



Teachers in school-based technology innovations: A typology of their beliefs on teaching and technology



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ARTICLE INFO

Article history:

Received 30 December 2016

Received in revised form 17 June 2017

Accepted 20 June 2017

Available online 21 June 2017

Keywords:

Secondary education

Pedagogical issues

Improving classroom teaching

ABSTRACT

In many innovations in technology and education in secondary schools, teachers are the crucial agents of these innovations. To select, match and support groups of teachers for particular school projects, school principals could be supported with insights into teachers' beliefs about teaching, learning and technology. A teacher typology has been developed based on an online questionnaire completed by 1602 teachers from 59 Dutch secondary schools. Teachers are grouped on the basis of their beliefs about learned-centered teaching and attitudes towards technology, which underlie the school innovations that form the context of the current research. Five teacher types are distinguished: 1) Learner-centered teachers with technology, 2) Teachers critical of technology use in school, 3) Teachers uncomfortable with technology, 4) Teachers uneasy with learned-centered teaching and 5) Teachers critical of a clear-cut stance. This classification of teachers into these five types could be used to select or match the right group of teachers to a particular intervention or to organize different professional development activities for different types of school teachers.

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1. Introduction

The increasing use of technology in society in combination with attention for constructivist learning orientations requires secondary schools to change to more suitable learning and teaching practices. As a consequence, teachers have to change accordingly, whether they perceive the required change similarly or not. Often teachers are treated as objects that must be changed, instead of agents of changes in school (Hennessy, Ruthven, & Brindley, 2005; Luttenberg, Imants, & van Veen, 2013). Innovations in teaching with technology are no exception and subsequently changes in this domain have entered the school sporadically: most classroom teachers use the technology to do what they always have done and choose those activities that will help them accommodate their own perspectives on teaching and learning (Liu, 2011; Orlando, 2013). The problem seems to be how to diffuse innovations in both technology and education at the same time. The context of the study reported in this paper is an initiative of the Dutch government to enhance the use of technology in secondary schools in a more learner-

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centered way. Schools were invited to submit their proposals and 59 secondary schools received finances to develop and implement various school-based innovations on learner-centered teaching with technology. These innovations were in different phases of implementation, ranging from initial developments to continuing innovations that were tried out in earlier years. The success of these innovations heavily depended on the teachers who should apply these in their classes. Therefore, the objective of the current study is to provide a typology of secondary school teachers based on their beliefs about teaching and technology, which could provide information for selecting, matching or supporting groups of teachers linked to the technology innovations schools would like to implement.

1.1. Technology acceptance models

Given the critical contribution that teachers can make in supporting the integration of computer technology in classrooms, to understand teachers' acceptance of technology becomes crucial. The successful use of technology in teaching and learning depends on the factors that significantly influence teachers' acceptance, intention to use and actual use of technology. One of the first models that included both technological and psychological factors affecting technology acceptance was the Technology Acceptance Model (TAM; Davis, 1989). TAM proposed the perceived usefulness and perceived ease of use to be the fundamental determinants of a teacher's intention to use technology in class. Perceived usefulness refers to the degree to which teachers believe technology supports their teaching in an efficient and productive manner. Perceived ease of use describes the extent to which teachers think that the use of technology will be relatively free of effort. The TAM-model was expanded to TAM2 and TAM3. TAM2 (Venkatesh & Davis, 2000) also included aspects of social influence and TAM3 (Venkatesh & Bala, 2008) was broadened with user factors such as self-efficacy and computer anxiety. Despite all of the refinements, TAM was more technology-oriented and less user-oriented, and therefore did not take into account some crucial individual psychological factors.

The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh, Morris, Davis, & Davis, 2003) was designed by synthesizing prior technology-acceptance research. The four key constructs that influence teachers' intention to use a technology and/or technology use were 1) Performance expectancy (the degree to which using a technology will provide benefits to teachers' teaching practice), 2) Effort expectancy (the degree of ease associated with teachers' teaching with technology), 3) Social influence (the extent to which teachers perceive that others in school believe they should use technology), and 4) Facilitating conditions (which refer to teachers' perceptions of resources and support available to use technology). In UTAUT2 (Venkatesh, Thong, & Xu, 2012), the original model was elaborated with three other key constructs: 5) Hedonic motivation (fun or pleasure derived from using technology), 6) Price value (cognitive trade-off between perceived benefits of using technology and the costs for using them), and 7) Habit (the extent to which teachers believe technology use is automatic). Raman and Don (2013) applied an adapted version of UTAUT2 to preservice teachers' acceptance of Learning Management Systems (LMS) and reported weak direct and indirect effects of these key constructs on preservice teachers' use of LMS. In contrast to Venkatesh et al. (2012), Raman and Don reported large correlations between the seven key constructs which might imply problems with the construct validity of the measurement of UTAUT2 factors.

Kreijns and colleagues (Kreijns, Vermeulen, Kirschner, van Buuren, & van Acker, 2013) proposed to apply the Integrative Model of Behavior Prediction (IMBP; Fishbein & Ajzen, 2010) to explain teachers' willingness to use technology in their pedagogy. In IMBP of Kreijns and colleagues, three key constructs (Attitudes, Perceived Norm and Self-efficacy) were hypothesized to influence teachers' intentions to use technology, which, together with skills and environmental constraints, influences teachers' actual use of technology. Attitude is the general sense of favorability regarding technology use. Perceived norm is a function of beliefs about the level of expected support from stakeholders in school, the extent to which these stakeholders use technology themselves and the motivation to comply with these referents. Self-efficacy is teachers' perceived capability in using technology. Based on a review of research into technology use of teachers, Kreijns et al. (2013) concluded that IMPB provided a parsimonious model to explain factors that influence technology use of teachers. The crucial role of technology-related teacher characteristics such as attitudes, self-efficacy and social norm in the domain of teaching with technology is confirmed in several other studies (e.g., Admiraal, Lockhorst, Smit & Weijers, 2013; Ertmer, Ottenbreit-Leftwich, Sadiq, Sendurur, & Sendurur, 2012; Hermans, Tondeur, van Braak, & Valcke, 2008; Petko, 2012; Player-Koro, 2012).

What these models of technology acceptance have in common is that they try to explain teachers' adoption of technology, with a focus on technology-related factors. Yet Ertmer (1999) described two types of barriers, first- and second-order, of teaching with technology integration. First-order barriers refer to missing or inadequately provided resources such as equipment, training and support. These are usually the barriers concentrated on first in reform efforts and might be easily removed once money is provided. Second-order barriers require more fundamental changes and are typically rooted in teachers' core beliefs about teacher–student roles, teaching methods and teaching with technology. These second-order barriers include technology-related teacher characteristics as included in the technology-acceptance models as well as teachers' beliefs on effective teaching. Hermans and colleagues (Hermans et al., 2008) convincingly argue that the latter should be addressed in studies on integration of technology in schools.

1.2. Beliefs on effective teaching

The literature conveys a wide spectrum of teachers' conceptions of what constitutes effective teaching, with a teacher-centered approach focusing on knowledge transmission at one end and a learner-centered approach at the other (Alger,

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