

TEACHING AND LEARNING WITH NEW TECHNOLOGY - A TOUGH NUT TO CRACK

Jacqueline BATCHELOR¹, Marlien HERSELMAN², John TRAXLER³

¹University of Pretoria, Groenkloof Campus, Pretoria.0001, South Africa

Tel: +27 83 616 0948, Email: jacqueline.bathcelor@gmail.com

²Meraka Institute, Building 43, CSIR, Meiring Naude St, Pretoria, 0001, South Africa

Tel: +27 82 809 4319, Email: mherselman@csir.co.za

³University of Wolverhampton, Wulfruna Street, Wolverhampton, WV1 1SB, UK

Tel: +44 1902 518591, Email: john.traxler@wvl.ac.uk

Abstract: Preparing learners for the demands of the 21st century requires dedicated, innovative teachers willing to push existing boundaries. It is also about exploiting the affordances of emerging technologies to enhance teaching and learning strategies. The unique and rapid changes occurring in this field present various problems for teachers who are willing to experiment with teaching and learning, raising questions of ownership, accountability, roles and responsibilities, learning spaces and situations, patterns of interaction, strategies and theories, as well as, modes of assessment [1]. A conceptual framework is presented that draws on tenets from socio-cultural theory, critical philosophy, emerging technology and teaching and learning theory and aims to support theory development to better our understanding of the factors influencing the pedagogical reasoning of teachers.

Keywords: Innovative, pedagogy, emerging practice, new technologies, teaching and learning, conceptual framework.

1. Introduction

Integrating technology in education is a complex issue taking many forms that differ in purpose. This can range from replicating existing educational practices through digital media with technology as tools, to transforming education to bring about new learning goals. New teacher knowledge and skills development relating to the use of technology in the classroom can also bring about change [2]. It is the task of teachers to grapple with the technology at their disposal and to grow their learners to acquire “*skills of the 21st century*”. Often these new practices are not well articulated and their consequences are not well understood or are transferred to differing contexts. The field of pedagogy has become complicated and teaching with technology been labelled as a “*wicked problem*” [3]. This ‘*problem*’ is not without solutions as teachers experiment with new technologies in the classroom and creatively engage in contemporary activities to explore temporary solutions in their practice. However, they struggle to articulate and communicate their newly gained tacit knowledge and therefore a conceptual framework is presented to construct a coherent account of their experiences with the potential to aid theory development.

2. Emerging field – Voice of the Teacher

A new research field has opened up recently, conceived by the International Association for Evaluation of Educational Achievement (IEA) Second International Technology in

Education Study (SITES) module 2 projects. This new research area has been called the “*Emerging Pedagogical Practices Paradigm*” (EPPP) [4]. During the SITES module 2 studies, schools were selected based on their *Innovative Pedagogical Practices using Technology* (IPPUT) and data collected during this study informed and helped sculpt the parameters of this emerging field.

In the current literature, the voice of the innovative practitioner teacher in a developing country is barely audible. This voice is rich in practice and experience and can aid us in our understanding best practice models. Personal theory/knowledge is created by experienced practitioners who test information through practice, reflect on its worth, and either integrate it into their actions and thoughts, or reject it [5]. This valuable learning process of knowledge creation aligns with the three intellectual traditions of the Emerging Pedagogical Paradigm (EPPP) namely:

1. Lifelong learning, leading to autonomous learning;
2. Constructivism, emphasising collaborative learning, real-world projects with authentic assessments with students accepting responsibility for their own learning;
3. Information literacy, especially the gathering and analysing of information.

Up to now, the EPPP has addressed many requirements of the knowledge society; however, there is much work still to be done in the full range of knowledge-based skills. Little is understood of the conceptualisation of the teacher who has not yet been integrated into this paradigm when initially entering this environment. Essential skills, such as deep understanding, critical thinking and high-performance learning, still need to be fully understood in their relation to technology use in the classroom and beyond. It is necessary to explore practical dimensions of this field to aid future teacher training and development.

