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A genre shift in disseminating knowledge: Student teachers' experiences of communicating their master's theses as popular science

John Henriksson, Gunilla Eklund & Jessica Aspfors

ABSTRACT

Previous research shows that there is a challenge in balancing research-oriented activities, including the master's thesis, in a way that promotes teachers' professional development. This study aims to investigate student teachers' experiences of communicating their master's theses as popular science to schools and school communities. Data (logbooks, videos and text submissions) were collected from Finnish student teachers (n = 38) during a campus-based course from 2019 to 2020. The results show that most students had difficulty shifting from a science to a popular science approach and found this experience of genre shift during dissemination as challenging.

Keywords: *teacher education; master's theses; science web video; popular science*

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ABSTRAKT

Ett genre skifte i kunskapsspridning: Lärarstuderandes upplevelser av att kommunicera sina magisteravhandlingar som populärvetenskap

Tidigare forskning har visat att det finns utmaningar med vetenskapliga aktiviteter inom lärarutbildning inklusive magisteravhandling, i relation till lärares professionella utveckling. Denna studie har som målsättning att undersöka lärarstuderandes upplevelser av att kommunicera sina magisteravhandlingar på ett populärvetenskapligt sätt till skolor och skolsamfundet. Forskningsdata (loggböcker, videor och textmaterial) samlades in från finländska lärarstuderande (n = 38) under en campus-baserad kurs under läsåret 2019–2020. Resultaten visar att de flesta studerande hade svårigheter med att byta genre mellan vetenskap och populärvetenskap samt att studerande upplevde genre-shiftet i samband med kommunikationen av magisteravhandlingen som utmanande.

Nyckelord: *lärarutbildning; magisteravhandling; video; populärvetenskap*

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Introduction

In a time when misinformation and fake news are increasing, it is even more important to disseminate scientific knowledge and results to a general audience in an understandable and easily accessible way (Scheufele & Krause, 2019). Due to the increased need for scientists to communicate their research findings to a wider public, the interest in popular science and the use of science web video has greatly expanded (Plank, 2017; Rakedzon et al., 2017; Tsai, 2017). However, there are few studies assessing popular science in general (Baram-Tsabari & Lewenstein, 2013; Pelger & Nilsson, 2016; Rakedzon & Baram-Tsabari, 2017) and science video in particular (Putortì et al., 2020). In research-based teacher education, where student teachers write scientific master's theses (Baan et al., 2019), there is a need to develop popular science communication. This connects to the well-known dilemma on theory, research and practice, which has been also recently discussed in the literature. For example, in the special issue of the *European Journal of Teacher Education*, trends and future directions of teacher education were highlighted (Menter & Flores, 2021).

In Finland, teacher education has adopted a research-based approach for over 40 years. This type of education is greatly appreciated, and newly qualified teachers perceive that they have a stable foundation to build upon (Jakhelen et al., 2019; Lavonen, 2018). However, studies have also shown that the role of the research in teacher education is somewhat unclear (Puustinen et al., 2018), and teachers find it difficult to apply the research-based knowledge gained in their education to their day-to-day work (Nikolov et al., 2020; Wågsås Afdal & Spernes, 2018). Herein, the challenge lies in balancing teacher education's research-based activities in a way that promotes teachers' professional development (Antonsen et al., 2020; Eklund et al., 2019; Ellis et al., 2019). To make learning meaningful, research-based activities must facilitate active and independent student participation and be connected to education practices (Baan et al., 2019; Flores, 2018; Nikolov et al., 2020). However, connecting research with school development entails new perspectives and qualities for student teachers, teacher educators in universities and teachers in schools (Flores, 2018).

