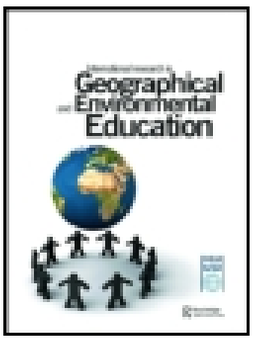

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Powerful knowledge and the significance of teaching geography for in-service upper secondary teachers – a case study from Northern Finland

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ABSTRACT

The aim of this research is to ask what kind of geography is taught in Finnish upper secondary schools and whether this knowledge is powerful knowledge. This is achieved by analysing 11 in-service geography teachers' concept maps and in-depth interviews with qualitative data analysis. The results indicate the dominance of three terms: spatiality, phenomena and a holistic approach running through the teachers' conceptions of geographical knowledge, skills and assessment. Geography is described by the teachers as a science which studies extensive spatial phenomena with the help of concepts and a holistic approach and in which values and students' own lived experiences play a major role. We conclude that the in-service Finnish upper secondary teachers' perceptions of geography are a form of powerful knowledge because they: (1) urge students to form new geographical thinking about the world, (2) give possibilities for students to study geographical phenomena and (3) evaluate their own knowledge, (4) encourage students to follow topical debates in different scales, (5) open up the students' world views and (6) support the general objectives of Finnish upper secondary schools by applying four of the six cross-curricular themes to a great extent in teaching geography, particularly sustainable development.

KEYWORDS

Geographical knowledge; geography education; powerful disciplinary knowledge; powerful knowledge; teacher conceptions

1. Introduction

1.1. Powerful (disciplinary) knowledge

The concept of powerful knowledge (PK) has received a great deal of attention in the research into geographical education during the past years (see, e.g., Catling, 2014; Catling & Martin, 2011; Chang & Kidman, 2018; Huckle, 2017; Lambert, 2014, 2016; Maude, 2015, 2016, 2018; Morgan, 2011; Puttick, Paramore, & Gee, 2018; Roberts, 2014; Slater, Graves, & Lambert, 2016; Stoltman, Lidstone, & Kidman, 2015; Uhlenwinkel, Béneker, Bladh, Tani, & Lambert, 2017). PK "is part of a broader

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argument for the importance of subject knowledge in the school curriculum, in opposition to a focus on generic skills and learning outcomes" (Maude, 2016, p. 70). In the field of geography education, there is raised a concern that teachers do not think critically what to teach but ensure that their students are able to "learning to learn" (Mitchell, 2016, p. 123; see also Mitchell & Lambert, 2015, p. 372; Morgan, 2011, pp. 90–91).

The concept of PK was originally defined almost decade ago by Michael Young (2014) as "…(1) features of the particular knowledge itself that is included in the curriculum and (2) what it can do for those who have access to it" (p. 74). In this view, knowledge should be (1) separated from everyday experiences; (2) systematic, in the form of concepts, that form subjects or disciplines and (3) specialised, produced by different groups, for example universities (Young, 2014, pp. 74–75).

Lambert define PK to be:

> (1) evidence based; (2) abstract and theoretical; (3) part of a system of thought; (4) dynamic, evolving, changing but reliable; (5) testable and open to challenge; (6) sometimes counter-intuitive; (7) exists outside the direct experience of the teacher and the learner and (8) discipline-based (Stoltman et al., 2015, p. 3).

Slater et al. (2016) have accepted Lambert's definition of PK but noted that he did not specify PK and described, "what it actually is" (p. 191). Lambert (2016) responded that it is not primarily the content in the curriculum that matters most, but "in what way is geography powerful knowledge" (p. 192). This raises the question of whether teachers' conceptions of geography are a form of PK.

Lambert, Solem, and Tani (2015) use the term powerful disciplinary knowledge (PDK) in their project GeoCapabilities. They conclude that:

> …the powerful disciplinary knowledge in all four countries is described in terms of world knowledge and understanding the world using geographical perspectives such as looking at human and nature interactions, using the concepts of scale and of local-global relationships, studying geographical issues (e.g. climate change) and linking these to personal (or individual or communal) choices (Uhlenwinkel et al., 2017, p. 10).

Maude (2015) states that the literature on PK has focused on the characteristics of the knowledge (thus, all disciplinary knowledge could be identified as powerful), and little has been written about the nature of geographical knowledge that might be powerful (however see Lambert, 2011; Maude, 2016, 2018; Uhlenwinkel et al., 2017). Maude (2018) takes a different approach in interpreting Young's idea by considering, "what powerful knowledge can do for those who have it" (p. 2). He (2018) suggests five types of powerful geographical knowledge (PGK) and compares them to PDK presented in the GeoCapabilities project (Table 1). These five types of geographical knowledge describe what geography enables students to learn and they could act as selection criteria for teachers when selecting content for teaching PGK (Maude, 2018, p. 7). Maude (2015, p. 25) concludes that all five types of PGK can be taught using the content of the Australian geography curriculum. The concept of PK does not produce a list of what to teach, but rather "ways of thinking that should be developed" (Maude, 2016, p. 75). There has been some criticism towards the concept of PK (see, e.g., Catling, 2014; Catling & Martin, 2011; Huckle, 2017; Roberts, 2014), but due to limitations of space this article does not discuss these arguments.

