Technological pedagogical content knowledge in teacher education: in search of a new curriculum

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BRIEF REPORT

Technological pedagogical content knowledge in teacher education: in search of a new curriculum

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The aim of this study was to explore the ways in which teacher education institutions (TEI) prepare pre-service teachers for integrating information and communication technology (ICT) in their classroom practise. Specifically, a multiple case study was conducted to examine the ways in which the development of technological pedagogical content knowledge (TPACK) was promoted in the existing curriculum of three TEI in Flanders. In the three cases, data were drawn from semi-structured interviews with the heads of the department and the ICT coordinators. Focus group discussions collected the perspectives of pre-service teachers and teacher educators. The results indicate that (1) the three institutions are moving from ICT as a 'stand-alone' course towards embedding ICT across the curriculum and (2) three approaches were adopted for developing pre-service teachers' TPACK, each representing different ways of understanding the place of ICT in the curriculum. The discussion will focus on the challenges and opportunities inherent in understanding how to develop pre-service teachers' TPACK in the curriculum of TEI.

Keywords: curriculum; teacher education; educational technology; technological pedagogical content knowledge (TPACK); qualitative research; case Study

1. Introduction

Teacher education institutions (TEI) are expected to provide pre-service teachers with the necessary knowledge, skills and attitudes to teach with information and communication technology (ICT). To address this challenge, many TEIs have included introductory ICT courses in their curriculum (Polly et al. 2010). Primarily focused on the development of technological knowledge (TK) and skills, these courses aim to equip pre-service teachers with a set of basic competences they can transfer to their future classroom practice. However, empirical evidence shows that pre-service teachers still do not feel adequately prepared to effectively integrate ICT into their classrooms (for an overview, see Kay 2006).

Various studies advocate TEIs not only to focus on developing basic competences, but also to stimulate the use of ICT in teaching and learning (e.g. Polly et al. 2010). Mishra and Koehler (2006) consequently introduced the concept of technological pedagogical content knowledge (TPACK). TPACK characterises the integrative

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knowledge base teachers need to effectively teach with ICT, involving the dynamic interactions between TK, pedagogical knowledge (PK) and content knowledge (CK) (Mishra and Koehler, 2006). Based on this framework, many researchers (e.g. Voogt et al. forthcoming) recommend integrating TPACK across the TEI curriculum, and thereby provide pre-service teachers with the opportunity to experience how ICT can support teaching within specific content areas. Practical experience worldwide reveals the considerable potential of such integrated approaches as well as the difficulties associated with their implementation (e.g. Tondeur et al. forthcoming).

2.   Purpose and methods

The aim of this study was to explore how the TEI curriculum prepares pre-service teachers for the integration of ICT. A case study was conducted in three TEIs in Flanders, the Dutch speaking part of Belgium, to examine the ways in which the development of TPACK was promoted in the existing curriculum. This was accomplished by collecting and triangulating the views of various stakeholders. In the three cases, data were drawn from semi-structured interviews with the heads of the department of the TEIs and the ICT coordinators of each TEI. Focus group discussions collected the perspectives of pre-service teachers (TEI-1: $n = 8$; TEI-2: $n = 8$; TEI-3: $n = 10$) and teacher educators (TEI-1: $n = 5$; TEI-2: $n = 6$; TEI-3: $n = 5$). All interviews were audiotaped with the informed consent of participants. Case-specific data were first analysed and then systematically subjected to cross-case analysis.

3.   Results

The results indicated that the three TEIs are undergoing transition: they are, in accordance with the TPACK framework, moving from ICT as a separate 'stand-alone' course (TK) towards embedding ICT across courses (TPACK). To put TPACK into operation, the three institutions decided to create ICT policy strategies. This resulted in three different approaches for developing pre-service teachers' TPACK. These approaches are described below.

3.1.   TEI-1: from TK to TPACK?

In TEI-1, the ICT team decided to integrate TK across the curriculum, and thereby promote TPACK. However, the results of the focus group discussions suggest that the integration of TK in the different courses was not fully realised. In part, this was attributed to the failure of teacher educators to incorporate ICT in ways that exemplify its use within a specific subject domain. In the words of one pre-service teacher: 'I think our teacher educators should act as role models, but we don't see good examples' (pre-service teacher, TEI-1). Likewise, data from interviews with the ICT coordinator, suggest that few teacher educators could be regarded as 'ICT users' in their teaching practice. It therefore seems that instead of moving towards TPACK, the preparation for ICT integration is disappearing in TEI-1 (see Figure 1).