To enhance the relationship between research and practice, an innovation project was initiated at a Finnish teacher education department. The overall aim of the project is to develop new forms of collaboration between teacher education and the school community, as well as increasing the interaction between them. Various kinds of technology, such as video, have been used as a link between theory, research and practice, often quite successfully (Körkkö et al., 2019). For example, technologies have been used as tools for mentoring student teachers during their practice periods in schools outside the teacher education department (Nesje, 2021). Within teacher education, technology has often been associated with innovation, and the implementation of innovations has been driven by applying technology in new ways (Fransson, 2021). In line with this, technologies can help transfer acquired

knowledge in new, innovative ways (Prilop et al., 2020). Furthermore, teacher education is strategically important for developing student teachers' information and communication technology (ICT) and digital competence, which are needed in a highly digitalised society (Lund et al., 2014) and the teaching profession. According to the national core curriculum for basic education in Finland (2014), multiliteracy and digital competence are two of the seven transversal competence areas. Pupils' use of digital tools is emphasised, which further increases the need for teachers' digital competence.

Aim of the study

To develop the connection between research and practice and enhance student teachers' professional development, technologies can be used in new, innovative ways (Lund et al., 2014). However, the question is what this means and how digital tools can be used to communicate the interconnection between research and practice. The aim of the study is, therefore, to investigate student teachers' experiences of communicating their master's theses as popular science to schools and school communities. Based on their master's theses, student teachers develop popular science videos and digital materials, aiming to reach the professional teachers in their working lives and further the entire school community. Therefore, the study poses the following two research questions:

1. How do student teachers communicate their master's theses as popular science?
2. How do student teachers experience the communication of their master's theses as popular science?

Popular science and shifting genres

Popular science can be defined as an interpretation of science intended for a general audience, rather than for other experts within the field. Comprehensive information is characterised by a simple yet entertaining style, and the ambition is to incorporate scientific content into a wider cultural context. Popular science texts differ from scientific texts in terms of both genre and register, specifically the vocabulary and technical jargon used (Parkinson & Adendorff, 2004; Rakedzon et al., 2017). Research articles present scientific findings as established fact and function (Myers, 1989), whereas popular texts present scientific findings as provisional and function as narratives of research, reporting on new knowledge claims not yet endorsed as fact by the research community. Research articles focus on theories and methods, whereas popular articles focus on people and what they say and think (Parkinson & Adendorff, 2004). Within the academic context and research-based teacher education, the student teachers in this study must shift their perspective from a science to a popular science approach. This change of perspective is known to be challenging and has been termed as 'genre shift'. Furthermore, this term can be related to Aristotle's

three types of persuasive speech—forensic, deliberative and epideictic. Scientific texts can largely be classified as forensic discourses, whereas the popularization of scientific texts is primarily epideictic. Different rhetorical situations require a change in genre, and this change to epideictic rhetoric from a scientific one requires the adjustment of new information to the audience's already held values and assumptions (Fahnestock, 1986). The genre shift thus concerns scientists or students who need to adapt their writing skills from scientific to popular science genres (Rakedzon & Baram-Tsabari, 2016). However, although popular science has gained increasing appreciation during the last decade, research on popular science genres in general and the above-mentioned genre shift, in particular, remains limited (Rakedzon & Baram-Tsabari, 2017).

Pelger and Nilsson (2016) investigated science students' writing about their scientific projects as popular science. Despite the students' efforts to make their projects interesting to the general audience, only a few students managed this. The students experienced difficulty in broadening their perspective, generalising the findings, arguing for the importance of the project and reflecting on its consequences. Despite this, most students found that popular science writing brought new perspectives and learning insights. Before the writing task, a vast majority of the students focused exclusively on perspectives that were relevant from a disciplinary point of view. Through popular science writing, the students saw the larger picture, understood the aim of their work and realised the implications the results might have on the society and the future (Pelger, 2017).

Writing in higher education is often synonymous with writing in the scientific genre. This has consequences for students' writing skills, subject understanding and scientific literacy (Roald et al., 2020). However, there are few studies assessing popular science writing (Baram-Tsabari & Lewenstein, 2013). In the studies of Pelger and colleagues (Pelger, 2017; Pelger & Nilsson, 2016), it was evident that students who framed their scientific projects for a non-scientific audience learned to distinguish the popular from the academic and, in turn, gained deeper scientific knowledge. Popular science writing thus enhanced students' development of scientific writing. The choice of content, perspectives and levels of abstraction was especially facilitated. Many of the students also expressed a positive attitude toward the assignment and would have preferred more training in popular science writing during their education (Ilinska et al., 2016).

