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Exploring pre-service teachers' and comprehensive school pupils' understandings of literacies in digital environments

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Abstract
This study focuses on Finnish pre-service teachers' and comprehensive school pupils' understandings of literacies in digital environments. The study included 181 participants: 38 pre-service teachers, 79 primary school (PS) pupils and 64 lower secondary school (LS) pupils. The pre-service teachers created concept maps and written descriptions that portrayed their understanding of reading literacy, digital literacy and multiliteracy. The pupils were asked to write down what kinds of literacies they need in digital environments. The results indicate that the pre-service teachers mainly understood the many modalities of literacies. However, they emphasised reading literacy as the fundamental basis of other literacies. Similarly, the PS pupils perceived the many modalities of literacies, especially emphasising their visual elements. Instead of noticing the diversity of texts, LS pupils highlighted critical attitude and language skills.

Keywords
Pre-service teacher, comprehensive school pupil, digital environment, reading literacy, digital literacy, multiliteracy

Introduction

In modern society, digital environments have become a major part of people's lives, and a considerable amount of research has been published on the literacies needed to manage these environments. These literacies have been defined by many scholars and referred to in various ways, for example, digital literacy, digital competence, multiliteracies, media literacy and twenty-first-century skills (eg. van Laar et al., 2017; Martínez-Bravo et al., 2020). Studies have examined the use of digital devices and environments, particularly among children and adolescents (e.g., Smahel et al., 2020), and in educational contexts, literacies have been examined in international comparative studies (e.g., Fraillon et al., 2020). Despite wide, multifaceted prior research, little is known about individual understandings of the literacies required in digital realms (Kulju et al., 2020; List et al., 2020).

The aim of the current paper is to study Finnish pre-service teachers' and comprehensive school pupils' understandings of the required literacies. The research questions are as follows: 1) how do pre-service teachers understand the notions of reading literacy, digital literacy and multiliteracy as well as the relations between these concepts? and 2) How do comprehensive school pupils understand the literacies they need in digital environments?

It is important to study pre-service teachers' conceptions of literacies because previous research has shown that teachers' personal qualities, such as conceptions, attitudes and beliefs about teaching and learning, can impact their classroom practices (e.g., Pajares, 1992). Studies of digital technology in education have extended these observations, showing that teachers' qualities play a significant role in the integration of information and communication technologies (ICT) into teaching (e.g., Bingimlas, 2009). Moreover, although the importance of digital environments is widely recognised, teachers are not necessarily aware of pupils' daily environments and do not utilise them in their teaching practices (Kulju et al., 2020). It is necessary to support pupils' literacy learning; thus, it is important to identify any gaps and strengths concerning their literacies. Last, the present study showcases youths' voices, which have been underrepresented in this research field (e.g., Gillett-Swan & Sargeant, 2018).

Literacies in digital environments

Previous literature (e.g., Leu et al., 2013) has stressed the overlapping nature of the various types of literacies and their scholarly conceptual understandings. In this section, we attempt to briefly define the interwoven key concepts of the current study: literacy, digital literacy and multiliteracy.

Literacy has already been defined through UNESCO's (2006) four theoretical understandings: 1) as skills, with an emphasis on the cognitive skills involved in reading and writing; 2) as an applied, practiced and situated approach to literacy; 3) as a process of learning; and 4) as a text, for example, genres, subject areas and even representations of ideological content. In the current study, we utilised the concept of reading literacy to observe how the pre-service teachers conceptualised reading literacy alongside digital literacy and multiliteracy.

Digital literacy has been divided into three main categories (List, 2019). The first is digital literacy as an automatic process that reflects the idea of digital natives (Prensky, 2001), in which literacy is acquired while being exposed to digital environments as one is growing from childhood into adulthood. The second category views digital literacy as a set of skills, which is a common way to structure the concept, and refers to various frameworks and taxonomies. For example, Ng (2012) defines digital literacy through cognitive, technical and social-emotional dimensions. Third, sociocultural perspectives on digital literacy (e.g., Lankshear & Knobel, 2006) stress literacy as an intentional and situated social practice that is learned in social online communities that are meaningful to their participants. List (2019) states that this perspective is the opposite of the digital native perspective, yet it deepens the skill perspective by offering a context in which the skills can be practiced. In their meta-analysis of digital literacy constructs, Martínez-Bravo et al. (2020) discover that the concept is related to the skills and competences of technology use but also to teaching, learning and related strategies. In addition to previous definitions, it is essential to note that digital literacy is now the basis for being able to operate as an active citizen, that is, to engage in civic and political activities online (Kahne et al., 2012).