3. Practice to Theory

Theory has to follow practice to enable the growth and maturation of a field still in its infancy. Theory can offer coherent explanations of learning activities and practice. It is time to move from largely practice-based models and begin to generate theories that cover the use of emerging ICT's in teaching and learning, and how it can contribute to the field of an “Emerging Pedagogical Practice Paradigm” from the teachers’ perspective.

There have been numerous attempts to advance from the theoretical perspectives of working with technology in the educational environment without much success [6, p.9]. Selwyn postulates avoidance and mistrust in advancing theoretical approaches when formulating a research direction on the role of “*new*” technology in education, and he redirects prospective research to seek out a more balanced angle and to move away from the more extreme utopian outlook as characterised by recent research agendas.

Reticence in reflecting on “*negative or less successful aspects of educational technology has long been seen as fundamentally restricting the field*” [6, p.9]. Selwyn calls for the adoption of a more objective air in academic engagement with educational technology, and encourages the asking of awkward questions in order to highlight both the advantages and disadvantages of engaging ICT's in education. He suggests a re-evaluation of the framing of educational technology research, and to reflect a more theoretical perspective in the formulation of research questions.

Serving similar notice, Bridget Somekh [7] cautions that without evidence of new ways of doing things, primarily regarding technology in education, and that a “*distinct lack of imagination can result in fossilised patterns*” being reinforced. These patterns refer to embedded cultural orientations and structures of power and authority that are involved in drafting policy and putting practice into effect. This resonates with a warning from De Bono stating: “*Culture is concerned with establishing ideas. Education is concerned with communicating those established ideas. Both are concerned with improving ideas by bringing them up to date. Problems arise when new information can only be evaluated*

through and old idea. Instead of being changed the old idea is strengthened and made ever more rigid.” [8, p. 9]. It is therefore important to take note of the voice within developing countries and of the ideas originating in teaching with technologies and to recognise the powerful influence that context and culture exert when researching teachers’ innovative use of technology, and to resist superimposing existing patterns of development or agendas with a Eurocentric research perspective. This will offer an opportunity to develop new theory, and not simply to strengthen existing models.

4. Proposed Conceptual Model

To reflect the call for a more theoretical approach, this study sets out to examine the background of knowledge growth in relation to innovative pedagogical practices using technology in schools, and to determine its contribution to new cognitive theory development and the implications for professional teacher development. At the heart of this investigation is the need to explore the interrelationships between practical, tacit teacher knowledge and the theory of teaching and learning with emerging technologies and the complexities of context. In order to understand the fit between these concepts the following are considered:

- Positioning emerging ICT’s in society;
- Current teaching and learning theories;
- Critical philosophy;
- Resultant knowledge creation.

In an attempt to uncover and illuminate the complexities in this field of knowledge creativity in teaching and learning with emerging technologies, a conceptual framework is put forward and illustrated in Figure 1.

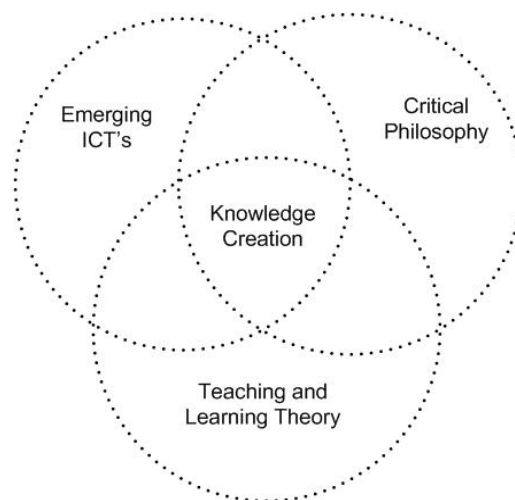


Fig 1: Factors Influencing Teaching and Learning Context

The concepts are placed in three spheres that overlap to create a new dimension. This resultant new space draws on all elements from the original spheres to inform the area of new knowledge and can be viewed alone or as part of the other overlapping spheres.

