



# Teachers' professional reasoning about their pedagogical use of technology



M. Heitink <sup>a, \*</sup>, J. Voogt <sup>b</sup>, L. Verplanken <sup>c</sup>, J. van Braak <sup>c</sup>, P. Fisser <sup>d</sup>

<sup>a</sup> University of Twente, Postbus 217, 7500 AE Enschede, The Netherlands

<sup>b</sup> College of Child Development and Education, University of Amsterdam, PO Box 15776, 1001 NG Amsterdam, The Netherlands

<sup>c</sup> Department of Educational Studies, Ghent University, Henri Dunantlaan 2, B9000 Ghent, Belgium

<sup>d</sup> National Centre for Curriculum Development, PO Box 2041, 7500 CA Enschede, The Netherlands

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## ABSTRACT

This study focused on teachers' reasoning about the use of technology in practice. Both teachers' professional reasoning and their technology use were investigated. Through video cases, 157 teachers demonstrated their technology use in practice and commented on the reasoning behind their actions. Results show that most technology use was intended to strengthen both pedagogy and subject matter, or else pedagogy alone. Reasons addressed making learning attractive for students, realizing educational goals and facilitating the learning process. The majority of teachers' technology use in practice shows aspects of the knowledge transfer model of teaching. Most technology tools were used to support a learning activity; the use of technology was essential in only a few video cases. About half of the video cases showed alignment between reasoning and practice. The results contribute to better understanding of how teachers reason professionally about their technology use.

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## 1. Introduction

Given the vast development of technological applications, education cannot ignore the use of technology for teaching and learning. However, using technology in education is not easy for most teachers, as it often implies organizational changes (e.g., time- and place-independent learning, tailored instruction, etc.) and changes in the way educational content is offered to students (Voogt, 2008). These changes require teachers to implement new teaching and learning practices (Mishra & Koehler, 2006; Voogt & Pareja Roblin, 2012; Webb & Cox, 2004).

The way teachers cope with new teaching and learning practices depends on how they reason about their professional work (Brown, 2009). Therefore insight into teachers' reasoning is needed in order to understand their teaching practices (Meijer, Zanting, & Verloop, 2002). Teachers' reasoning is based on their knowledge, beliefs and experiences (Sang, Valcke, Van Braak, & Tondeur, 2010; Van Driel, Verloop, & De Vos, 1998). Although ample research has studied the impact of teachers' knowledge (e.g., Kafyulilo, Fisser, Pieters, & Voogt, 2015) and educational beliefs (e.g., Ertmer, 2005; Prestridge, 2012) on their use of technology in teaching and learning, little is known about the professional reasoning teachers rely

\* Corresponding author.

E-mail address: [m.c.heitink@utwente.nl](mailto:m.c.heitink@utwente.nl) (M. Heitink).

on regarding their use of technology within their pedagogical practices. Therefore, the purpose of this study was to understand teachers' reasoning about the way they use technology within their pedagogical practice.

## 1.1. Theoretical underpinnings

### 1.1.1. Teachers' professional reasoning about technology

Teachers' reasoning about the use of technology in their practice stems from their professional knowledge (Webb & Cox, 2004). Teachers' professional knowledge, also referred to as practical knowledge (Meijer, Verloop, & Beijaard, 1999), is defined as 'the knowledge and beliefs that underlie his or her [teacher] actions' (p. 60). Professional/practical knowledge is related to context and content, based on formal knowledge and beliefs about technology and education, and develops through (reflections on) day-to-day experiences in the field (Van Driel et al., 1998; Voogt, Fisser, Tondeur, & Van Braak, 2016).

Meijer (1999) identified eight categories of practical knowledge on which teacher decisions and the professional reasoning supporting those decisions are based. These categories cover teachers' knowledge about (1) the subject/domain, (2) student characteristics, (3) learning processes and conceptualizations, (4) educational goals, (5) the curriculum, (6) instructional techniques and (7) interaction. Studies in the field of technology have identified similar categories of professional reasoning and knowledge. For example, Niess (2011) mentioned knowledge about instructional techniques and representations for teaching and learning a certain subject. Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur (2012) found that the reasons teachers gave for using technology were related to the desire to enrich or supplement the existing curriculum and to provide a different pedagogical approach. Furthermore, Akgun (2013) emphasized that effectiveness, efficiency and attractiveness are key components in fostering student learning goals, student achievement and the appeal of the learning process. Teachers' professional reasoning should incorporate at least one of these components to accomplish successful technology use in practice.

Mishra and Koehler (2006) introduced Technological Pedagogical Content Knowledge (TPACK) as an important element of teachers' professional knowledge when they intend to incorporate technology within their educational practice. TPACK assumes that technological knowledge should be an integrated part of pedagogical content knowledge. This means that teachers need more than basic technological skills to be able to use technology to strengthen their pedagogical approach when providing subject-matter instruction to students with different interests and capabilities. Having TPACK helps teachers to select appropriate technologies that fit with the pedagogy and content in a specific context. Irrelevant use of technology and use of technology that has a poor fit with the pedagogy and subject matter can lead to negative learning effects (Webb & Cox, 2004).

### 1.1.2. Teachers' technology use in educational practice

In line with the underlying ideas of TPACK, teachers who use technology successfully in their teaching need to be able to 'fit' pedagogy, content and technology. Britten and Cassady (2005) argued that an important aspect of this 'fit' also relates to the necessity of using specific technologies to realize specific learning goals. They proposed a continuum representing the extent to which teaching practice depends on the technology application. In this continuum, 'non-essential use of technology' refers to learning activities that do not depend on the selected technology. 'Supportive use of technology' means that the technology application supports the implementation of the learning activity, but is not essential for achieving the intended learning goals. The use of technology is called 'essential' when the learning activity cannot be carried out without the technology application. An important aspect of teachers' professional knowledge regarding technology use is to know whether and how the technology applications they select are essential or at least supportive for realizing the goals in a particular learning activity.

This fit is demonstrated in the (technology-rich) learning activities that teachers develop. Based on their professional knowledge, teachers develop learning activities that are oriented more toward either transfer or construction of knowledge (Ertmer & Ottenbreit-Leftwich, 2010; Tondeur, Hermans, Van Braak, & Valcke, 2008; Niederhauser & Stoddart, 2001). Research shows that it is not the isolated learning activity that affects learning, but the way the teacher structures learning activities in a learning environment (Lai, 2008; Voogt, 2008). Learning environments that incorporate technology can be characterized by: the role of technology, curriculum characteristics, class organization, teacher and student roles, control of the learning activity, and organization of assessment and feedback (Ertmer et al., 2012; Kozma, 2003; Lai, 2008; Voogt, 2008).

## 1.2. Research questions

In this study we argue that the educational use of technology concerns not only teachers' actual use of technology in the classroom but also the underlying professional reasoning. This study addresses the following research question and sub-questions: *How do teachers reason about the use of technology in their pedagogical practice?*

1. *How do teachers reason professionally about their use of technology?*
2. *How do teachers use technology in their pedagogical practice?*
3. *To what extent is teachers' professional reasoning aligned with their use of technology?*

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