3.2.   TEI-2: from TK to TCK

TEI-2 also decided to move from a separate ICT course (TK) towards a more integrated approach. The ICT coordinator, previously responsible for supporting
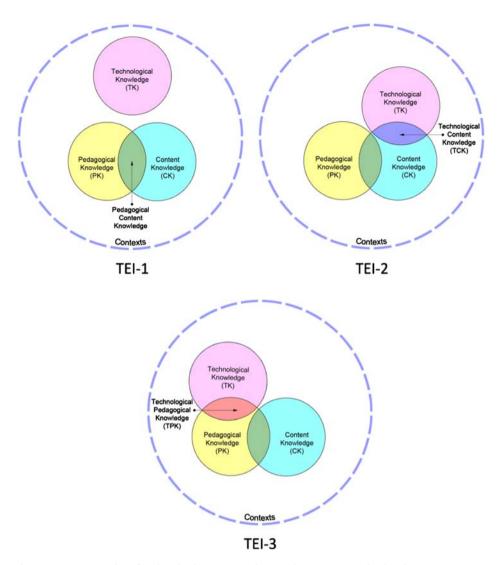
Figure 1. Approaches for developing pre-service teachers' TPACK in the three TEI's.

the development of pre-service students' TK through an ICT course, now teaches exemplary ICT-rich lessons in different subject areas, e.g. how digital storytelling can be used to support language learning. The goal of these lessons is to connect TK and CK. Pre-service teachers confirmed the relevance of these lessons, welcoming the concrete examples of how ICT can be used across various subject domains (TCK). However, they also argued that this approach does not provide them with the PK they need to integrate ICT in their future practice (see Figure 1). The ICT coordinator was also sceptical about the potential of this approach, as illustrated by the following comment: 'you take one lesson in French and then you are supposed to give lessons in French. It doesn't work' (ICT-coordinator, ITE-2).

3.3. *TEI-3: from TK to TPK*

In TEI-3, a new course on the educational use of ICT was introduced in the first year of the programme. In contrast to the previous course, which had focused on the development of TK, this new course centres specifically on how ICT can be used in teaching and learning (TPK). Nevertheless, the interviews with the ICT coordinator and head of department reveal that most teacher educators lacked adequate TK and/or the understanding of the potential relevance of ICT to their curriculum. In this respect, the ICT coordinator suggests that due to the limited use of ICT across the curriculum this TPK-based course should also provide pre-service teachers with the necessary competences to better understand the pedagogical merits of adopting ICT (see Figure 1). The head of department acknowledges that to achieve TPACK there must first be a clear vision of the pedagogical relevance of ICT. In this respect he states: '(…) You can easily replace a pen by a laptop, even without a vision. But the main question here is: what is the added value [of doing it]? Where is the educational innovation?' (Head of Department, TEI-3).

4.   Implications and challenges

The findings of the cross-case analysis suggest that ICT should be infused into the entire curriculum so that pre-service teachers have the opportunity to (a) understand the educational reasons for using ICT and (b) experience how ICT can support teaching and learning across different subject domains. Without such integrated approaches, the knowledge and the skills pre-service teachers gain are likely to remain isolated and unexploited (Polly et al. 2010). However, data from focus groups with pre-service teachers and teacher educators reveal that the three TEIs studied still have not yet succeeded in adequately equipping teachers with TPACK.

The discussion about how to develop pre-service teachers' TPACK should be seen as part of the development of the entire TEI policy (Tondeur et al. forthcoming). Such school improvement point of view leads to a focus on curriculum renewal and calls for increased attention to institutional level conditions, such as vision building, ICT-planning and leadership, co-operation within and between institutions and training staff (Kay 2006). The various strategies adopted by the TEIs documented in this multiple case study, point to a conscious effort to integrate ICT more fully into curricula, but they remain insufficient to instil teachers with TPACK. While in the three cases we could find multiple examples of ICT use, examples of student teachers actually being prepared to teach using ICT remain scarce. This suggests that teacher educators should be provided with professional development in order to infuse TPACK as a systemic aspect throughout the entire curriculum (cf. Kay 2006). Above all, role models of ICT's potential in different subject domains and authentic practical experiences throughout training will allow pre-service teachers to implement such practises themselves.

The adoption of integrated (cross-curricular) approaches to promote TPACK continues to confront TEIs with major challenges. At the time of writing this report, many TEIs and researchers are examining various alternatives to resolve a range of issues related to how to prepare student teachers for ICT integration. These issues include, among others: *How to effectively integrate TPACK across the curriculum of TEIs? Is there a need for courses focused specifically on ICT? How to assess*

student teachers' TPACK? Our study suggests that no 'off-the-shelf' configuration can directly resolve these complex issues, while at the same time it also reveals that TEIs are taking important steps forward in the search for a new curriculum that meets the challenge of developing student teachers' TPACK.

Notes on contributors

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