Table 1. Five types of powerful geographical knowledge.

Powerful geographical knowledge (PGK)	Powerful disciplinary knowledge (PDK)
1) "Knowledge that provides 'new ways of thinking about the world'" (e.g., if students change their thinking about their relationship with the environment, it could change their behaviour)	
2) "Knowledge that provides students with powerful ways of analysing, explaining and understanding" (analytical methods when examining relationships between phenomena; relative location and explanatory power; generalisations of phenomena)	2) "A critical conceptual knowledge that has explanatory power and systematicity, providing a relational understanding of people living on the planet" (emphasises a holistic approach)
3) "Knowledge that gives students some power over their own geographical knowledge" (to be a critical and independent thinker, geographical reasoning, how knowledge is created, tested and evaluated)	
4) "Knowledge that enables young people to follow and participate in debates on significant local, national and global issues" (the ability to follow and participate in public debates)	3) "A propensity to think through alternative social, economic, and environmental futures in specific place and locational contexts" (the world is not "given" and is thus open to change)
5) "Knowledge of the world" (teaching about unfamiliar places and helping to understand world's diversity)	1) "A deep descriptive world knowledge" (includes the idea of deep description and explanation)
(Maude, 2018, pp. 3–7)	(Lambert et al., 2015, p. 732, the GeoCapabilities project)

1.2. Conceptions of (teaching) geography

There has been wide range of research on geography teachers' perceptions or conceptions about geography and the teaching of geography in the last two decades (Puttick et al., 2018). Research into pre-service (Catling, 2004; Martin, 2000, 2008; Morley, 2012; Preston, 2014; Puttick et al., 2018) and in-service (Preston, 2015) teachers' conceptions in primary level education conclude that pre- and in-service (especially early career) teachers' conceptions of geography are limited to an informationally oriented view of the subject. This centres on the human-physical features of the world but lacks the interactions between the features and processes that shape them. Environmental issues are also invisible.

Research into pre-service (Alexandre, 2009; Alkis, 2009; Béneker, Palings, & Krause, 2015; Seow, 2016; Waldorf, 1996) and in-service (Alexandre, 2016; Arenas-Martija, Salinas-Silva, Margalef-García, & Otero-Aurinstondo, 2017; Brooks, 2006, 2010; Clausen, 2017; Lane, 2009, 2015; Uhlenwinkel et al., 2017; Walshe, 2007) teachers' conceptions in secondary level education has been broad. Waldorf (1996) and Alkis (2009) report that pre-service teachers' views can be described as "interactionist", which supports the same human-physical view of geography as the primary level teachers have. However, when examining the purpose of teaching of geography, Alkis (2009, p. 126) states that environmental conceptions dominate the views of secondary level teachers. Béneker et al. (2015) conclude that "teachers do not have clear, inspiring visions about geography education" (p. 366). They found that the rationale for teaching geography was mainly to raise citizenship and geographical awareness and to prepare young people for further studies.

Research into the conceptions of in-service secondary school teachers' are much more diverse in their nature: they relate to pedagogical content knowledge (Arenas-Martija et al., 2017; Clausen, 2017; Lane, 2009, 2015), conceptions related to teaching geography (Brooks, 2006, 2010; Uhlenwinkel et al., 2017; Walshe, 2007) or geography teachers' social representations (Alexandre, 2016). However, they conclude that

teachers' experiences, personal values and professional training affect their understanding of geography (Alexandre, 2016; Arenas-Martija et al., 2017; Brooks, 2006; Clausen, 2017; Walshe, 2007) and that a well-developed knowledge of the subject content affects the success of teachers (Brooks, 2010; Lane, 2009).

In the research by Uhlenwinkel et al. (2017) in the GeoCapabilities project, six Finnish geography teachers among others "were asked what geography education enable students to know, understand, and be able to do" (p. 5). These teachers said that acquiring knowledge is important so that students can act responsibly, construct wholes from facts and develop thinking skills and competencies. Analysing the similarities between four European countries they conclude that a common reason to teach geography is "to increase the capability of young people as (responsible) citizens" and "link geography education to values such as sustainability and diversity" (Uhlenwinkel et al., 2017, p. 9). These results are in line with Béneker et al. (2015) and Alkis (2009). Walshe (2007) points out that her results on teachers' conceptualisations of geography can be organised into one theme, global citizenship, which includes the three big concepts of: planning, place and process.

