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Examining Factors Predicting Students' Digital Competence

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Abstract

The purpose of this study was to examine factors predicting lower secondary school students' digital competence and to explore differences between students when it comes to digital competence. Results from a digital competence test and survey in lower secondary school will be presented. It is important to learn more about and investigate what characterizes students' digital competence. A sample of 852 ninth-grade Norwegian students from 38 schools participated in the study. The students answered a 26 item multiple-choice digital competence test and a self-report questionnaire about family background, motivation, and previous grades. Structural equation modeling was used to test a model of the hypothesised relationship between family background, mastery orientation, previous achievements, and digital competence. The results indicate variation in digital competence among the ninth-graders. Further, analyses showed that students' conditions at home, i.e., language integration and cultural capital, together with mastery orientation and academic achievements predict students digital competence. This study indicates that there is evidence of digital diversity between lower secondary students. It does not seem like the development of digital competence among the students happens automatically. Students' family background and school performance are the most important factors. Therefore, as this study shows, it is necessary to further investigate how schools can identify students' level of competence and to develop plans and actions for how schools can help to try to equalize differences.

Keywords: digital competence, structural equation modelling, family background, mastery orientation, average grades, lower secondary school.

Introduction

For many of us, daily life involves extensive use of information and communication technology

(ICT), including, for example, searching for, processing, communicating, or producing information at work or for private purposes. The rapid development of ICT for private, public, and business purposes has taken place globally through a variety of technologies, such as computers, tablets, and smartphones.

When examining the use of ICT in the educational systems of the European Union, the European Commission

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(2013) found that countries are choosing different priorities and strategies regarding whether and/or how to implement and use ICT at school. This paper addresses some experiences from Norway, where digital skills and competence have been explicitly described (since 2006) through both general statements and concrete competence aims as part of the subjects in the curriculum (Norwegian Directorate for Education and Training, 2012). We have identified several competence objectives at the end of lower secondary school concerning the use of ICT.

The aim of this paper is to examine the relationship between digital competence, mastery orientation, academic achievements, and family background.

Perspectives

Digital Competence

There are several research articles and papers that address what students do and how they learn to use technology for learning and developing (Aviram & Eshet-Alkalay, 2006; Claro et al., 2012; Eshet, 2012; Gui & Argentin, 2011; Katz & MacKlin, 2007). Digital competence (Calvani, Fini, Ranieri, & Picci, 2012; Ferrari, 2013; Hatlevik & Christophersen, 2013) is important in Norway because (a) it underpins a flexible and broad understanding of what students are able to do with technology, (b) the concept is operationalized in a recent European framework of digital competence (Ferrari, 2013), and (c) it is in alignment with competence aims in the Norwegian curriculum (Norwegian Directorate for Education and Training, 2012).

Initially, the concept of a digital divide referred to differences in access to computers or the Internet (Pedró, 2007; van Deursen & van Dijk, 2011; Warschauer, 2002). However, as the differences in access have decreased in Norwegian schools, it seems that other factors are also important, i.e., the students' use at home, years of experience with computers, their academic ambitions, and the family background (Fraillon, Ainley, Schultz, Friedman & Gebhardt, 2014). Changes in society, school and curriculum demand new digital competence for the students and the teachers. One cause of inequality in digital competence could be that this digital inequality follows existing societal inequalities (Boyd, 2014; van Deursen & van Dijk, 2011).

This paper defines digital competence as the skills, knowledge, and attitudes that make learners able to use digital media for participation, work, and problem solving, independently and in collaboration with others in a critical, responsible, and creative manner. This is a broad definition compared to the concepts of digital skills or Internet skills. The concept of digital competence includes domains such as student Internet safety awareness, digital communication, retrieving digital information, creating digital content, and problem solving. Moreover, this is an understanding of digital competence in line with the digital competence framework initiated by the European Commission (Ferrari, 2012, 2013) and the 21st Century skills initiative (Binkley et al., 2012).

