR) initiatives utilising thought leadership pieces, in addition to representations at educational conferences, and networking events for industry professionals. These initiatives will be further supported by the relevant promotional material. Customer relationship management (CRM) is the cornerstone for maintaining positive momentum.

- PR retainers
- Communications
- Graphic design and printing
- Travel expenditure

How will we distribute the service?

A sales force will be needed, in order to acquire leads. Furthermore, due to the nature of the proposition, we will require industry experts. By engaging with our network of associates, we aim to actively promote the concept – namely, enabling universities to publish their existing learning resources, in order to facilitate off-campus teaching and learning, and thereby increase their student numbers.

How will the service be structured, contractually?

The core service comprises multiple different areas. These include the following:

1. Publishing services
2. New resource development services
3. Platform services

Publishing services

Our publishing services consist of the following elements and sub-elements:

1. Management
    - Regular update meetings
    - Regular scoping meetings
    - Development and management of timelines
2. Curriculum design
    - Establishing a sound pedagogical discourse for the offering
    - Developing and managing outlines
    - Establishing and mapping learning objectives
    - Classifying and tagging content and learning objectives
    - Setting up the CMS – learning areas, units, sections, subsections etc.
3. Instructional design
    - Capturing learning resources
    - Styling learning resources
    - Capturing links
    - Capturing resources, images and videos
    - Building and developing quizzes in HTML5
    - Building and capturing interactive quizzes in HTML5
    - Converting PowerPoint slides to PDFs
    - Converting existing HTML resources
    - e-book inclusion
    - Layout
    - Cover design
    - Layout of content for extracted PDFs
    - Managing images
    - Managing print readiness
4. Media bugs and corrections
    - This relates to any errors within the existing media, which is captured in the CMS and displayed in ELE or other formats.
    - This excludes EDGE creating new media, or EDGE providing services related to additional media – only minor changes and corrections.
5. Media backups
    - EDGE will ensure that all client resources are backed up to a specified site, on a weekly basis.

New resource development services

Our new resource development services consist of the following elements and sub-elements:

1. Management
    - Regular update meetings
    - Regular scoping meetings
    - Development and management of timelines
2. Images (as per below matrix)
    - Image brief
    - Research
    - Development
    - Revisions
    - Rendering

No. of images (Total)	Standard (ZAR)	Medium complexity (ZAR)	Complex (ZAR)
10	700	800	900
20	650	750	850
21–50	600	700	800
>50	550	650	750

Table 5: New resource development services – images

3. Videos/animations (as per below matrix)
    - Concept design
    - Script development/storyboarding
    - Style design
    - Animation
    - Review/revisions
    - Rendering
    - Management

Minutes (Marginal)	Standard (ZAR per minute)	Intermediate (ZAR per minute)	Advanced (ZAR per minute)
Minutes 1–10	2 500	5 000	10 000
Minutes 11–20	2 000	4 000	8 000
Minutes 21+	1 700	3 500	5 250

Table 6: New resource development services – videos/animations

- These are estimated prices, and subject to change. They are influenced by the complexity of the subject matter, as well as by the selected production values, including the following:
    - Type of animation selected
    - Screen recordings
    - Voiceovers
    - Motion graphics
    - Live camera shooting
    - Voice recording
    - Custom imagery

Platform services

Our platform services consist of the following elements:

1. *CMS – Access:* The EDGE CMS is made available to the education provider, so that the media can be updated by the users. Once the media has been updated, it can be extracted and updated on ELE.
2. *ELE – Access:* EDGE provides ELE access to students. Students' login details are transferred directly from the education provider's platform to ELE.
3. *CMS and ELE – Bugs:* This allows media to be captured, edited or changed in the CMS or ELE.
4. *CMS and ELE – User management:* This allows additional users to be added, passwords to be changed, or user rights to be revoked or changed.
5. *CMS and ELE – Updates and upgrades:* This allows updates and upgrades to be made to the system. The CMS or ELE will not be available for use during this time.

What is the financial model?

Heading	Case 1	Case 2	Case 3
Student intake for the first year	2 000	1 000	1 000
Average credit value per learning area	20	20	20
E-reader resources as a percentage of the credit value	40%	40%	60%
E-reader text/digital resources split	60%	60%	80%
Text learning resource density (pages per credit)	10	10	12
Percentage of text resource held by the education provider	80%	80%	90%
Digital learning resource density (minutes per credit – minutes also apply to images)	10	10	5
Percentage of digital resource held by the education provider	50%	20%	60%
Total publishing cost per page of text media	R 100.00	R 100.00	R 80.00
Total publishing cost per minute of digital media	R 1 000.00	R 1 000.00	R 1 000.00
Average cost per page of new text media	R 500.00	R 500.00	R 200.00
Average cost per minute of new digital media	R 4 000.00	R 4 000.00	R 3 000.00
Platform service absorption cost per e-reader	R 20 000.00	R 20 000.00	R 20 000.00
Total number of pages of text learning resources per e-reader	48	48	115.2
Total number of minutes of digital learning resources per e-reader	32	32	12
New text media required	9.6	9.6	11.52
New digital media required	16	25.6	4.8
Total new media cost per e-reader	R 68 800.00	R 107 200.00	R 16 704.00
Total publishing cost per e-reader	R 19 840.00	R 10 240.00	R 15 494.40
Total platform absorption cost per e-reader	R 20 000.00	R 20 000.00	R 20 000.00
Total cost per e-reader	R 88 640.00	R 117 440.00	R 32 198.40
Markup	200%	300%	200%
Selling price per e-reader	R 177 280.00	R 352 320.00	R 64 396.80
Percentage per e-reader as lump sum payment/deposit	20%	10%	10%
Lump sum fee per e-reader	R 35 456.00	R 35 232.00	R 6 439.68
Amount to be amortised	R 141 824.00	R 317 088.00	R 57 957.12
Number of months of use by a student	12	12	12
Cost of capital	8%	8%	8%
Monthly recurring fee per e-reader	R 18 819.34	R 42 076.00	R 7 690.62
Monthly student fee per e-reader	R 9.41	R 42.08	R 7.69