1.3. Aim and research questions

In reference to the above discussion there is need for more research into teachers' conceptions of geography focusing clearly on the in-service upper secondary teachers. Our aim is to study Finnish in-service upper secondary school teachers' conceptions of geography – and especially focus on what kind of geography (see, e.g., Lambert & Biddulph, 2015; Mitchell, 2016; Mitchell & Lambert, 2015) they currently teach in Finnish upper secondary schools. By presenting the view of geography that in-service upper secondary teachers hold we can determine whether some of the knowledge that teachers hold and teach is already a form of PK. The editors of IRGEE have encouraged scholars to contemplate aspects of PK in geography (most recently in Chang & Kidman, 2018). This article contributes to the debate on PK in geography by examining what form PK can take by analysing teachers' conceptions of geographical knowledge. By doing this we can answer the questions about PK presented by Slater et al. (2016) to determine "what it actually is" (p. 191) and by Lambert (2016) we examine "in what way is geography powerful knowledge" (p. 192) by applying Maude's (2018) five knowledge types.

1.4. Geography in upper secondary schools in Finland

Unlike in most other countries, school geography belongs to the natural sciences in Finland and most geography teachers have a background in natural sciences (Tani, 2014, pp. 94–95). Teachers have a high degree of autonomy in carrying out their teaching in Finland. Alexandre (2016, p. 180) point out that greater autonomy could allow teachers to form their conceptions and practices better in line with their true beliefs about teaching. There is one compulsory course (GE1) for all students and three national specialisation courses (GE2–4) in the geography curriculum in upper secondary schools (Table 2, Finnish National Board of Education [FNBE], 2016).

Table 2. Content of the school geography syllabus in Finnish upper secondary schools.

GE1. The world in change	*GE2. The blue planet*
Geography as a field of science	Geographical thinking related to physical geography
Key global risks areas related to the system of nature	Planetary movements of the Earth and phenomena caused by these
Key global risks areas related to natural resources and the environment	The atmosphere and hydrosphere in motion
Global risk areas and essential development questions of humankind	The structure and variable topography of the Earth
	The use of physical geographic data in the society and daily life
GE3. A Common world	*GE4. Geomedia – explore, participate, and get involved*
Geographical thinking related to human geography	The use of geomedia in daily life, the world of work, and the promotion of sustainable development
Population and settlements	Geomedia and geographic research skills
Primary production and the environment Industry and energy	Development control and sustainable development
Services, movement and interaction	A geographic study or a participation and involvement project
The regional structure of human activity	
The use of human geographic data in the society and daily life	

Source: Finnish National Board of Education (2016, pp. 155–160).

Before the national core curriculum was rewritten in 2015, there were two compulsory courses. In this reform, the order of the four geography courses was changed, but the content of the courses was mainly retained.

2. Data and methods

Our research data consist of mind maps and interview data gathered from 11 in-service geography teachers working in upper secondary schools in Northern Finland. Four of the teachers were male and seven were female. They were between 32 and 59 years of age (average 46) and they had between 5 and 33 years of teaching experience (average 18) at the time of the data gathering. They studied geography at Finnish universities during the years 1976–2013.

During December 2014 and the beginning of February 2015, the teachers were assigned to take a blank sheet of paper or use the cMapTools concept mapping software to produce a concept map on the topic "What is geography?". We also conducted in-depth interviews afterwards, which were conducted in February and March 2015. These were semi-structured with themes that guided the otherwise very free discussion between the interviewer and interviewee (see Brinkmann, 2017, pp. 579–580; Lichtman, 2013, pp. 195–206). The average duration of the interviews was 2 hours and 18 minutes and after each interview, the interview was transcribed using the Nvivo qualitative data analysis software. As a result, there were 403 pages of text in Microsoft Word format to be analysed. The aim of the interviews was to secure our interpretations about the respondents' concept maps and to gather additional data about the teachers' conceptions of geography.

The research material was analysed with qualitative data analysis, first for the concept maps and then the interviews. We applied Lichtman's (2013, pp. 250–255) analysis method by using what she calls the three Cs: coding, categorising and concepts. First, we coded concept maps and interview transcripts by initial coding, without any guiding principles from theory. Then we revisited it and developed categories and concepts. Finally, we divided the concepts into three themes.

3. Results

3.1. Geographical knowledge

3.1.1. The character of geography

The results (Figure 1) show that above all, teachers define geographical knowledge as spatial knowledge. Eight teachers' concept maps and ten teachers' interviews mention the "*spatial aspect*" (teacher 9, T9). From the teachers' point of view, geography differs from other sciences because of its' spatial approach to examining phenomena. Two teachers also mention the geographical relationship between humans, places and space, as well as humans' lived experiences in the world they live in. Geographical knowledge is usually presented and interpreted in the form of maps. The teachers feel that "*maps are the most important tools for geographers*" (T3) and with maps they can conceive the world and help students' geographical thinking to develop. The teachers take into account different geographical scales when illustrating geographical phenomena.