Figure 1 draws on the conceptual model proposed for this study based upon Gardiner’s global model called the ‘Three Interfaces of Adam’[9]. In this model he postulates three dimensions of existence: the natural world or *ecosphere*, other people or the *sociosphere*, and man-made things the *technosphere*. These spheres, or dimensions, overlap, and tensions created at the intersections of the spheres give direction to future trends.

We are currently in an industrial society, but we are rapidly moving towards a more post-industrialized society dominated by knowledge workers [10], resulting into a technosphere that is muscling in on the other dimensions with consequences for the

remaining spheres [11]. In this study, the ecosphere can be likened to the critical philosophy creating the environments that inform decisions and actions, the sociosphere to the learning surroundings and the technosphere to the emerging ICT's. As these come together in a shared space and influence each other, the dynamic interchange leads to new knowledge creation.

Separating these three concept spheres (emerging technologies, teaching and learning theories and critical philosophy) is an analytical endeavour and one that is difficult to accomplish in practice. These components exist in a state of dynamic equilibrium. The philosopher Thomas Kuhn [12] proposed, in a different context, a state of "*essential tension*". The dynamic interplay between these three concept spheres emphasizes connections among knowledge bases and the dominant driving force behind new knowledge creation. To unravel this dynamic interplay would require a nuanced understanding of specific context, and each should not be regarded in isolation [3] as they are interdependent. Despite the intricate dependencies within these context spheres, it is imperative to gain a better understanding of each and negotiate a shared meaning for each.

In the overlapping segment of knowledge creation, teacher knowledge reflects an intellectual richness of practical experience, and Shulman [13, p.12] comments that "*practitioners simply know a great deal that they have never tried to articulate.*" Literature suggests that teachers hold personal theories, cognitive constructs, and guiding principles that determine their instructional decisions and technology integration [14]. These decisions are often made without one being able to justify oneself to others. Rosiek and Atkinson [15] surmise that these insights will need to be translated into accessible forms to make them publicly available.

Teachers are reflective by nature and use their own systems of beliefs to pursue solutions to problems as determined by their contexts [16]. In the past, critical theory has been used to examine the ethics of educational technology in society and how ethical behaviour can actually be used to exacerbate unequal social relations, resulting in the exclusion of groups of people in the process [17]. But ethics also provide a way of thinking about and "*transforming relationship among classroom teaching and the production of knowledge*" [18, p. 35].

The concept of tacit knowledge can have liberating effects, but can easily become a thinly disguised veil for use of power. Bordum [19] calls for tacit knowledge to be made explicit, as the notion of non-communicable knowledge can pose a threat to rationality. If tacit knowledge remains encoded and inaccessible, it can lead to abusive positions of power where knowledge is withheld on purpose in order to manipulate others. Once open, however, and accessible to all, it can result in the emancipation of the teaching profession.

In this study, an effort has been made to articulate how the use of technologies can push the boundaries of established pedagogical practices. The resultant innovative practices can be categorized as technical, process-based, or the new application of an old idea [20]. Innovation is much more than a technical development, but rather a "*qualitative educational shift towards a new paradigm as a result of an ongoing process*" [21].

5. Innovation in Education

The reason for innovation given by teachers in a recent study conducted by the *Innovation Unit* [20] is the recognition of a changing landscape that learners inhabit. Teachers make a concerted response to keep pace with the demands of change. Their answer to these pressures is to adapt their pedagogy to accommodate and anticipate future demands. Technology must be well integrated to support this learning process and can equip learners with transferable skills that will maximise their opportunities [22]. Reasons for the worldwide phenomenon of integrating technologies in education in both developed and developing countries and sustained on policy level is summarised by Hinostroza *et al.*, [23]:

- ICT is an essential “life skill” in the same way as literacy and numeracy are.
- ICT provides an opportunity for economic development and is a requirement for employability.
- ICT is a tool for educational management.
- ICT is a tool that can improve teaching and learning.

Because of policy expectations, increased ICT availability, the wide range of learning activities and scenarios, the choice of ICT in the classroom are all heavily dependent on the context and affordances offered by various ICT tools.

