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Factors affecting teachers' use of computer technology for promoting meaningful learning

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DECLARATION

I submit this thesis in fulfillment of the requirements for the degree of Doctor of Philosophy at the University of the Witwatersrand. I declare that, apart from the assistance acknowledged, this research is my own unaided work. I further declare that I have not submitted this thesis for any other degree or examination at any other university.

_____

Ann Zeta George

22 August 2014

ABSTRACT

The research described in this thesis is a case study of the factors influencing teachers' use of computers for teaching at a private secondary school in South Africa. Two problems motivated the study. Firstly, teachers were not using ICT for meaningful learning despite the South African Education Department's emphasis on the use of ICT in education. Secondly, teachers were not coping with the demands of a new school curriculum involving innovative practices and new content. The case study school had purchased a software package for the sciences which claimed to be suitable for the new South African curriculum. The software package was evaluated as part of the study, to investigate its usefulness for supporting Life Sciences teachers to teach new content during a period of curriculum change. The study comprised two phases, one before and one after the school introduced an innovation promoting the use of ICT for instruction.

In the absence of a suitable model to underpin the investigation a literature-based mind-map was constructed to provide a conceptual framework to guide the study. An analysis of 48 papers reporting on the factors affecting teachers' use of computers led to the identification of 43 factors, which were classified into categories and sub-categories in the form of a hierarchical map showing the relationships between the factors, and providing the framework used to structure the investigation of factors. This was later developed into a holistic model showing the relationships between the factors, based on the theory of planned behaviour, but modified by the addition of knowledge and skills, which were found to influence teachers' computer usage directly, as well as impacting on teachers' beliefs, attitudes and behavioural intentions about using technology. This model could be useful for stakeholders to identify factors that could be used to promote the use of ICT in ways that benefit learning.

During the first phase factors were identified using participant observation recorded by means of a researcher's journal and semi-structured interviews with four teachers, with open-ended checklists being used for the software evaluation. Five categories of teacher-level factors (factors within teachers' control) were identified which affected their use of ICT: teachers' perceptions of the effectiveness of ICT; teachers' attitudes towards ICT; teachers' level of innovativeness; teachers' technological knowledge; and teachers' level of ICT proficiency. Five categories of institutional factors (beyond teachers' control) also emerged: the availability and accessibility of computer hardware; the availability of suitable software; the level of technical support available; the provision of training; and the amount of time available to plan for and use technology for teaching and learning. The biodiversity section of the software package purchased by the school was evaluated in terms of supporting teachers with teaching this new section of content required by the new curriculum. Five features of software design were evaluated: the extent to which the software promoted seven of the nine new classroom practices required by the new South African curriculum, the extent to which the package covered the content needed to teach biodiversity and the pedagogical strategies used to teach this content, how effectively the user interface conveyed messages to users, and the multimedia strategies used in the software package to promote effective learning. The software evaluation aspect of the study led to the development of several open-ended checklists to evaluate different relevant curriculum-related criteria, and a new model for the context-based evaluation of software which could be useful for designers of instructional software.

The introduction at the case study school of an innovation promoting the use of ICT for instruction allowed the study to enter a second phase extending the sample for investigating factors affecting ICT use, and focusing on teachers' use of computers in response to being provided with more ICT resources and being required to set computer-based tasks for learners to complete at home on dedicated technology days (*DigiDays*). During this phase multiple online questionnaires were administered to a sample of 29 teachers, semi-structured interviews were conducted, and 33 ICT-based tasks set by the teachers were reviewed using content analysis, to see whether they used technology effectively. The innovation allowed three obstacles which had emerged during the first phase of the study to be investigated in more depth. Firstly, the setting aside of time for computer-based work addressed the lack of time for using computers in lessons, mentioned by teachers during the first phase of the study, and permitted an investigation of whether this alleviated the time pressures teachers associated with using computers. Secondly, the effect of the training provided for using *Moodle* on *DigiDays* was investigated to see whether it adequately prepared teachers to use computers in ways which enhanced learning. A lack of training which met teachers' needs had emerged during the first phase as a major factor hindering teachers' use of computers. Thirdly, the influence of teachers' levels of innovativeness on their computer use outside of the mandated usage on *DigiDays* was investigated. Teachers were classified into groups based on Rogers' adopter categories (Rogers, 1962, 2003), but using additional features to just the rate of uptake of an innovation, used by Rogers. A quick and easy method involving a questionnaire and associated key for placing teachers into adopter categories was developed. This method could facilitate the classification of teachers into adopter categories and the tailoring of support aimed at promoting the rate of uptake of ICT, based on the characteristics of the different adopter groups.

Case studies of selected teachers were carried out to better understand why they were using computers in certain ways. Based on the model of Donnelly et al. (2011) the selected teachers were grouped according to whether they were using ICT for teaching in instructivist or constructivist ways, and whether or not they showed discerning use of ICT for teaching. A number of subgroups emerged, highlighting the need to understand the complex reasons underlying teachers' behaviours relating to using ICT and underscoring the importance of designing training programmes based on why teachers use ICT for teaching in a particular way.

DEDICATION

This work is dedicated to my family,

to my parents, Alan and Rayda Thompson (in memoriam), who nurtured the flame,

to my husband, Robin, for his love and support,

and to my children, Jason and Jessica, who carry the torch.

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