Video as a popular science tool

In popular science, a web video is often referred to as a science web video or science video and can be defined as a short video that focuses on the communication of scientific content for a broad audience on the Internet (Morcillo et al., 2016). Due to the increased need for scientists to communicate their research findings to general audiences, the interest in and use of video has greatly expanded (Plank, 2017;

Rakedzon et al., 2017; Tsai, 2017). In the Videonline project, for example, researchers studied online science videos as a tool to communicate science and technology using a broad international perspective (León & Bourk, 2018). Specific programs are also organised in an attempt to provide scientists with specific training for creating and publishing videos (Plank et al., 2017).

Overall, video is an attractive medium because it catches people's attention and the information it presents is easily accessible (Tsai, 2017). However, in order to successfully communicate science, a video should possess specific features. The first study on the popularity factors for science videos on YouTube was conducted by Welbourne and Grant (2016). In line with their approach, other studies have identified the key features of science videos, such as non-technical vocabulary, a simplified speech structure, images drawn from everyday experience and a narrative structure (Putorti et al., 2020). In a study by Morcillo et al. (2016), 190 science web videos were analysed, and as a result, they identified a wide variety of genres, moderately complex production and the complex use of montage and storytelling. Most of the videos had calculated introductory passages and ends aimed at community building, while the most significant aspect was their storytelling. In addition, an entertaining style and user-generated content have been emphasised as features of successful science videos (Bourk et al., 2018; Davis et al., 2020; Welbourne & Grant, 2016). Compared to texts, well-designed videos appear to be more effective in connecting the scientific community with the general public and disseminating scientific knowledge (Putorti et al., 2020). In this study, student teachers' use of popular science videos and digital materials is thus an interesting point of departure in communicating their master's theses.

Methods and analysis

In order to answer the two research questions, a qualitative research approach was chosen. The following sections will elaborate on the data collection, methods used and analysis.

Participants and data collection

Data were collected from a teacher education department in Finland by a research team. Overall, 38 student teachers (26 females and 12 males) participated in the study during their master's programme in primary-school teacher's education. The informants were selected because they had all completed an advanced campus-based course, *Research in Education* (5 ECTS), from 2019 to 2020. This course aims to prepare and enable students to use different kinds of digital tools to communicate the main ideas behind their written master's theses as popular science. The course was offered online, and one of the researchers was responsible for its content and framework in collaboration with the others on the team. The course was arranged for the first time, and due to its pilot character, the instructions were broad and the

expectations were low. The student teachers were offered some lectures on popular science writing and digital tools, as well as individual supervision for science video production, although none of them took advantage of the last opportunity.

All student teachers worked independently. They wrote ingresses and made science videos, as well as digital text materials, based on their thesis work, which were published online on a webpage. The student teachers completed a strength, weakness, opportunity and threat analysis at the beginning of the course in order to establish their views and understanding of the task. In addition, they wrote logbooks and evaluated two other students' science videos and digital materials. For the purpose of the current article, the focus was on student teachers' mediation of their master's theses as popular science and their experiences of such communication. The data included student teachers' science videos, digital text materials and logbooks. All students signed written ethical agreements, and the study follows the general ethical standards approved by the scientific community (Finnish National Board on Research Integrity, 2020).

Data analysis

In previous exploratory studies on videos, content analysis has been assumed to be an appropriate method for analysing the data (Waters & Jones, 2011). The content analysis used in this study is in line with what Hsieh and Shannon (2005) call *summative content analysis*, involving counting and comparisons of content and the interpretation of the underlying context. The analysis process was conducted in three phases, in which the video data were analysed first, followed by the students' text material and logbooks. The first phase began inductively in the form of becoming familiarised with the video and text material, followed by an open-coding procedure in which initial keywords and content were identified and categorised in an Excel spreadsheet highlighted by colour coding (video submissions and text material), as well as in NVivo (logbooks, NVivo for Mac release 1.3.2). Furthermore, the statements and content were counted using a summative approach. In the second phase, a more systematic coding process began, in which the content in the initial categories was scrutinised and compared in terms of similarities and differences to reduce the amount of data. In the third phase, the list of categories was grouped under higher-order headings in the form of a main category (Type) and subcategories (Form and Content), which are visualised in the form of tables (Tables 1–4). The first author conducted the analysis in the first and second phases, while all authors discussed and finalised the analysis in the third phase.