Multiliteracies, which are closely connected to digital literacy (Martínez-Bravo et al., 2020), is a key concept representing the literacies fostered in the Finnish National Core

Curriculum for Basic Education (FNCCBE; NBoE, 2014). Multiliteracy (in the singular form) is defined as follows:

> the competence to interpret, produce and make a value judgement across a variety of different texts, which will help the pupils to understand the different modes of cultural communication and to build their personal identity. Multiliteracy is based on the broad definition of text. In this context, text refers to knowledge presented by systems of verbal, visual, auditive, numeric and kinaesthetic symbols and their combinations. (NBoE, 2014, pp. 22–23)

In the Finnish context, multiliteracy differs somewhat from the original concept (New London Group [NLG], 1996), which introduces the multimodal and multicultural aspects of multiliteracies. In the FNCCBE definition, multimodality is accentuated, but multicultural diversity is mentioned only briefly. The relationship between the Finnish concept of multiliteracy and the international literacies debate is problematic, and there has not been an attempt to bring the original concept into Finnish pedagogy. However, the term is compact, novel and relatively neutral in the Finnish context (Mertala, 2018).

Linguistic issues add to the challenges of conceptualising literacy. In the Finnish language, a direct translation of 'literacy' does not exist; instead, 'reading and writing' are commonly used together or individually. Moreover, the Finnish term 'lukutaito' ('luku' meaning 'reading'; 'taito' meaning 'a skill') in the singular form means 'reading literacy', but 'lukutaidot', its plural form, is a wider concept that refers to different types of reading/interpreting and writing/producing skills. However, the FNCCBE utilises the singular form of the concept of multiliteracy ('monilukutaito'), even though it includes both the interpretative and productive side of the concept. According to Mertala (2018), these widely discussed linguistic challenges affect all the purposes for which literacy concepts are translated and used in the Finnish language.

Previous research concerning the understanding of digital literacies

Recent research on pre-service teachers' and pupils' understandings of literacies in digital environments is scarce. For example, List et al. (2020) state that pre-service teachers' conceptions concerning digital literacy have not been extensively studied. Instead, earlier studies have focused on their attitudes towards technology adoption, beliefs regarding their own digital literacy skills and level of professional competence that will be needed in future work. For example, List (2019) states that, in their beliefs, pre-service teachers comprehended digital literacy as mostly skill-based by nature. More attention was placed on technology skills than cognitive skills, such as criticism of sources, the digital native perspective was quite prominent, and socio-emotional aspects (e.g., communication) were almost completely missing. Similarly, in those studies on pre-service teachers' concepts of digital literacy, both List et al. (2020) and Nabhan (2021) show that understandings of digital literacy are often narrow and superficial, and digital literacy is seen as the fluent use of technology, instead of being comprehended on a more sophisticated level, for which critical reasoning is needed.

Regarding multiliteracy, previous research has focused mainly on projects implemented in classrooms and on classroom pedagogy, not on teachers' conceptualisations per se (Kulju et al., 2018; Kulju et al., 2020). However, there are some studies about teachers' (Hankala et al., 2022) and experts' (Matveinen et al., 2021) conceptions of multiliteracy. Accordingly, children's and adolescents' conceptions of digital literacy and multiliteracy have still not been directly studied; instead, their interpretations of the internet and computers have gained more research interest (e.g., Eskelä-Haapanen & Kiili, 2019; Wennås Brante & Walldén, 2021).

Methods

This section is structured according to the research questions. The first addresses pre-service teachers' understandings of the notions of reading literacy, digital literacy and multiliteracy and the relations between these concepts as presented in concept maps. The second question focuses on pupils' written explanations of their understanding of the literacies they need in digital environments. This study was implemented during 2017–2019 as part of a research project exploring digital literacy in the context of mental well-being.

Pre-service teachers' concept maps (RQ1)

The research data consist of 38 concept maps and complementary descriptions created by pre-service teachers who were going to teach at the primary school level (grades 1 to 6). These first and second-year students participated in a multidisciplinary course combining health education and mother tongue and literature. The course, which was a compulsory part of their Master of Education degree programme, focused on enhancing their digital literacy skills, allowing them to guide pupils in digital environments concerning mental well-being.

The concept maps were created individually and by hand during the course's first meeting. The pre-service teachers were asked to create a concept map about the definitions of literacy concepts 'lukutaito' ('reading literacy'), 'monilukutaito' ('multiliteracy') and 'digitaalinen lukutaito' ('digital literacy') and the relations between these concepts. They were also asked to write a few sentences of complementary description about the main points of their maps. We then conducted a qualitative data-driven content analysis that included quantification (Schreier, 2012) to analyse the concept maps from two perspectives: the relations between the three literacy concepts and the expressions associated with literacies.

