Doctoral Research on Teachers as Technology Users: Summary of a Work in Progress

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Abstract. This is a summary of a doctoral research study in progress which deals with secondary school teachers, and their use of different forms of information and communication technology (ICT). The particular focus of the study is on the relationships between various teacher-level, societal and contextual factors, and the ways in which these factors either support or constrain technology integration in education. This mixed-method small-scale study was conducted in Latvia and Estonia. Both countries have tried to make digital competences an integral part of every school subject, but there are no formal requirements on how subject teachers should integrate technology into their teaching. As a result, very diverse attitudes towards ICT and technology usage practices emerge. Part of this study was conducted as an action research project, and thus the findings have been utilized in providing recommendations to a group of teachers willing to make technology a more integral part of their teaching.

Keywords: Secondary school teachers · Teachers' beliefs · Pedagogic use of ICT

1 Introduction

This doctoral study is about secondary school subject teachers as users of information and communication technology (ICT). For decades, instructional use of ICT has been one of the major research streams in teacher studies, and thousands of articles have been published. However, there are still gaps in our understanding of why some teachers, in terms of technology use, act like "innovators", while others are described as "laggards" [1]. Drawing on the theory of social domains by Layder [2, 3], this study focuses on some less investigated teacher-level, social and contextual factors which are related the pedagogic use of ICT. The aim of the study is to analyze how various aspects of different social domains are related to the ways in which teachers integrate technology into their practices.

Data for this study were partly collected in Estonia, and partly in Latvia in the course of an action research project. This project started in 2013 with a group of teachers from a regional secondary school. The author's role in the project has been to help the action research group understand the "status quo" of teachers' skills, beliefs, attitudes toward technology, and training needs at different stages of the project in order to develop recommendations for in-service training. This explains the seemingly wide scope of aspects that have been examined in this study and reported in five individual papers,

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which are summarized in the empirical section of this paper. The empirical work largely reflects the issues which were raised by the action research group. Each publication is aimed at answering more specific questions, but the overarching questions of the doctoral research are:

- How are various factors stemming from individual, societal and contextual domains related to teachers' usage of ICT?
- What is the role of teachers in promoting and mediating the technology use of their students?

The rest of the paper is structured in the following way: first, the theoretical framework is outlined, then the national context is provided, and finally an overview is given of the methodology of the research and empirical work carried out so far.

2 Theoretical Background

The theory of social domains of Layder [2, 3] was chosen as the overarching theoretical framework for this study. Layder [3] has proposed that the social world can be understood by looking at four broad domains, which range from micro-level to macro-level: the psycho-biography of the individual (the self), the situated activity (everyday interaction, and face-to-face encounters), the social setting (proximate relations) and contextual resources (institutional and cultural resources). All domains are strongly interconnected and they interact with each other through power, social relations and practices.

In formulating his theory, Layder drew on a number of other theories, and in many ways he has views similar to several social theorists, including Habermas, Giddens and Bourdieu [3, p. 6–13]. However, Layder's multi-layered perspective on the agent-structure relationship serves as the most useful theoretical basis for doing an in-depth analysis of the ways in which teachers integrate ICT in their teaching, because the focus of this study is on teachers as individuals, and the study does not try to make any claims on the macro level. The theory of social domains, more than any other theoretical framework, seeks a balance between systems (structures) and actors (individuals) [4], arguing that structures influence people's actions, but individuals can change the social structures they relate to. In addition, placing this doctoral research in the framework of social domain theory avoids dealing with technological determinism or assumptions about taken-for-granted benefits of technology. This theoretical framework helps to show that ICTs do not define teachers' instructional practices; rather, the application of technology always depends on the individual teacher's interaction with technology.

3 The National Context

There are several reasons why Latvia and Estonia serve as interesting cases for studying teachers and their use of ICT. Firstly, Estonia is recognized internationally as a success story for its rapid change from a post-socialist country to a modern democracy, and its considerable investments in educational infrastructure and teacher training. Latvia in

many ways has made similar progress, especially after becoming a member state of the European Union in 2004 and gaining access to European structural funds. Secondly, both countries have striven to make digital skills an integral part of every subject curriculum [5, 6]. However, there are no formal guidelines on how subject teachers should deal with the promotion of ICTs and digital skills in their teaching [7]. This means that teachers can decide whether and how to use digital teaching materials and educational ICTs in their subjects. As a result, teachers develop very diverse practices of ICT use, based on a range of individual, societal and contextual factors.

4 The Empirical Part of the Study

4.1 Methods

This doctoral study is largely based on qualitative data collected through semi-structured interviews with 26 in-service secondary school teachers (16 teachers in Latvia and 10 teachers Estonia) and classroom observations (in Estonia only). In addition, an approach to data collection was tested to overcome the problem of social desirability in self-reported measures assessing people's ICT skills. A small scale study was conducted with a group of Latvian teachers ($n = 10$), who were asked to perform a number of information retrieval tasks online with the search process being recorded by a search logger and a screen-capturing program. By triangulating various methods of data collection, a data set was aggregated which offered opportunities for deep and holistic insights in the complex interplay between various teacher-level, societal and contextual factors (see Table 1).