According to the teachers, observing and explaining different phenomena is a characteristic of geographical knowledge. In geographic research, the causalities between phenomena existing in our world are examined: "*we always have to look for*

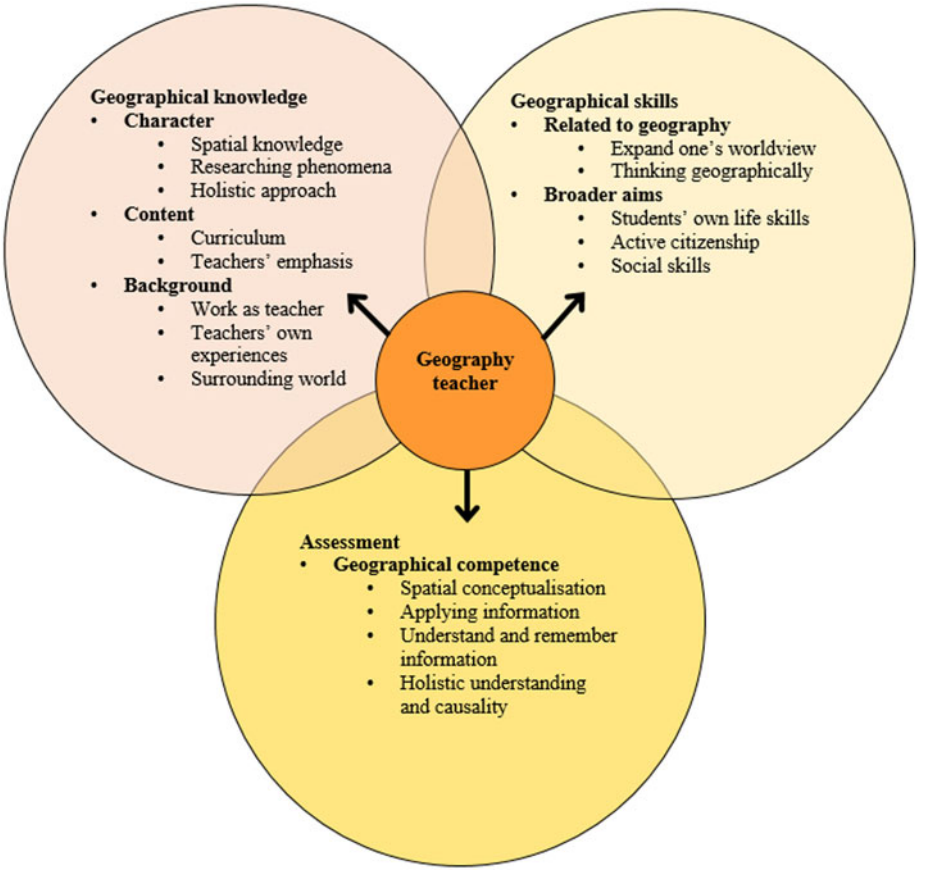

Figure 1. The main results of this article under three themes: geographical knowledge, skills and assessment.

causalities. How these phenomena link to each other" (T4). In the understanding of geographical phenomena, geographical concepts play a vital role acting as a language of geography and teachers themselves consider that they play an important role when students are acquiring new concepts. The teachers believe that without the help of a teacher, the students would just memorise new concepts and not develop a good, geographical understanding of them.

"*Above all, for me, it is holistic. This is a rare kind of science. And this must be its power and weakness*" (T7). This holistic approach to exploring the world is based on the nature of geography as a multidisciplinary science to link social and natural sciences together. The teachers point out that the human-nature relationship and the understanding of their meanings and the way they affect each other is a key aspect in teaching geography.

The teachers see geography as an enquiry-based science. They want their students to ask questions and make observations regarding the world around them. The teachers report that they try to form entities from scattered pieces:

> That you wake up the inner 3-year-old, who always asks what, where, why and why there. So that they get an understanding that if something happens somewhere – they realise why it happens just there and they start to realise what probably happens next and what impacts it has on local, regional and global level. (T9)

"*Then I have this sustainable development as a… ideological thing, that is sort of running through… running through my teaching all the time*" (T9). From the teachers' point of view, what is important for geographical knowledge is the understanding of values, especially sustainable development that urges students to reflect on their own perceptions.

3.1.2. Content of geography

In relation to geographical knowledge, seven of the teachers explained the content of geography they are teaching in more depth. It is clear that the content of geography held by the teachers comes from the national core curriculum (Table 2). The teachers describe how they divide geography into natural and human geography (seven teachers):

> One course of geography is about natural phenomena – seasons and time of the day and those phenomena, that this, the planet is moving in space – and there is an atmosphere, hydrosphere and lithosphere for the basis for all geography. (T2)

> In addition, we have a population geography, the emphasis of cultural geography on population and settlement. – Then, of course the structure of regions, industry, industrial areas and cores and peripheries, the city structure. (T6)

Teachers also divide geography into hazard geography and regional geography (five teachers). This classification is the same as the one used in the national core curriculum. The teachers also mention that geographical content is dependent on the teacher's point of view or emphasis, that is, the teacher's own knowledge and interests affect the content they teach.

3.1.3. Teachers' understandings of the background to the knowledge

When the teachers ponder their understanding of the background to their geographical knowledge, they mention three different categories: their work as a teacher, their own lived experiences and the surrounding world. The most significant source of knowledge is their work as a teacher. All teachers mention that textbooks and curriculums have affected their geographical knowledge, so these two are considered to be the most important factors. These are experienced as guiding principles to their teaching along with the assignments of the matriculation examination: "*Well yes they guide you so that you have to teach those specific things that are required in the matriculation examination*" (T1).

