

Technological literacy and reflection in the classroom

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Abstract

In this article we take a theoretical model that describes technological literacy as being enacted by individuals in the course of shaping their lives and the world around them and explore how it is possible to develop meaningful and effective educational classroom activities that intertwine capabilities with technological processes in authentic situations. Technological literacy involves the enactment and shaping of the technological process in such a way that enactment successively recognises the original need as well as a shared purpose and potential consequences – an action that we argue to be *reflective*, or mindful, in nature. We suggest that two elements of knowledge can be identified as goals for technology education. Firstly, a basic understanding of technological processes, a capability to orient in the landscape of relevant knowledge, and the knowledge contexts of what the process is about. Secondly, reflection on process development, (shared) purpose, underlying needs, necessary competence, consequences, and personal engagement intertwined with enactment. Here the notion of reflection-in-action as the manifestation of a mindful relationship between experience and enactment can be seen as driving the technological process. We argue that the ultimate and proximate purposes of teaching are useful constructs for discussing the constitution of continuity between objectives in classroom activities. An analysis of data from a Swedish technology education classroom is used to illustrate the argument developed. The article concludes by suggesting that focus must be centred on what activities are meaningful – and as far as possible authentic – for pupils as aims for learning.

Extended Abstract

Just what it means to be “technologically literate” continues to be the subject of debate amongst researchers and practitioners (Barnett, 1995; Devon & Ollis, 2007; Kahn & Kellner, 2005). As a contribution to this debate, we recently developed a theoretical model that describes technological literacy as being enacted by individuals in the course of shaping their lives and the world around them (Ingerman & Collier-Reed, 2011). At the heart of this model are two interrelated elements: the potential for, and enactment of, technological literacy. The model suggests that that *enactment* and *potential* mutually constitute each other.

One of the fundamental assumptions of this model is that the ultimate goal of technology education (i.e. technological literacy) cannot be understood as a stand-alone capability. Rather, it must be understood as intertwined with technological processes in authentic situations – something that is often considered difficult to achieve in classroom settings. In this article we explore, theoretically as well as empirically, how it is possible develop meaningful and effective educational activities to achieve this goal.

Education for technological literacy

Technological literacy involves the enactment and shaping of the technological process in such a way that enactment successively recognises the original need as well as a shared purpose and potential consequences. To allow for the flexibility and openness implied in the process, there must also be a mindfulness (Mortari, 2012, p.528) of the people involved as well as the possibilities of further enactment shaping the process. Another way of describing such actions would be that they are *reflective*, or mindful, in nature.

Two elements of knowledge can be identified as goals for technology education in general. The first relates to a basic understanding of technological processes, a capability to orient in the landscape of relevant knowledge, and the knowledge contexts of what the process is about. The second focuses on the reflection on process development, (shared) purpose, underlying needs, necessary competence, consequences, and personal engagement intertwined with enactment. In this case, the notion of reflection-in-action (Schon, 1984, p.69) as the manifestation of a mindful relationship between experience (in a phenomenographic sense, as perceived by different individuals and communicated in enactment) and enactment can be seen as driving the technological process. Mindfulness is then understood as a *quality* of the experience-enactment relationship – in the phenomenographic sense. It suggests a simultaneous awareness of experience and enactment, which may be understood as different dimensions in relation to the technological process as a phenomenon in the world.

It is the identification of elements of individual knowledge on which technological literacy hinges. There is potential for developing such individual knowledge as an integrated part of technological literacy participation, but at the same time, school can (and we argue, should) attempt to foster such potential on the way towards ‘effective’ technological literate participation. At the same time we must recognise that school activities are rarely authentic technological processes.

Activities with purpose

The ultimate and proximate purposes of teaching are useful constructs for discussing the constitution of continuity between objectives in classroom activities. We suggest that they may be useful in helping to be explicit about the relationship between the target capability and the context of activities constituting relevant variation – we must recognise the pedagogical layer in the classroom technological process as explicit, and not just as a by-product (Booth, 1992). If we want learning to take place, with all good intentions of the teacher, the technological process as enacted is different to that in an environment where the focus is on the solution of a problem – the focus of a professional. This can be understood both in terms of ultimate/proximate purposes, as well as variation theory principles.

Variation theory suggests that in order to develop the possibility of seeing a particular meaning in a phenomenon it is necessary to grasp that phenomenon both as a whole and in terms of its constitutive parts – sometimes denoted its critical aspects. The principle idea of variation theory design of teaching and learning is to give systematic attention to variation, critical aspects and the emerging meaning.

An empirical analysis of video data collected from a Swedish technology classroom suggests that the proximate and ultimate purposes associated with a ‘bridge building’ technological process were universally not visible to the pupils. One of the groups was dominated by a single individual and in this case a mindful awareness was not evident in their interaction with the

process. There was little evidence of reflection taking place on the possibilities of further enactment shaping the process. This situation can be contrasted with a group that considered many alternatives. The data suggest however that these pupils were not capable of enacting a decision – and were thus not considerate of the time and other constraints of the technological process. However, in a limited way they did arguably realise potential that may build towards the target capabilities that otherwise would not have been the case.

This outcome of this article presents an empirical response to the dimensions of our model developed earlier as represented by reflection, mindfulness, the basic epistemological nature of processes, and various knowledge contexts. It also suggests that focus must be centred on what activities are meaningful – and as far as possible authentic – for pupils as aims for learning.

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