In terms of the limitations of this research, although data sets came from two countries and there is a lack of comparative research in the field, this doctoral research did not aim to examine cross-national differences in the pedagogic use of ICT. This was due to the small sizes of the samples, which did not allow for any generalization of the findings.

4.2 Overview of the Individual Papers Comprising the Doctoral Thesis

All together, five individual papers will comprise the final doctoral thesis. The first paper [8] explores the ways in which teachers have integrated ICTs in teaching humanities and science classes. Data were collected through classroom observations and two consecutive interviews with 16 Estonian teachers. The findings indicate that technology use was strongly related to the teacher's dominant instructional style [9] and the specific subject culture [10].

The second paper [11] aims to reveal how various pedagogical beliefs and subject cultures shape the ways in which primary and secondary school teachers mediate students' use of digital technology. Empirical data were provided by 26 semi-structured interviews with teachers in Latvia and Estonia. The results indicate that teachers mostly applied mixed approaches to mediate students' use of technology, and the mediation approaches were based on teachers' dominant pedagogical beliefs and subject domains.

Table 1. Overview of the aspects of social domains covered in the individual papers

Publication	Psycho-biography	Situated activity	Social setting	Contextual resources
I		Instructional style; teacher-student-technology interaction	Subject cultures	
II	Teacher beliefs about the nature of technology and the nature of learning; teachers' self-efficacy	Mediation of students' use of digital technology	Subject cultures	
III	Expertise in technology use	Student-centered vs. Teacher-centered learning	Subject cultures	
IV	Achievement goal orientation; teachers as learners about ICT			Curricular requirements; high-stakes exam factor
V	Computer self-efficacy	Information retrieval online; teacher-technology interaction		

In the third paper [12], two cases from the Latvian sample were analyzed from the perspective of the pedagogy of connection [13, 14] to examine how a teacher of science and a teacher of humanities promoted students' digital competences during the course of teaching the subject. The findings indicate that each teacher promoted different sets of skills, and they had different motivations for teaching ICT to their students. This paper indicates that teachers were able to help students to develop various aspects of digital literacy; however, the teachers were not the main providers of digital competences for students.

The fourth paper [15] explores relationships between in-service teacher achievement motivation [16, 17], the practices of technology integration in teaching, and the ways in which teachers learn about ICT. This paper is based on 26 semi-structured interviews with teachers in Latvia and Estonia. This study indicates that teachers with mastery goal orientations had rich repertoires of ICT use and intrinsic motivations to improve their ICT skills. Teachers with ability-approaches and work-avoidance motivations were

active users of ICT; however, the former teachers acquired new skills to gain professional recognition and demonstrated superior ability in ICT use, while the latter teachers mainly sought opportunities to learn about available digital teaching resources to avoid putting effort into preparation for lessons and teaching. Teachers who strove for close and caring relationships with their students limited their ICT use and showed little interest in developing their ICT skills, arguing that technologies might make the learning process "cold" and distant.

The fifth paper [18] deals with a specific aspect of digital literacy – skills of information retrieval – and its relationship to teachers' perceived Internet self-efficacy. This narrow focus was chosen based on the argument of Bandura [19] that self-efficacy can be researched best on the micro-level. Data were collected, first, through 16 semi-structured interviews with the action group participants in Latvia. Later a purposive sampling method was applied based on teachers' self-efficacy levels, and ten teachers were invited to do a number of pre-defined online search tasks. The results indicate that the teachers' perceived Internet self-efficacy did not correlate with their actual search performance. In addition, teachers with low and high self-efficacy used similar online search strategies. Teachers over-estimated the difficulty of search tasks before conducting searches.

A summary is provided of the various factors from different social domains [3] that were analyzed in the five individual papers (Table 1).

As can be seen from Table 1, most of the attention in this doctoral study was on the individual and situated activity domains, which is related to the aim of addressing teachers and their uses of technology from the perspective of the individual. In terms of the research questions that inform the study, answers to the first research question were provided by the results of all individual papers, while the second research question was addressed in the second and third papers. However, the particular factors that were included in the analysis are not exhaustive; rather, each individual article contributes to providing a broad picture of the complex interplay of micro-, meso- and macro-level forces that shape the ways in which teachers integrate technology into their teaching.

5 Conclusions

This paper provides a summary of a doctoral research study in progress on secondary school teachers and their use of technology. The findings of the study have been utilized in providing practical recommendations to a group of Latvian teachers willing to make technology a more integral part of their teaching. This research also provides a useful basis for future studies, with more representative samples and including a cross-national dimension, knowing how limited the number of comparative studies is on factors that influence teachers' use of ICT.

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