The second category includes free time activity (including, e.g. walking in the forest, an interest in astronomy, GPS-tracking, travelling), their own understanding of the world and their studies at university. The teachers say they enrich their teaching by telling stories and showing their own pictures. The teachers' own studies are mentioned as a basis for the formation of their knowledge, that is, what they have studied in university had affected their geographical knowledge.

The surrounding world is the third source of their geographical knowledge. For half of the teachers this means "*everything that happens in science, in Tiede-magazine* (magazine popularising science) *and in Helsingin Sanomat* (Finland's leading newspaper) *science- and environment sections. And then the documentaries on television and also things that can be found on the Internet*" (T1). The teachers regularly follow different media sources in order to gain new geographical information and to update their own understanding. The teachers also mention that following the news is important when they teach geography because geography should be about teaching globally topical issues. More than half of the teachers say that they do not know what is happening within the discipline of geography. They feel that they do not know where to find scientific information. Only one teacher mentions science and scientific articles as a source of teaching.

3.2. Geographical skills

3.2.1. Skills related directly to geography

The skills related to geography mentioned by the teachers can be grouped into two categories. First, they mention that geography expands one's understanding of the world and one's world view: "*some kind of understanding of the world is developed slowly*" (T6). The teachers feel this can be done by helping students to understand everyday phenomena. The teachers hope that their students would get the chance to know their own surroundings and to develop the ability to read their world, for example, by following the news on various media channels.

A second skill mentioned by the teachers was thinking geographically, since it was thought to be an important skill to be able to understand geographic phenomena and the causality between phenomena. They mention that it is important to be able to understand the world as a diverse place and maps were the most effective teaching method for achieving this. Maps are both produced and interpreted: "*it is important that they have some kind of understanding how to make and understand maps. And*

above all I encourage them to draw maps" (T9). The teachers say that they want their students to think geographically, not just to memorise facts: "*If you understand this geographical.. well.. everyday reality and geographical phenomena, it will enrich your world and make it more interesting*" (T9).

3.2.2. Broader educational aims

The teachers also emphasise geography's importance in supporting broader educational aims. The teachers think it is important to educate young people for life and for their future studies, that is students' own life skills, active citizenship.

Another significant broader educational aim is to teach social skills and provide an all-round education. The teachers hope that by teaching geography, their students understand their own ability to affect things and take part in society: "*So something that makes them believe in the future*" (T3).

3.3. Assessment in geography

When describing their assessment methods in teaching geography, the teachers point out four different aspects related to geography: (1) Spatial conceptualisation is the most mentioned aspect. It means that students are able to show their understanding of the spatial dimension in their answers. Seven teachers test students' ability to interpret or produce maps, diagrams, and charts.

Another important aspect of assessment is the students' ability to (2) apply information. This is mentioned by nine teachers and means that teachers assess whether students could use information studied in new situations. Typical assignments asks students to interpret maps or connect information from many sources. One way to assess this is also to clarify how students could express values related to geography, that is assess whether students have adopted a view of a sustainable way of life.

Seven teachers also evaluate their students' ability to (3) understand and remember information. This can be done by "*… testing how they can define concepts and use them in a proper way, otherwise, how can they speak about geography*" (T9). Lastly, five teachers point out that (4) understanding entities and causality is also an important aspect to be evaluated. Two teachers mention that they evaluate the layout and spelling of the answers, because it develops skills that students need in their future studies.

4. Discussion and conclusion

4.1. Conceptions of geography

This study shows that in-service geography teachers in Finnish upper secondary schools hold quite an extensive understanding of geography. The results of this study are in line with the earlier research results of teachers' conceptions of geography in upper secondary level (e.g., Alexandre, 2016; Arenas-Martija et al., 2017; Béneker et al., 2015; Brooks, 2006; Clausen, 2017; Uhlenwinkel et al., 2017; Walshe, 2007) but in contrast to earlier research results in primary level education (e.g., Catling, 2004; Martin, 2000, 2008; Morley, 2012; Preston, 2014, 2015; Puttick et al., 2018).

What is notable in our results is the dominance of three terms: *spatiality*, *phenomena* and *a holistic approach* that occurred throughout the teachers' conceptions of geographical knowledge, skills and assessment. We will now summarise our results by examining these terms and comparing them to what Alexandre (2009) has said to be the meaning of geography according to newly qualified teachers in Portugal (three principles). Although he (2009) has said that "they also tend to recapture a certain kind of idiographic geographical education" (p. 257).

Geographical knowledge is seen above all as *spatial* knowledge, for example different scales, the human-place-space relationship and human's lived experiences (for similar results see Uhlenwinkel et al., 2017; Walshe, 2007). This corresponds to Alexandre's (2009, p. 257) third principle, in which geography is described to have a spatial perspective. Understanding maps is part of geographical knowledge and skills. Spatial conceptualisation is emphasised in teachers' assessment and producing and interpreting maps are also evaluated by the teachers in this study (see also Alexandre, 2009, p. 257).