Relations between literacy concepts: two authors studied the 38 maps and 33 complementary descriptions separately, after which they compared their results, which were similar, for the triangulation of the data. Both authors analysed the concept maps by placing the maps and their associated descriptions side by side. They considered which concepts from each map were labelled as the main concept, sub-concept or parallel concept, and then compared the maps with the complementary descriptions. Generally, the authors' interpretations of the maps were in line with the complementary descriptions. In cases in which a map could be understood in multiple ways, the description written by the pre-service teacher guided the researchers' interpretation. Five students' descriptions were missing; hence, only their concept maps were analysed.

Expressions associated with literacies: The expressions mentioned in the concept maps were listed and then classified into categories. An expression typically consisted of one word ('pictures') or of a meaning-carrying compound of a few words ('the ability to read different kinds of text types'), although in some cases there were complete sentences. Each expression was examined in relation to what literacy or literacies it referred to. Quite often, one expression was related to more than one literacy. Thus, a single expression may have been counted one, two or three times, depending on the situation. This resulted in the total number of expressions (761) being higher than the actual number of expressions that were mentioned.

Pupils' written answers to literacies (RQ2)

The data consist of 85 written answers created by 143 comprehensive school pupils from four schools: 21 group answers from 79 primary school (PS) pupils (ages 9–10, grades 3 and 4) and 64 individual answers from lower secondary (LS) school pupils (ages 13–15, grades 7–9).

PS and LS pupils participated in three workshops in which they designed digital environment scenarios for the promotion of mental well-being. The workshops were co-organised by the authors and teachers as part of the schools' general curriculum. To ground the scenarios, in the first workshop (1.5 h), the pupils were asked to write down their thoughts on the literacies ('lukutaidot' – plural form) that they felt they needed in digital environments. In cases where this question was too difficult, the assignment included an additional question: 'what skills do you need while using different digital environments, for example websites or applications?' The pupils answered by creating written presentations with Book Creator (PS) and Google Slides (LS), and the data were subsequently analysed using data-driven content analysis (Schrier, 2012). The responses were presented as the number of mentions, which were usually single words ('writing') or short sentences ('You need to know how to behave').

In the current study, the data collection method varied between groups. Thus, the authors could only examine indicative explorations of the similarities and differences. The pre-service teachers were assumed to have a more complex understandings of literacies than the school pupils, and for this reason, their assignment required them to engage with a more conceptual level that the pupils. PS pupils were allowed to answer in groups of three to five because earlier studies (e.g., Eskelä-Haapanen & Kiili, 2019) have shown that, in interviews, children's answers might remain scarce. The LS pupils were considered capable of producing answers individually.

Regarding the ethics of the study, the pre-service teachers gave their consent to participate in digital form. As the comprehensive school pupils were minors, and the project topic as a whole addressed mental well-being, the research group applied for an ethics clearance that was approved by the university's Ethics Committee. In addition, the pupils themselves and their parents gave their consent for the children to participate.