Table 7: Financial model

What are the costs, markups and pricings?

EDGE's financial model provides that the services are costed according to the specifications. These, in turn, are based on the amount of publishing and new media services required. A cost for the platform services is absorbed into this amount, to arrive at a total cost per unit or e-reader. A markup is then applied to this overall cost.

Remittance is based on a lump sum cash payment, which can be staggered on the development milestones. The balance is then amortised over the life of use of the learning resource. This results in a monthly fee – either per student or per e-reader. Services are typically divided into staggered lump sum payments (based on the project specifications and development milestones), recurring monthly payments, and/or ad hoc payments.

A quote is provided according to the number of existing resources to be published, and/or new resources to be created. This can be seen in Case 3 of Table 7: Financial model. The service for publishing and creating media for a 115-page e-reader, at a 200 per cent markup, is R 64 396.80 – depending on the complexity of the desired resources. This will be settled upon completion of the project – i.e. a lump sum payment of R 6 439.68. The relevant education provider will be charged R 7.69 per month, per student using the e-reader.

What is the sales forecast?

	January 2017	February 2017	March 2017	April 2017	May 2017
Number of departments within faculties	1	2	2	3	3
Average number of e-readers per department	9	5	5	5	5
Total number of e-readers	9	10	10	15	15
Average price per e-reader	R 64 396.80	R 64 396.80	R 64 396.80	R 64 396.80	R 64 396.80
Lump sum payment of 10%	R 57 957.12	R 6 439.68	R 57 957.12	R 38 638.08	R 57 957.12
Monthly fee per e-reader	R 7.69	R 7.69	R 7.69	R 7.69	R 7.69
Monthly revenue based on average of 1 000 students per e-reader	R 69 215.59	R 76 906.21	R 76 906.21	R 115 359.32	R 115 359.32

Table 8: Sales forecast January–May 2017

How will we manage our cash flow?

EDGE will finance this service through operations. Cash flow is project-based and ring-fenced. Quotes are provided for projects upfront, and payment is staggered. While customer acquisition costs are low, the sales cycle is long. Overall, our costs are low and sunk. Each project requires investment in human resources; however, these can be scaled through existing internal staff, as well as freelancers and independent contractors. Overall, our revenues and margins are attractive.

What does the production cycle look like?

End-to-end, it takes an average of three to six months to produce an e-reader, depending on the project specifications and complexity. Both circulation and planning account for a large period of time – the cycle is normally one month. Organising and publishing existing resources is also time-consuming; because quality is paramount, it necessitates rigorous checking and rechecking of resources. From a time-based perspective, new media is the most heavily weighted variable: the more animations, images, artefacts etc. required, the longer the production cycle. The process of linking and building learning opportunities around the learning resources occurs at the end of the cycle. However, because the project is dynamic in nature, additional learning resources or learning opportunities can be added to the e-reader at any time.

What is the proposed location?

EDGE has established offices in both Cape Town and Durban. However, because customers and competitors are primarily located in Gauteng, we will need to establish a new office. This will be initiated together with a sales manager. This location is an important aspect of the managed service, as customers are often required to meet with instructional designers in person. Pretoria is the preferred location.

The team consists of a lead project/product manager, who is responsible for managing the expectations of the customer. He/she is supported by academic content specialists, instructional designers, layout designers, and editors. Workflow is managed within each of these teams. It is the responsibility of the project manager to ensure that the workflow is coordinated and managed within these support teams.

What are the legal implications?

EDGE possesses a full set of contracts for the different services. All copyrights to learning resources already owned by the education provider remain with the education provider; moreover, all copyrights to new media created by EDGE are assigned to the education provider. All rights of ownership and copyright to EDGE's system – including the CMS and ELE – remain the property of EDGE. All respective trademarks remain the property of their respective holders.

Are the suppliers independent contractors?

EDGE utilises the services of many independent contractors, including authors, academic content specialists, editors, instructional designers, and more. This is reflective of standard industry practice.

How will we expand the opportunity?

Within the South African market, our plan is to expand department by department, faculty by faculty, and university by university. We also plan to extend the model to the corporate market.

What are the risks and rewards?

The risks include the deployment of resources for services with little recurring income per unit. In addition, the publishing process is heavily dependent on human resources.

The rewards include a per-student annuity income. The education provider will be charged a platform fee for each student. This model allows EDGE to penetrate the public higher education space.

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