Geographical knowledge is about investigating and understanding *phenomena* and causalities between them with the help of geographical concepts (for similar results see Uhlenwinkel et al., 2017). These are also worth evaluating. Teachers aim to help students develop skills to think geographically and expand their understanding of the world by encouraging them to understand everyday geographical phenomena and to be interested in following the surrounding world. This corresponds to the Alexandre's (2009, p. 257) second principle, in which geography is said to present the world as it is and identify today's problems and to predict the future. Similar results can be also seen in the work of Béneker et al. (2015) in which teachers report that "the relevance of the content is related to news and current events, to what students can learn about their local environment" (p. 362). However, Lambert (2011) points out that teaching geography should not be just about "current events" (p. 250). It is also important that students can make "meaning for themselves" (Lambert et al., 2015, p. 727). Clausen (2017, p. 11) found that three out of four Danish secondary geography teachers tries to bridge the gap between the daily life of their students and the discipline of geography. Lane (2015, p. 54) reports results where 12 out of 16 experienced geography teachers do not see any value in exploring their students' conceptions of geography.

Geographical knowledge is *holistic* in nature and it relates to different fields of science, for example human and natural sciences. It has an enquiry-based approach to investigating the world and understanding entities, causality and human-nature relationships. Teachers also evaluate their students' ability to apply and use information in new situations. This corresponds to the Alexandre's (2009, p. 256) first principle in which geography is seen to produce synthesis and to help explain and understand relationships. Furthermore, in the research by Béneker et al. (2015, p. 362) it is found that teachers want to make their classes more enquiry-based, encouraging students to find answers for themselves.

Teachers associate geography with values such as sustainable development (for similar results see Alkis, 2009; Uhlenwinkel et al., 2017) and with the broader educational aims of education such as students' life and social skills (for similar results see

Béneker et al., 2015; Walshe, 2007). According to teachers in this research, it is important that students become aware of their own ability to influence their own lives. These aspects also form the ground of the GeoCapabilities approach in which is attempted to form bridges between geographical education and broader educational aims (see Lambert et al., 2015; Uhlenwinkel et al., 2017). As our results show, teachers form these bridges by saying that their teaching of geography contains aspects of broader educational aims.

It is clear that the content of geography held by the researched teachers comes from the national core curriculum (see Table 2) (similar results in different national context see Béneker et al., 2015; Seow, 2016). However, in our research teachers see themselves as playing an essential role when choosing what to emphasise and what to teach. It is interesting, although not surprising, (see earlier research findings by Alexandre, 2016; Arenas-Martija et al., 2017, Clausen, 2017; Brooks, 2006; Walshe, 2007) to find out that teachers' conceptions and understanding of geographical knowledge comes mainly from their work as teachers, from their own life experiences and from the media, not from the discipline of geography. Arenas-Martija et al. (2017, p. 60) found that only one teacher is using scientific material as a resource in her teaching and Alexandre (2016, p. 178) also points out in his research that university has little effect on teachers' understandings.

4.2. Is teachers' geographical knowledge powerful knowledge?

We have concluded that the teachers we researched hold broad conceptions of geography and next we turn our view towards how this knowledge can be regarded as powerful. What kind of knowledge does PK resemble?

Following Young's (2014) first definition of PK, we can say that the teachers' knowledge of geography is only partly powerful because it does not originate from the discipline of geography. However, this view can be questioned because the knowledge that a school produces is different from the knowledge of the discipline (Young, 2014, p. 76; see also Lambert, 2014, p. 163; Lambert et al., 2015, p. 727; Maude, 2016, p. 72). We follow Maude's example of adopting Young's second definition of PK, what it can do for those who have it, and we conclude that this research shows that teachers in this data do indeed display PDK (see five knowledge types by Maude, 2018; see also Lambert et al., 2015 and Table 1 in this research):

1. The teachers describe that they provide "new ways of thinking about the world" by taking students' daily lives and topical phenomena that occur in the world at the core of their teaching. They do this with the aid of scientific concepts and a range of geographical skills so that students can form a bridge between their own geographical experiences and the discipline of geography. The teachers in our study use geographical concepts to help their students make sense of geographical phenomena and in that way students are able to access knowledge beyond their experience, which is a clear indication of PK (Young, 2013, p. 110). Knowledge is powerful when combining the students' own experiences with the discipline of geography (see Catling, 2014; Roberts, 2014).

2. The teachers provide "powerful ways of analysing, explaining and understanding" the world and its phenomena, spatiality and causal relationships. The teachers think that geographical knowledge operates on different scales to understand the relative location of things. The teachers in this study feel that they help their students to apply geographical information and use information in new situations.
3. The teachers give "students some power over their own geographical knowledge" by enabling them to evaluate, produce and create new geographical knowledge, for example, in the form of maps.
4. The teachers emphasise the students' own experiences and the surrounding world around them by encouraging students "to follow and participate in debates on significant local, national and global issues".
5. The teachers provide geographical "knowledge of the world", by teaching students something that they do not already know about the world, opening up their view of the world with the help of a holistic approach.
6. We also add number 6 to Maude's list of knowledge types by presenting that geographical knowledge can be seen as PK when it is related to the broader educational aims of schooling (see Uhlenwinkel et al., 2017). As a result of this research, we discovered that the geography teachers we interviewed teach geography which supports the idea of building a sustainable way of life and developing eco-social knowledge (see FNBE, 2016, p. 13, the underlying value). Their teaching also "reinforces the student's awareness of the impacts of human activities on the state of the environment" (FNBE, 2016, p. 34, the general objectives of education). Four out of the overall six cross-curricular themes of the Finnish National Core Curriculum for General Upper Secondary Schools (see FNBE, 2016, p. 35) can be applied to a great extent to geography according to this research, including: active citizenship; a sustainable way of life and global responsibility; knowledge about cultures and internationality; as well as multiliteracy and the media.