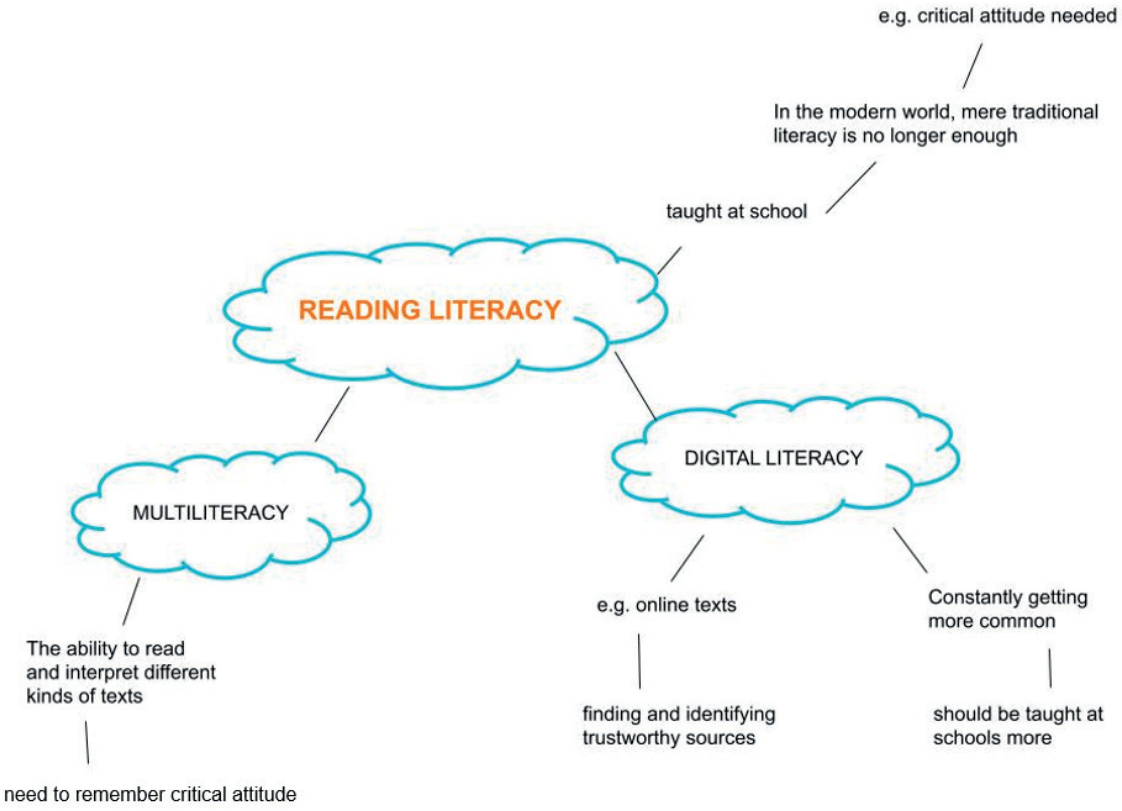
Results

Pre-service teachers' understanding of literacies in digital environments (RQ1)

Relations between literacy concepts

The pre-service teachers perceived the relations between literacy concepts in three ways via 38 concept maps: 25 maps represented reading literacy as the main concept, and correspondingly, multiliteracy was the main concept of eight maps. In the five remaining maps, all literacies were understood as equal. On maps where reading literacy or multiliteracy were the main concepts, the sub-concepts were usually parallel.

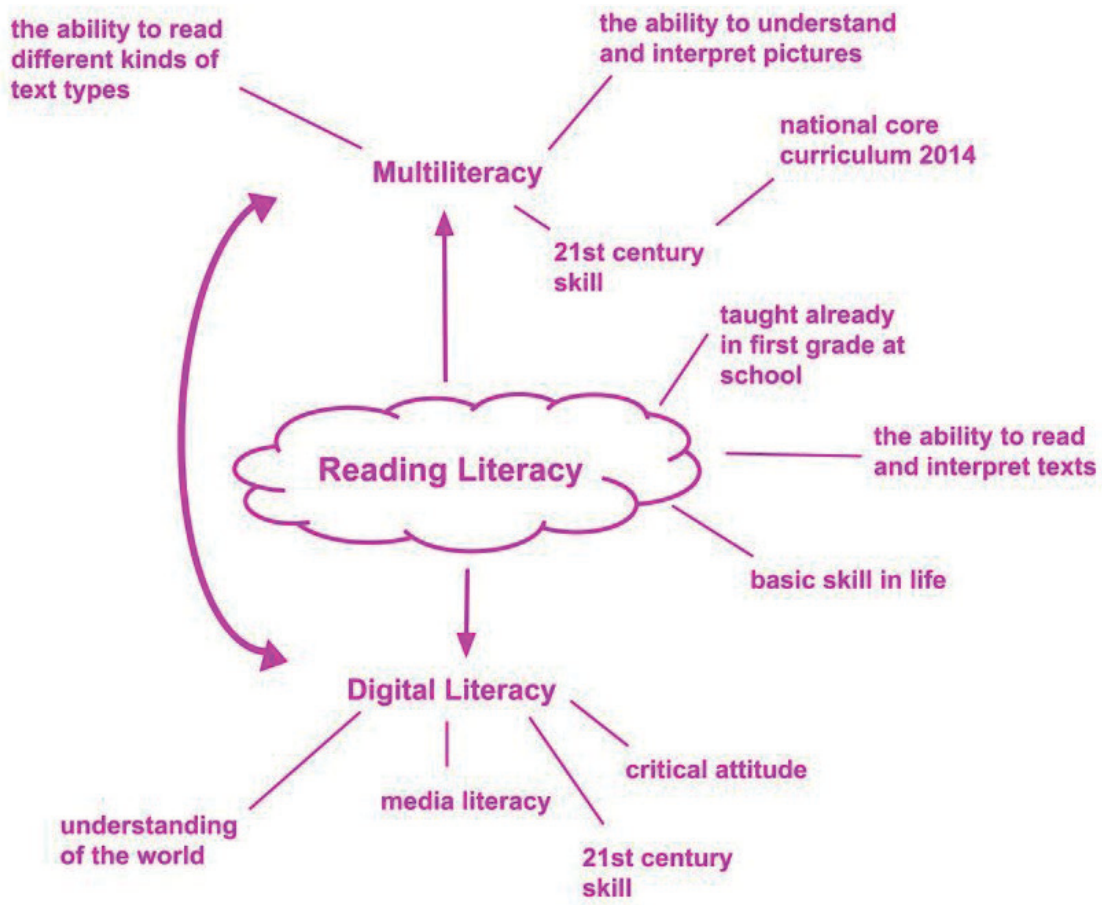
In the 25 maps in which reading literacy was placed as the central concept, there were two kinds of perspectives: 1) reading literacy above other literacies and 2) reading literacy as a basis or enabler of the other literacies. Altogether, 15 pre-service teachers set reading literacy above other literacies as a main concept, including digital literacy and multiliteracy as its sub-concepts, as presented in Figure 1 (accompanied by pre-service teachers' complementary descriptions).