Results

When analysing student teachers' experiences of communicating their master's theses as popular science, four category systems were found (Tables 1–4), including one

main category (Type) and two subcategories (Form and Content). One submission can include multiple forms and contents. The results will be accounted for by focusing on each type separately, starting with Research Question One and following up with Research Question Two.

Student teachers' communication of their master's theses

To investigate how student teachers communicate their master's theses, their science videos and digital text materials ($n = 30$) were analysed (Tables 1 and 2). The science web videos were categorised into four main types: talking head ($n = 9$), recording of handwriting (1), picture-in-picture slideshow (1) and slideshow (19) (Table 1). The subcategories, Form and Content, include 14 aspects that, in various degrees, are represented in the main categories.

Table 1. Student teachers' video material

Type		Slideshow (19)	Talking head (9)	Recording of handwriting (1)	Picture-in-picture slideshow (1)
Form	Background music	13	2	1	
	On location		9		1
	Voiceover	8			
	Multiple points of view		6		
	Includes B-roll		4	1	
	Text effects	3	1		
	Sound effects		1		
Content	Research summary	17	5	1	
	Explaining concepts	4	4	1	1
	Call to action	3	5		1
	Suggesting solutions	2	4		1
	Clear hook	3	4		
	Marketing text material	1	2		
	Dialogue		2		

Most video submissions were categorised as *slideshow videos* ($n = 19$). The visual aspects consisted either of recorded presentation slides or images imported into video editing software and exported as a video. In the subcategory Form, the use of background music was frequent in most of these videos ($n = 13$). The slideshow videos were screen recordings with no identifiable location. Some videos included a voiceover ($n = 8$), and a few slideshow videos ($n = 3$) included separate text effects that were added on top of the screen recording. In the subcategory Content, almost all slideshow videos ($n = 17$) included a research summary characterised by a conventional research disposition, with background, aim, research questions, methods and results. The other aspects in this subcategory were evenly distributed in the slideshows. Four slideshow videos contained an explanation of concepts, three videos

contained a call to action and three videos began with a clearly defined hook. Finally, two videos included suggestions for solutions based on the associated research, and one video marketed the student's text material.

Talking head videos (n = 9) was the second most popular type, characterised by the student speaking directly to the camera. Seven talking head videos were recorded in a home environment, one at a local farm and one on many locations at home (subcategory Form). Furthermore, six used multiple camera angles during the video and four contained B-roll footage. Two videos contained background music, and one of these videos also contained text and sound effects. In the subcategory Content and talking head videos, five videos contained a research summary and five videos a call to action. Four videos contained an explanation of concepts from the students' research, four included suggested solutions for the viewer and four videos began with a clear hook. Finally, two videos were dialogues between students, and two marketed the text material.

One video submission was made by a *recording of handwriting* (n = 1) from a bird's eye view. It contained background music and B-roll (subcategory Form) and consisted of a research summary and an explanation of the researched concepts (subcategory Content). The final submission consisted of a combination of a slideshow and talking head footage, which was edited as a *picture-in-picture slideshow* (n = 1). The talking head was recorded in a home setting (subcategory Form) and contained the explanation of concepts, a call to action and suggested solutions to a problem (subcategory Content). In conclusion, the slideshow videos were more reminiscent of a scientific presentation of the student's master's theses, whereas the talking head videos were more entertaining and accessible.

The analysis of student teachers' text material submissions was categorised into two main categories (Type): normative guides (n = 22) and hands-on material (n = 8). The subcategories, Form and Content, include aspects that are represented in the main categories to various degrees (Table 2).