It is important to notice that we should be cautious when interpreting these aspects because it is a "matter of subjective judgement" whether these presented knowledge types can be regarded as powerful (Maude, 2016, p. 72). Thus, PK in geography can be difficult to define in the form of a curriculum, for example, because teachers are the real interpreters of a curriculum (see Lambert, 2014, p. 169; Lambert & Morgan, 2010, p. 50) and teachers' conceptions "shapes how that subject is actually taught" (Alexandre, 2016, p. 168). If teachers' have a clear vision of their subject, it will affect their success (Brooks, 2010; Lane, 2009) and for that reason, our research tried to support the teachers accompanied in this study reflect upon their own teaching and geographical understanding. This can also be regarded as powerful.

This article has shown that we need specialised teachers who know the discipline of geography well (see also Lambert & Hopkin, 2014) if we want to ensure that students have access to PK in geography. Previous research has shown that teachers at primary level and also pre-service teachers at secondary level do not possess clear enough knowledge of the discipline of geography to make their teaching powerful in the PK sense. Lambert (Stoltman et al., 2015) point out that PK "needs to be taught" (p. 2). Thus, in this research we have added to the previous research on teachers'

conceptions of geography. We have examined the views of Finnish in-service upper secondary schools teachers' and found that experienced, qualified teachers with a disciplinary background in geography hold a clear understanding of geography which can be regarded as PDK. Our research has only grasped the surface of teachers' conceptions and there is a need for future research into teachers' understanding of powerful geographical knowledge.

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References

Alexandre, F. (2009). Epistemological awareness and geographical education in Portugal: The practice of newly qualified teachers. *International Research in Geographical and Environmental Education*, *18*, 253–259.

Alexandre, F. (2016). The standardization of geography teachers' practices: A journey to self-sustainability and professional identity development. *International Research in Geographical and Environmental Education*, *25*, 166–188.

Alkis, S. (2009). Turkish geography trainee teachers' perceptions of geography. *International Research in Geographical and Environmental Education*, *18*, 120–133.

Arenas-Martija, A., Salinas-Silva, V., Margalef-García, L., & Otero-Auristondo, M. (2017). Fragility of pedagogical content knowledge in geography. *Journal of Geography*, *116*, 57–66.

Béneker, T., Palings, H., & Krause, U. (2015). Teachers envisioning future geography education at their schools. *International Research in Geographical and Environmental Education*, *24*, 355–370.

Brinkmann, S. (2017). The Interview. In N. K. Denzin & Y. S. Lincoln (Eds.) *The SAGE Handbook of Qualitative Research* (pp. 576–599). USA: SAGE publications.

Brooks, C. (2006). Geographical Knowledge and Teaching Geography. *International Research in Geographical and Environmental Education*, *15*, 353–369.

Brooks, C. (2010). Why geography teachers' subject expertise matters. *Geography*, *95*, 143–148.

Catling, S. (2004). An understanding of geography: The perspectives of English primary trainee teachers. *GeoJournal*, *60*, 149–158.

Catling, S. (2014). Giving younger children a voice in primary geography: Empowering pedagogy – a personal perspective. *International Research in Geographical and Environmental Education*, *23*, 350–372.

Catling, S., & Martin, F. (2011). Contesting powerful knowledge: The primary geography curriculum as an articulation between academic and children's (ethno-)geographies. *The Curriculum Journal*, *22*, 317–335.

Chang, C.-H., & Kidman, G. (2018). Reflecting on recent geographical and environmental education issues. *International Research in Geographical and Environmental Education*, *27*(1), 1–4.

Clausen, S. W. (2017). Exploring the pedagogical content knowledge of Danish geography teachers: Teaching weather formation and climate change. *International Research in Geographical and Environmental Education*, *27*, 267–280.

Finnish National Board of Education. (2016). *National core curriculum for general upper secondary schools 2015*. Helsinki: Next Print Oy.

Huckle, J. (2017). Powerful geographical knowledge is critical knowledge underpinned by critical realism. *International Research in Geographical and Environmental Education*, 1–15. doi: 10.1080/10382046.2017.1366203

Lambert, D. (2011). Reviewing the case for geography, and the "knowledge turn" in the English National Curriculum. *Curriculum Journal*, *22*, 243–264.

Lambert, D. (2014). Subject teachers in knowledge-led schools. In M. Young, D. Lambert, C. Roberts, & M. Roberts (Eds.) *(2014) Knowledge and the future school: Curriculum and social justice* (pp. 159–187). London: Bloomsbury Academic.