In my opinion, reading literacy is a main concept that encompasses smaller entities, such as multiliteracy and digital literacy. Mere reading literacy is no longer enough now because anyone is capable of writing and publishing anything they want. Thus, the importance of these different types of literacies and a critical attitude is constantly being emphasised.

Figure 1 Concept map and complementary description

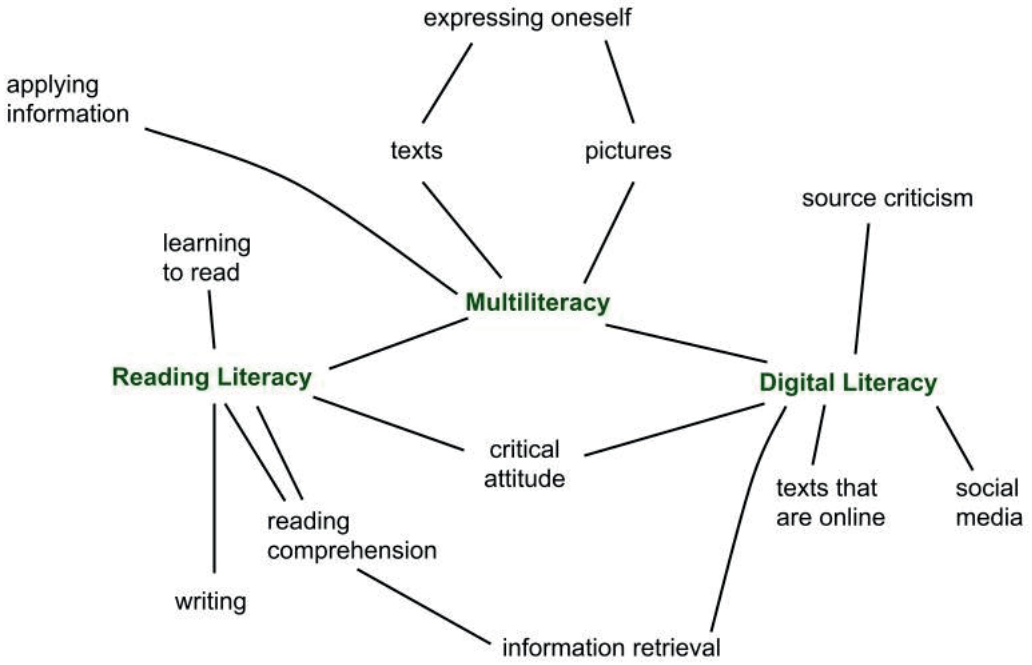
In 10 concept maps, reading literacy was understood as a solid basis for other literacies. In many of the complementary descriptions, digital literacy and multiliteracy were presented as concepts that can be built on top of reading literacy or as an extension of it (Figure 2).



Reading literacy is the basic skill of life, and when you have learned it, it is possible to also learn multiliteracy and digital literacy. These skills will be given more attention and practiced in primary school because they are a part of the curriculum.

Figure 2 Concept map and complementary description

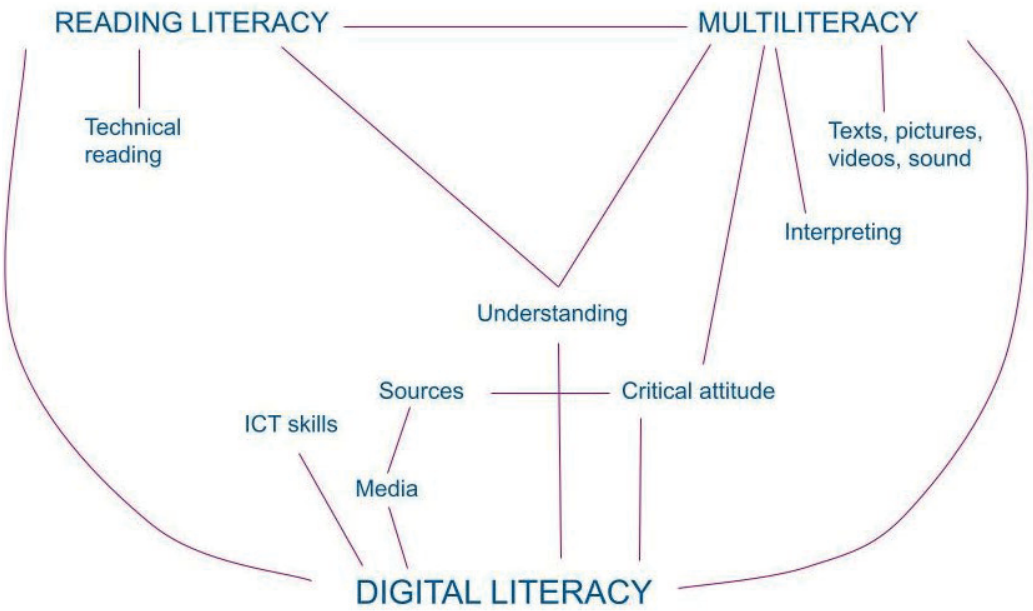
For eight pre-service teachers, multiliteracy was the main concept under which other literacies were situated (Figure 3).