Assessment of digital competence provides schools, teachers, and students with information about what is recognized as important aspects of digital competence, provides insight into what students master, and can be a tool for the planning of further teaching and education (Calvani et al., 2012).

The Norwegian Directorate for Education and Training (2012) has distinguished between four domains of digital skills and competences: *(a) to acquire and process digital information, (b) to produce digital information, (c) digital responsibility, and (d) digital communication*. These four domains have been used as guidelines when changing the curriculum and competence aims during 2012 and 2013. Overall, these domains are in line with other frameworks of digital competence (Ferrari, 2013), 21st Century Skills (Binkley et al., 2012) and the International Computer and Literacy study (Fraillon, Schulz, & Ainly, 2013).

The Norwegian curriculum contains competence aims as part of subject definitions at the end of 2nd, 4th, 7th and 10th grade in primary and lower secondary school. A review of the competence aims at grade level 10 show that at least 40 aims explicitly mention technology. We have identified 20 competence aims in mathematics at grade level 10, at the end of lower secondary school. None of these aims are exclusively digital, but seven out of 20 competence aims have a digital aspect or theme. For example using a spreadsheet for calculations or reading a coordinate system on paper and online.

Mastery Orientation

Research based on the goal orientation framework attempts to understand and explain the students' mindset when the students participate in learning- or performance-related activities. Mastery orientation is an important perspective within goal orientation (Elliot & McGregor, 2001; Martin, McGill, & Sudweeks, 2013; Schunk, Pintrich, & Meece, 2008). It is important for students who strive for mastery orientation to get insight and understanding and to improve their perceived competence. Mastery oriented students measure their success in terms of self-improvement. Young students tend to be more mastery-oriented than their older counterparts (Schunk et al., 2008). There are various research findings on the relationship between mastery orientation and achievement (Harackiewicz, Pintrich, Barron, Elliot, & Trash, 2002; Midgley, Kaplan, & Middleton, 2001; Urdan, 2004a, 2004b). Younger students' mastery goal orientations are positively related to achievement, motivation and self-regulation (Schunk et al., 2008). Studies have found a positive correlation between digital competence and mastery orientation (Hatlevik & Christophersen, 2013; Hatlevik, Gudmundsdottir, & Loi, 2015).

Family Background and Digital Competence

There are several studies that indicate that family background could explain differences between students when it comes to being able to use technology in learning at school (Calvani et al., 2012; Claro et al., 2012; Erstad, 2010; Fraillon et al., 2014; Krumsvik, Ludvigsen, & Urke, 2011; Organisation of Economic Co-operation and Development [OECD], 2011). Different kinds of indicators have been used to identify students' family backgrounds: for example, parental background (e.g., education, occupation, salary); immigrant background (e.g., language at home), and cultural goods, such as the number of books at home (Centre for Educational Research and Innovation, 2010; European Commission, 2013; Hargittai, 2010; Hatlevik & Christophersen, 2013; Ministerial Council for Education, Early Childhood Development and Youth Affairs, 2010).

The PISA (Programme for International Student Assessment) 2009 (OECD, 2011) and 2012 (Kjærnsli & Olsen, 2013) studies used 'number of books at home' as an indicator of family and socio-economic background. The 'number of books at home' based on the theory by Bourdieu serve as a proxy of cultural capital (Bourdieu & Thompson, 1991). Several studies have found that socio-economic background, i.e., cultural capital, is related with achievements in school (Norwegian Directorate for Education and Training, 2014; NOU, 2010; OECD, 2011). Analysis of the Norwegian results from exams and the national tests reveal that "indicators of a pupil's socio-economic background explains most of the variance" (Norwegian Directorate for Education and Training, 2014, p. 80).