Lambert, D. (2016). A response to Graves and Slater. *International Research in Geographical and Environmental Education*, *25*, 192–193.

Lambert, D., & Biddulph, M. (2015). The dialogic space offered by curriculum-making in the process of learning to teach, and the creation of a progressive knowledge-led curriculum. *Asia-Pacific Journal of Teacher Education*, *43*, 210–224.

Lambert, D., & Hopkin, J. (2014). A possibilist analysis of the geography national curriculum in England. *International Research in Geographical and Environmental Education*, *23*, 64–78.

Lambert, D., & Morgan, J. (2010). *Teaching Geography 11-18 – A Conceptual Approach*. England: Open University Press.

Lambert, D., Solem, M., & Tani, S. (2015). Achieving human potential through geography education: A capabilities approach to curriculum making in schools. *Annals of the Association of American Geographers*, *105*, 723–735.

Lane, R. (2009). Articulating the pedagogical content knowledge of accomplished geography teachers. *Geographical Education*, *22*, 40–50.

Lane, R. (2015). Experienced geography teachers' PCK of students' ideas and beliefs about learning and teaching. *International Research in Geographical and Environmental Education*, *24*, 43–57.

Lichtman, M. (2013). *Qualitative Research in Education: A User's Guide*. USA: Sage publications.

Martin, F. (2000). Postgraduate primary education students' images of geography and the relationship between these and students' teaching. *International Research in Geographical and Environmental Education*, *9*, 223–244.

Martin, F. (2008). Knowledge bases for effective teaching: Beginning teachers' development as teachers of primary geography. *International Research in Geographical and Environmental Education*, *17*, 13–39.

Maude, A. (2015). What might powerful geographical knowledge look like? *Geography*, *101*(2), 70–76.

Maude, A. (2016). What is powerful knowledge and can it be found in the australian geography curriculum? *Geographical Education*, *28*, 18–26.

Maude, A. (2018). Geography and powerful knowledge: A contribution to the debate. *International Research in Geographical and Environmental Education*, *27*, 179–190.

Mitchell, D. (2016). Geography teachers and curriculum making in "changing times." *International Research in Geographical and Environmental Education*, *25*, 121–133.

Mitchell, D., & Lambert, D. (2015). Subject knowledge and teacher preparation in English secondary schools: The case of geography. *Teacher Development*, *19*, 365–380.

Morgan, J. (2011). Knowledge and the school geography curriculum: A rough guide for teachers. *Teaching Geography*, *36*, 90–92.

Morley, E. (2012). English primary trainee teachers' perceptions of geography. *International Research in Geographical and Environmental Education*, *21*, 123–137.

Preston, L. (2014). Australian primary pre-service teachers' conceptions of geography. *International Research in Geographical and Environmental Education*, *23*, 331–349.

Preston, L. (2015). Australian primary in-service teachers' conceptions of geography. *International Research in Geographical and Environmental Education*, *24*, 167–180.

Puttick, S., Paramore, J., & Gee, N. (2018). A critical account of what "geography" means to primary trainee teachers in England. *International Research in Geographical and Environmental Education*, *27*, 165–178.

Roberts, M. (2014). Powerful knowledge and geographical education. *Curriculum Journal*, *25*, 187–209.

Seow, T. (2016). Reconciling discourse about geography and teaching geography: The case of Singapore pre-service teachers. *International Research in Geographical and Environmental Education*, *25*, 151–165.

Slater, F., Graves, N., & Lambert, D. (2016). Editorial: Geography and powerful knowledge. *International Research in Geographical and Environmental Education*, *25*, 189–192.

Stoltman, J., Lidstone, J., & Kidman, G. (2015). Powerful knowledge in geography: IRGEE editors interview Professor David Lambert, London Institute of Education, October 2014. *International Research in Geographical and Environmental Education*, *24*(1), 1–5.

Tani, S. (2014). Geography in the Finnish school curriculum: Part of the "success story"? *International Research in Geographical and Environmental Education*, *23*, 90–101.

Uhlenwinkel, A., Béneker, T., Bladh, G., Tani, S., & Lambert, D. (2017). GeoCapabilities1 and curriculum leadership: Balancing the priorities of aim-based and knowledge-led curriculum thinking in schools. *International Research in Geographical and Environmental Education*, *26*, 327–341.

Waldorf, R. (1996). "What is geography?" An analysis of definitions provided by prospective teachers of the subject. *International Research in Geographical and Environmental Education*, *5*, 69–76.

Walshe, N. (2007). Understanding teachers' conceptualisations of geography. *International Research in Geographical and Environmental Education*, *16*, 97–119.

Young, M. (2013). Overcoming the crisis in curriculum theory: A knowledge-based approach. *Journal of Curriculum Studies*, *45*, 101–118.

Young, M. (2014). Powerful knowledge as a curriculum principle. In M. Young, D. Lambert, C. Roberts, & M. Roberts (Eds.) *(2014) Knowledge and the future school: Curriculum and social justice* (pp. 65–88). London: Bloomsbury Academic.