I thought that multiliteracy would consist of reading literacy and digital literacy. Multiliteracy is the ability to search for information in a diverse way from a range of environments, as well as the ability to review existing information critically.

Figure 3 Concept map and complementary description

In five pre-service teachers' concept maps, all literacies were closely linked or were placed in equal relationships with one another (Figure 4).



Reading literacy, multiliteracy and digital literacy are all connected. They all require reading comprehension. Multiliteracy consists of interpreting and producing text, in addition to technical reading. Texts include, in addition to written language, images, videos and notes. To the concept of digital literacy, I associate media and, through it, a critical attitude towards media.

Figure 4 Concept map and complementary description

Although reading literacy was given a central role in the pre-service teachers' concept maps, the importance of multiliteracy and digital literacy were emphasised in many complementary descriptions. However, the concepts of digital literacy, and, to a lesser extent, of multiliteracy were not clear for some participants. This was noticeable in their descriptions. In addition, the link between multiliteracy and digital literacy was not usually indicated in the maps. It seems that it was more important for pre-service teachers to emphasise the main concept than the sub-concepts.

Expressions associated with literacies

There were a total of 761 expressions on the concept maps (see Table 1), 188 of which were related to reading literacy, 289 to digital literacy and 284 to multiliteracy. The number of expressions by the number of expressions by pre-service teachers varied: some produced a few expressions, and most produced around 20. In addition, there were four participants who each produced a rich number of expressions: 46, 50, 66 and 81, a total of 243 of the 761 expressions.

Table 1 Number of expressions in pre-service teachers' literacies maps

Reading literacy, digital literacy and multiliteracy in pre-service teachers' concept maps (RL = reading literacy, DL = digital literacy, ML = multiliteracy)	**RL** 188	**DL** 289	**ML** 284	**ALL** 761
Texts and digital environments	28	98	110	236
Reading as a basic skill and learning reading skills	75	20	17	112
Understanding, interpretation and reading of (printed or multimodal) texts	17	32	61	110
Information retrieval skills and criticism of sources	17	42	26	85
Critical attitude	9	25	23	57
Production	10	15	14	39
ICT skills, including netiquette	-	24	3	27
Interaction and communication	5	5	5	15
Society and active citizenship	6	4	3	13
The other expressions	21	24	22	67

The pre-service teachers typically perceived literacies as *texts* and the *digital environments* in which the texts were interpreted or produced. In their maps, the total number of mentions was 236, including texts (169) and digital environments (67). Of the 169 texts, 82 were printed or digital texts, such as 'poems', 'textbooks' or 'blogs'. Multimodal texts (36) were mainly 'videos', 'advertisements' and 'news' – games were mentioned only twice. Visual texts (30) referred almost solely to 'images'. Auditive ('voice') or numeral texts were mentioned only in single maps, as were 'symbols' and 'signs'. The digital environments (67) were perceived as social media applications (mentioned by name), general concepts ('social media') and device types ('tablet'). Notably, 88 of the 236 expressions were produced by three pre-service teachers.

Reading as a basic skill and learning reading skills (112 expressions): individuals' reading literacy of printed texts and its development in the initial school years was an important part of the literacies in the pre-service teachers' concepts (75). They mentioned that reading literacy is 'the basic skill in life' and that 'reading literacy develops over time'. Expressions attached to reading literacy were typically 'reading comprehension skills' and more technical skills, such as 'reading fluency' or 'letter–sound correspondences'.

Understanding, interpretation and reading of (printed or multimodal) texts (110 expressions): these expressions were mostly associated with multiliteracy and consisted of a diverse collection of various skills. The pre-service teachers mostly used the words 'understanding' and 'interpretation', as well as 'reading'. In several expressions, the words were connected to visuality and, to some extent, to numbers, symbols and speech.

Information retrieval skills and criticism of sources generated 85 expressions. However, 24 mentions were supplied by one person. The ability to search for, find, use and evaluate information was associated most often with digital literacy and, to a lesser extent, with multiliteracy. Information retrieval skills were expressed on a general level, for example, 'an ability to obtain information'. In addition, some steps of the informal retrieving process were presented alone, especially critical evaluation of the information, such as 'evaluating materials found from the internet'.