Table 2. Student teachers' text material

Type		Normative guides (22)	Hands-on material (8)
Form	Document	14	8
	Poster	6	
	Presentation slides	2	
Content	General tips	18	3
	Explaining concepts	13	
	Exercise/lesson plan		7
	Research summary	5	
	Tips for further reading	3	1
	Content library	1	2
	Sequence plan		1

Normative guides (n = 22) were characterised as those focusing on educating or informing the reader, as opposed to the hands-on material, which provided the reader with practical materials for their own use. Most normative guides (n = 14) were multiple-page documents, six were single-page posters and the remaining two were presentation slides (subcategory Form). In the subcategory Content, almost all normative guides (n = 18) focused on providing general tips regarding the subject matter, while 13 contained an explanation of concepts from the students' research topics. Five normative guides included a research summary from the students' master's theses, three provided tips for further reading and one contained a content library, in which the student had collected material in a shared folder for the recipient to use.

The other part of the submissions was characterised as *hands-on material* (n = 8) for the teachers to use in practice, without the need for further planning. All these were multiple-page documents (subcategory Form). Seven contained ready-to-use lesson plans or exercises and one was a sequence plan for multiple lessons (subcategory Content). Three hands-on materials contained general tips regarding the subject, and two contained content libraries in the form of shared folders with added material. One hands-on submission contained a list of further readings. To conclude, normative guides with elements of research summaries, general tips and concept explanations are in line with a scientific approach, as opposed to the hands-on material submissions that are more practical in nature.

Student teachers' experiences of communicating their master's theses

The material consisted of 33 logbooks reflecting on the 30 videos and text materials (Tables 3 and 4). The discrepancy is due to some students' collaboration in making the video and text material while writing individual logbooks. The results are presented below, with illustrated quotes from the Swedish material, translated by the authors. In Table 3, student teachers' experiences of making video submissions are illustrated and divided into four main categories (Type): slideshow, talking head, picture-in-picture slideshow and recording of handwriting. The statements are categorised into two subcategories: Form and Content.

Table 3. Student teachers' experiences of making video submissions (n = 33)

Type		Slideshow (21)	Talking head (10)	Picture- in-picture slideshow (1)	Recording of handwriting (1)
Form	Software	9			
	Talking head preferable	6		1	1
	Lack of confidence	7			
	Easy way	6			
	Make it personal		5		

(Fortsatt)

Table 3. (Fortsatt)

Type	Slideshow (21)	Talking head (10)	Picture-in-picture slideshow (1)	Recording of handwriting (1)
Length of slides	4			
Perseverance required		3		
Editing		3		
Content Overwhelmed by content	9			
Scriptwriting		7		
Content more accessible		5	1	1
Communicate my research	5			
Challenge myself		4		

Most students made *slideshow videos* (n = 21). In the subcategory Form, nine students reflected on the software used for making slideshow videos. Most slideshows were made using software that the students were already familiar with. Seven students lacked confidence and did not feel comfortable being in a video.

I knew from the start that I don't want to be seen or heard in the video. This is because I would be too nervous, and the process would take much longer. I know myself and know that I would be more pleased with the end results if I'm neither seen nor heard. (Student 26)

Six students, however, mentioned that it would have been more preferable to make talking head videos because they considered them more appealing. Six students reflected on being daunted by making a talking head video and that recording a slideshow was an easier option. Four students had difficulty determining how long a slide containing text should remain on screen for the reader to keep up and not have to pause the video. In the subcategory Content, nine students who made slideshow videos were overwhelmed by the content from their theses and having to choose what to include in the video. Finally, five students mentioned that communicating their research to a larger audience was important.

Of the 10 students who made *talking head videos*, 5 students mentioned the willingness to showcase themselves in the video and make the video personal and interesting (subcategory Form). Three of the students stated that making the video required perseverance and was more time-consuming than they had anticipated. Furthermore, three students reflected on the editing phase, in which they had difficulties choosing an editing software or experienced challenges when learning new software, such as adding background music to the video and making video cuts. In the subcategory Content, seven students experienced challenges with scriptwriting, specifically identifying the key elements and content to be included in the script and following the time limits.

I chose to write all my lines in detail and try to understand how long it would take to speak those lines. After that, I tried to compress the content further so that just the most important parts were conveyed. (Student 31)

Five students noted that the video made their theses and text material more accessible to a broader audience. Four students were not comfortable being seen or heard on the video but challenged themselves in making them because they saw the importance of learning how to make videos, given their future teaching practice.