6. Choice of ICT’s in the Classroom

Hinostroza, Labbé, López and Iost [23] surmise that there is not enough evidence to produce responsible recommendations regarding technology choices made by schools. They ascribe their reasoning to rapid changes in the availability of choices owing to either new pedagogical approaches or new opportunities arising from new technologies that are introduced in schools by management (eg. interactive whiteboards – IWB), or those being adopted by learners (eg. mobile phones). Arguments for the best technology options often change before they can be proved right or wrong [23]. Hinostroza *et al.*, [23] suggest grouping these emerging technologies, based on intention, as belonging to one of the following three groups:

- Expanding new learning opportunities (learn anywhere anytime)
- Creating new learning scenarios in traditional contexts (tools for learners that focus on improving learning in schools)
- Improving teaching and the learning process (tools for teachers focused on improving classroom teaching. [23, p 90])

Teachers make these choices from personal rules that are based on intuition, exposure and experience. Hinostroza *et al.*, [23] recognise the complexity of ICT selection and see it as being defined by a particular context, pedagogy and activities during the lesson.

Factors that need to be taken into account when teachers select technologies include:

- Level of learner/teacher competencies?
- Connectivity
- Number/variety/compatibility of tools
- Personal vs institution owned
- Timeframe – time zones
- Speed/clarity of services
- Cultural issues

7. Role of ICT’s in Education

Contemporary beliefs regarding learning have moved away from *knowledge transmission* models of simply “imparting information” to *generative knowledge* models where knowledge is negotiated between parties and transformed learning occurs [24]. In the process of meaning-making, technology is roped in to support the communication and co-construction of new knowledge resulting in new communities of practice [25]. Teachers want their learners to make their own decisions in future, enabling them to “*learn for themselves*” and to continue the trend once they leave school [26].

Law and Plomp [27] categorise the role of ICT in education as learning *about*, learning *with* and learning *through* ICT. The latter involves a full integration of ICT to bring about learning experiences that would otherwise not be possible. The implication is that there is a distinct difference between practices in which learning is merely supported by ICT to enhance existing instructional practices and learning that relies solely on the various applications used to enact teaching and learning. Another practice thrown into the mix is

when personal ICT is used to liberate learners from the limitations of their physical environments owing to inadequate infrastructure or lack of resources.

The unique and rapid changes occurring in this field presents various problems for teachers who are willing to experiment in their teaching and learning, for example questions of ownership and accountability. The concept that learning can take place at any time and at any place lead to a much broader conceptualization of computer uses in education [28]. Using ICT's inside and outside the classroom can affect roles, learning situations, patterns of interaction, learning spaces and assessment [1] and can differ across various contexts.

8. Complexities of Context

Because learning is becoming more anchored in real-world scenarios, multiple contexts encroach into the physical and virtual learning environment. This in turn leads to greater awareness of instances of inequality and injustice. Learners make comparisons with other contexts, and issues are highlighted, resulting in a greater enlightenment among learners.

Becoming more responsible for their learning directs learners towards liberating themselves from the constraints of their immediate physical environments and forces them to formulate their own solutions[29]. They become more daring in their own contexts sometimes superseding established authority owing to their proficient use, and affinity with, technology, giving them a voice on a wider platform that gain momentum as it gathers strength. A case in point is the "My community - My pride" project entry in the *Microsoft Innovative Teacher Forum Awards Competition* where learners identified contemporary problems in their own environments and used various ICT tools to devise solutions involving the broader community.

9. Conclusions

This call to advance theoretical perspectives that will deepen our understanding the uses of ICT in education resonates my desire to research, uncover and illuminate the complexities of this field of knowledge creation. Educators are central to this challenge .Every day they attempts to incorporate ICT in everyday teaching and learning.

As researchers, we cannot neglect to focus on episodes of changing pedagogical practice to suit the *'tools of our time'* as we currently have a proliferation of new ideas in the arena of ubiquitous technologies and their impact on teaching and learning theory. Instead of strengthening existing theories, as researchers we must seize the opportunity to amend the *"fossilized patterns"*, to expand and amend existing teaching and learning practices with emerging ICT's and we need to generate theories that better our understanding of this emerging field.

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