Critical attitude (57 expressions): the previous category was accompanied by expressions indicating a critical attitude that could be related to the information retrieval process. In addition, pre-service teachers often used only one word, '*kriittisyys*'; this can be translated as 'critical attitude' or a critical stand towards, for example, different texts. It was connected more often to multiliteracy and digital literacy than to reading literacy.

Production (39 expressions) mostly consisted of separate expressions, including 'producing your own digital material', 'writing' and 'image editing'. Understandably, production is not usually placed as a part of reading literacy, yet it was not seen as a characteristic feature of multiliteracy or digital literacy.

ICT skills (27 expressions) were connected almost exclusively to digital literacy. In most cases, the pre-service teachers mentioned the skills needed in digital environments or the use of ICT at a very general level ('the digital devices and the use of them'). Thus, it was not possible to decipher whether they meant technical skills or more complex skills, or if the skills included interpretative or productive elements or both. Netiquette, which was seldom mentioned, was connected to ICT skills.

Interaction and communication (15): expressions such as 'interaction' or 'communication' were mainly concise and did not reveal further information. Similarly, expressions belonging to the category *Society and active citizenship* (13) consisted of only single sporadic expressions, for instance, 'reading literacy keeps you attached to society' and 'public participation'. The expressions in both categories came from a very limited number of pre-service teachers, who attached the same expressions to all three literacies.

Other expressions (67): The 'other expressions' category included notions mentioned only a few times or once. Examples include 'language', 'curricula', 'assessment', 'values' and 'self-esteem'.

Comprehensive school pupils' understanding of literacies in digital environments (RQ2)

This section features pupils' understanding of literacies in digital environments. In their written answers, on average, the PS pupil groups mentioned six factors concerning literacies. One group supplied only two factors, while a few other groups provided 10. LS pupils con-

tributed one to three factors concerning literacies. Table 2 presents the categories of literacies needed in digital environments according to the number of mentions in PS pupils' answers.

Table 2 Literacies needed in digital environments in pupils' written answers

Primary school students (79 students in 21 groups)	121	**Lower secondary school students (64 students)**	125
Understanding, interpretation and reading of multimodal texts	37	Critical attitude	30
ICT-skills, including netiquette	28	Language skills	30
Language skills	15	Reading literacy	21
Reading literacy	14	ICT-skills, including netiquette	20
Production skills: writing	7	Interaction and communication	7
Information retrieval skills and criticism of sources	7	The other mentions	7
The other mentions	6	Understanding, interpretation and reading of multimodal texts	4
Thinking skills	5	Information retrieval skills and criticism of sources	5
Critical attitude	2	Production skills: writing	3

Understanding, interpretation and reading of multimodal texts. The PS groups described the uses of literacies in a versatile manner (in 37 mentions). They characterised literacies as multimodal skills and most often described a diverse selection of literacies that they believed were necessary in digital environments: 'we need our literacy, for example, math literacy, normal literacy, sign literacy, image literacy, digital language, voice literacy (note emoji) and to recognise vibration [of a device].' These pupils especially experienced the need for the ability to read images and symbols (16). Other responses included literacy for guidelines and commands ('You need to understand commands…'), game literacy ('You need to understand hints in games'), mathematical literacy and the listening skills necessary to comprehend internet texts. Only four LS pupils mentioned diverse literacies, and none responded with image reading.

ICT skills, including netiquette. Both the PS groups (28) and the LS pupils (20) described literacy in terms of the abilities needed to act in digital environments. They most often mentioned ICT skills that they deemed necessary to operate technical devices, diverse applications, and the internet. Both groups brought up general technical skills, such as the mere 'ability to use computers and mobile phones' (LS), and more concrete skills, such as 'You need to know to push the right tabs…' (PS). PS pupils more often mentioned the latter. Both PS and LS pupils described safety skills (e.g., decency of the content utilised). Regarding netiquette, they referred to knowing and acting according to the rules and behaving well on social media.

Language skills. Both pupil groups (PS 15, LS 30) categorised language skills as necessary in digital environments: 'you need to know foreign languages' (PS). For the LS pupils, this tied with critical attitude as the most mentioned category. English was especially dominant among the languages in both groups.

Reading skills. Another common literacy area for both pupil groups was reading literacy per se (PS 14, LS 21). The PS pupil groups mostly only mentioned the word 'reading' or connected it with writing. In some cases, they highlighted the importance of the pace of reading,

especially when browsing internet sites. LS pupils brought forth reading comprehension, reading of different texts and reading fluency: 'you need to know how to read quickly by browsing and find essential issues from the text.'

Critical attitude was mentioned by only two PS pupil groups. In contrast, the LS pupils mentioned it most often (30 mentions; tied with language skills). In numerous answers, they explained the importance of evaluating the trustworthiness of different texts: 'in the use of digital environments, you need to distinguish what is true and what is not. Is the information in the news reliable and is the image I see real or edited?'