Both students behind the *picture-in-picture slideshow* video and the *recording of handwriting* reflected on a talking head approach being more preferable but noted that the ongoing coronavirus disease 2020 pandemic made filming on locations impossible (subcategory Form). In addition, the students noted that although they had made their research more accessible, in hindsight, they believed that they could have made the videos more personal (subcategory Content).

Student teachers' experiences of making text submissions are divided into two main categories (Type): normative guides and hands-on material. The statements are categorised into two subcategories, Form and Content (Table 4).

Table 4. Student teachers' experiences of making text submissions (n = 33)

Type		Normative guides (26)	Hands-on material (7)
Form	Highlight the importance of my topic	11	
	Hands-on preferable	7	
	Software	6	
	Visual appeal	4	2
	Easy way	3	
	Make the material accessible		2
	Needs more multimedia		1
Content	Inform the teachers	13	
	Summarise my research	9	
	Straining	6	
	Could not identify hands-on	4	
	Help teachers		4
	Closure	3	1
	Utilise own expertise		2

Most students made *normative guides* (n = 26). Eleven students believed that they had succeeded in highlighting the importance of their research topics to the readers (subcategory Form). Seven students mentioned that it would have been better to focus on writing hands-on material as opposed to normative guides. Six students reflected on the choice of software when making their text material and discussed using ready-made templates within the software. The students mainly used

software that they were already familiar with. Furthermore, four students noted that their contribution could have been more visually appealing. Finally, three students mentioned that they chose the easy way when deciding to write normative guides because they had already made similar presentation material for their master's theses seminars.

In the subcategory Content, 13 students wanted to inform teachers of the importance of their research and 9 students had difficulty summarising their research for their target audience.

In my poster, I use the scientific concepts of aim, research questions and so on. In order to make the material more popular scientific, these concepts could have possibly been left out. (Student 25)

Six students experienced the process of writing the text material as straining and time-consuming, while three students considered the task a suitable end for their studies. In addition, four students noted the difficulty of finding something hands-on to contribute and that a general guide is better so teachers can make their own materials for their students.

Some students made *hands-on material* ($n = 7$). Two students felt that their final material could have been more visually appealing if other tools had been used (subcategory Form), while two others noticed the importance of making the material accessible for teachers who have limited or no knowledge of a specific topic. One student was generally pleased with the final result but wanted to add some form of multimedia or a game. In the subcategory Content, four students highlighted their aim of helping working teachers.

The idea with the material is that I want teachers to be able to use this material, so they don't need to allocate time for planning. (Student 26)

Two students found it meaningful to relate their theoretical expertise derived from writing the thesis to practical use in writing the material. Finally, one student also mentioned this task as a suitable end for their studies.

Discussion

In the following sections, we will discuss two themes permeating student teachers' experiences of communicating their master's thesis as popular science: genre shift and the dissemination of popular science. Finally, we will elaborate on the limitations and implications of the study and provide suggestions for further research.

Regarding the first theme, *genre shift*, the results showed that most students had difficulty changing perspective from a science to a popular science approach (Fahnestock, 1986). Within a research-based teacher education, students usually write within the scientific genre (Roald et al., 2020). However, popular science is different.

It is characterised by a simple yet entertaining style and intends to communicate content to a general audience (Parkinson & Adendorff, 2004; Rakedzon et al., 2017). Students' science videos could mainly be categorised as slideshows and talking heads. The slideshows can be considered scientific in nature, while the talking head videos are more in line with the definition of popular science (Bourk et al., 2018; Davis et al., 2020; Morcillo et al., 2016; Putortì et al., 2020; Welbourne & Grant, 2016). Furthermore, the student text materials were categorised as normative guides and hands-on materials. A similar argument can be made here that normative guides fall in line with a scientific approach, as opposed to the hands-on material submissions. Consequently, only some students were successful in switching genres, while the majority were not (Fahnestock, 1986).