There were several skills or issues with fewer than 10 mentions. Both groups stated the need for *information retrieval skills and criticism of sources* (PS 7, LS 5). The answer provided by one PS group could be interpreted as multimodal information retrieval because they expressed the ability to navigate YouTube when looking for interesting video content: 'in YouTube, you need to look at the title, and you can also read images'.

Production skills, especially writing, were mentioned by only a few pupils. The PS groups briefly mentioned writing on its own or with reading. The LS pupils also noted writing and speaking in English (e.g., in games) as a prerequisite for communication: 'it is good to know how to write and speak English. Otherwise, communication in games does not work!' The latter example also mentions 'communication', which was part of the category *Interaction and communication* that was mentioned by some LS pupils. This category includes a mixture of mentions, including 'in digital environments, you need a thick skin; it is not good for you if you get offended from all that exists on the internet'.

Some PS pupil groups mentioned expressions that can be classified as *thinking skills* (5), such as 'reasoning and memory'. In addition, various single mentions were sorted into *Other mentions*.

Discussion

This paper has provided views of pre-service teachers' and pupils' understandings of literacies to support the literacy teaching practices of future teachers. There were certain similarities, but also contradictions, in their views of literacies. In the pre-service teachers' thoughts, the clear focus was on reading literacy, especially the development of individuals' cognitive skills (UNESCO, 2006). A reading-based approach to literacies was also visible in List et al.'s (2020) study. Despite their espousal of traditional concepts, the pre-service teachers also perceived numerous understandings, interpretations and readings of multimodal texts – literacies were widely seen as skills consisting of a variety of subskills (e.g., Ng, 2012). However, it is notable that their views of literacies, as well as those of the pupils', focused on interpretation rather than production. This might be due to challenges related to communicating literacy concepts in Finland. Even though the pre-service teachers were at the beginning of their studies, they should have been familiar with the FNCCBE (NBoE, 2014), which introduces the concept of multiliteracy and its productive side. Therefore, in teacher education, key literacy concepts must be thoroughly discussed, to ensure shared meanings.

Reading literacy also played a clear role in the pupils' insights. Although there have been concerns about the declining valuation of reading literacy, the pupils saw it as an essential skill when acting in digital environments. Similar to the pre-service teachers, the PS group highlighted the multimodal nature of diverse literacies (see NBoE, 2014; NLG, 1996), especially visual elements, while these were both ignored by the LS pupils. Instead, the LS pupils highlighted language skills, especially English. It seems that visuality is stressed at an age level when foreign language skills are still limited, and when one needs to navigate in digital

environments with the help of visual elements. Also, few pre-service teachers brought up languages, and thus, language skills were not deemed an essential part of literacies. These findings necessitate a wider consideration of the age-specific and contextual elements of literacies, both in teacher education and in the research field. The current study has contributed to addressing the meaningfulness of pupils' voices concerning their literacies, but their views should be studied more widely and in more depth.

The current study revealed that pre-service teachers and LS pupils noted the essential importance of critical attitude as a part of literacies in digital environments, and the pre-service teachers also stressed information retrieval skills and the criticism of sources. However, the PS students rarely mentioned these elements. Critical attitude and criticism of sources are included in the FNCCBE (NBoE, 2014), which requires that PS pupils should be guided by their teachers in the critical examination of digital environments and their contents.

It was noticeable that societal participation was almost missing from the pre-service teachers' insights. Literacies were not seen as a means of active citizenship (Kahne et al., 2012). This is in line with earlier research indicating that Finnish teachers face challenges in connecting their teaching to societal perspectives (e.g., Fornaciari, 2020; Hankala et al., 2022). Correspondingly, the socio-emotional approach to literacy (e.g., Ng, 2012), namely the skills needed in communication and interactions, was not emphasised within pre-service teachers' conceptions (see also List, 2019). These skills are essential in digital environments, especially in gaming, as the PS and LS pupils often mentioned, but were absent from the conceptions of the pre-service teachers.

The results of this study lay the groundwork for considering that, in current digital environments, children can fathom varied and emerging multimodal literacy skills before they begin learning the more 'traditional' form of reading and writing literacy at school. However, some pre-service teachers seemed to consider that digital literacy or multiliteracy cannot be learned before learning to read and write. All pre-service teachers might not be fully equipped to understand the multimodal literacy skills required by modern environments. However, their view of literacies was more versatile than in List et al.'s (2020) study, in which digital literacy was understood mainly as superficial ICT skills. Nevertheless, during their studies, the pre-service teachers' approach towards literacies should be broadened from a cognitive, skill-based perspective to more societal views. Additionally, it is important to increase their understanding of the new digital reality in which games, digital media and social interaction are intertwined.

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