This result is in line with previous research, according to which the change of perspective from a science to a popular science approach is challenging (Pelger & Nilsson, 2016). Students who did not switch genres when making videos stated that they had chosen an easy option, while students who switched genres experienced the process as quite challenging. This suggests that although videos are an attractive medium (Tsai, 2017), training for creating and publishing videos is required for students to succeed (Plank et al., 2017). Students who managed to switch genres experienced the process as meaningful. They saw the video as personal and found the content to be accessible to the viewer, with the latter being supported by previous studies (Pelger, 2017). The analysis of the text materials follows a similar pattern, in which students who made normative guides wanted to highlight their topic and inform teachers of their findings. Some students also preferred normative guides because they had previously made research presentations for master's thesis seminars and, therefore, it was easier to take the scientific route (Roald et al., 2020). Furthermore, students who were successful in switching genres were able to use their theoretical knowledge to create ready-to-use material and thus succeed in communicating their results to a wider context (Parkinson & Adendorff, 2004; Rakedzon et al., 2017).

The second theme concerns the *dissemination of popular science*. As stated above, many students found the process of communicating their master's theses as popular science to be quite challenging (Fahnestock, 1986). Students generally understood the importance of the task, and as in previous research (Pelger & Nilsson, 2016), some of them also experienced it as positive and obtained new insights via the project. Despite this, most students had difficulty with the task and did not complete it. Furthermore, the results showed that the successful dissemination of popular science requires effort and knowledge. Most students whose results were lacking chose software and tools that they were already familiar with. In contrast, those students making talking head videos had gone through a learning process regarding new tools for video recording and editing. As stated, web science videos are known to be successful in connecting the scientific community with a general audience and disseminating scientific knowledge (León & Bourk, 2018; Putortì et al., 2020). However, the video

should possess specific features, and this requires knowledge and skill on the part of the creator (Plank et al., 2017).

Similarly, students who made normative guides commented on hands-on materials being preferable, but they could not identify aspects of their master's theses that were used for hands-on material. Instead, they chose to summarise their research, explain concepts or communicate general tips regarding the topic. During the course, the students were offered guidance by one of the course teachers, although no one used this opportunity. In line with previous studies, students express a positive attitude towards popular scientific assignments and would like more training during their education (Ilinska et al., 2016; Pelger, 2017). However, in research-based teacher education, students act within a scientific context. A popular scientific approach thus means a challenge for the relationship between research and practice (Puustinen et al., 2018). The fact that the students did not invest in the task but only did what they had to can be understood as indicating they did not truly understand the relationship between science and popular science approach (Wågsås Afdal & Spernes, 2018).

Limitations and implications for further research

The current study is based on a pilot project conducted in one teacher education department with a rather small data sample. Thus, the conclusions drawn may be limited. Despite the fact that all available material was analysed for this study, greater depth could have been reached if interviews had been conducted as a complement to the logbooks. The findings, nevertheless, outline the potential to develop research-based teacher education, disseminating scientific knowledge and promoting student teachers' professional development (Antonsen et al., 2020; Eklund et al., 2019; Ellis et al., 2019; Puustinen et al., 2018). The purpose of the study is, however, not to provide generalisable answers, but results that can serve as developmental tools and be useful for the readers' understanding and own practice (Stake & Trumbull, 1982). Due to limited research on popular science genres in general and, in particular, genre shifting (Rakedzon & Baram-Tsabari, 2017), further research investigating how recipient teachers and school communities experience genre shift and how they can benefit from students' popular science materials is warranted.

Conclusion

The change from a science to a popular science perspective was challenging for the students, and this genre shift relates to the well-known discussion on research and practice within teacher education (Menter & Flores, 2020). The students' communication of their master's theses as popular science turned out to be somewhat confusing for the students, which can be understood in the context of scientifically oriented teacher education. To support students' genre shifting, training in popular science should be included in their education (Ilinska et al., 2016). Furthermore,

most students did not challenge themselves to learn new technologies and saw the opportunity to do the task in an easy way. However, higher requirements and innovative models for video and digital materials could increase students' interest and involvement in the task (Lund et al., 2014). Various kinds of technology, such as video, have been successfully used as a link between research and practice (Körkkö et al., 2019) and as a tool for transferring acquired knowledge in new ways (Fransson, 2020; Prilop et al., 2020). In conclusion, when connecting students' master's thesis to school and school communities, students' science and popular science development can be enhanced (Pelger, 2017; Pelger & Nilsson, 2016).

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