Results from students' digital reading performance in the PISA 2009 showed a positive correlation between cultural capital ('number of books at home') and Norwegian students' digital reading performance ($r = .09$) (Frønes & Narvhus, 2011). When examining digital competence, positive correlations were found between students' cultural capital and their digital competence (Hatlevik & Christophersen, 2013; Hatlevik et al., 2015).

Students' language background is defined as part of the students' home environment in the International Computer and Information Literacy Study (ICILS) (Fraillon et al., 2014). Studies show that language integration, measured by language at home, is correlated with students' digital competence (Hatlevik & Christophersen, 2013; Hatlevik et al., 2015). Analysis of the Norwegian national tests and final examinations, show that students with immigrant backgrounds achieve at the 8th and 10th grade lower scores compared to children with non-immigrant backgrounds (NOU, 2010). One explanation of these differences could be the language spoken at home.

Finally, Norwegian studies (Hatlevik, 2010; Krumsvik, Egeland, Sarastuen, Jones, & Eikeland, 2013) indicate that students with higher marks/grades overall demonstrate more digital competence. First, this shows how digital competence and academic performance do not oppose one another. Second, this reveals how students with academic success also tend to succeed when measured in transversal competences.

Research Hypotheses and Theoretical Model

This paper addresses the factors predicting students' digital competence. A model with five factors has been developed (see Figure 1). Five hypotheses describe family background with language integration and cultural capital.

- H1: There exists a positive correlation between language integration and cultural capital.
- H2: Cultural capital predicts academic achievement.
- H3: Cultural capital predicts digital competence.
- H4: Language integration predicts mastery orientation.
- H5: Language integration predicts digital competence.

Three hypotheses describe previous academic achievements, i.e., average grades, and mastery orientation.

- H6: Previous academic achievements predict mastery orientation.
- H7: Previous academic achievements predict digital competence.
- H8: Mastery orientation predicts digital competence.

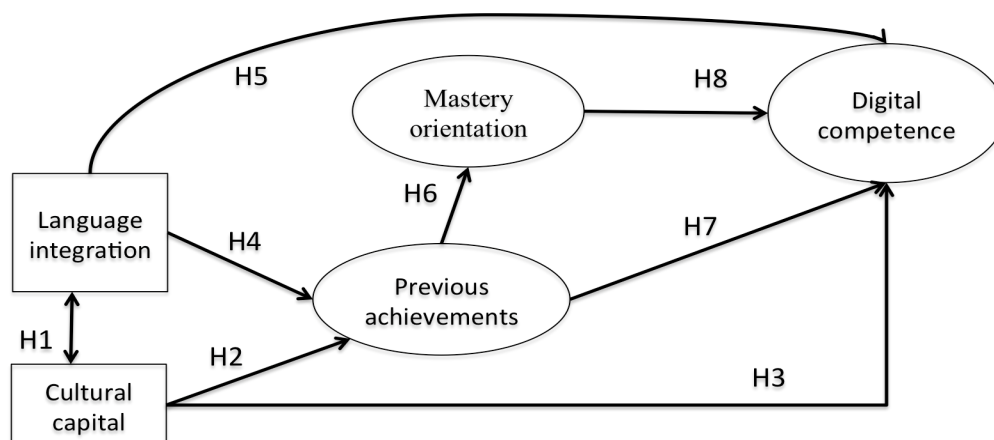


Figure 1: Theoretical model showing the relationship between students family background, their personal characteristics and digital competence (a rectangle represent a manifest variable and an ellipse represent a latent variable)

Method

Procedures and Participants

This is a cross-sectional survey with a two-step selection of students. Initially, 150 schools with 9th grade students were randomly selected in 2013. All 150 schools were contacted by regular mail, e-mail, and by phone. Schools not willing to participate were not replaced. The schools were asked to choose one class to participate in the survey. The schools received e-mail with information on how to administrate the survey and how to provide access to the online survey for the participating students. The final sample consisted of 852 students from 38 participating schools. The response rate at school level was 25.3%.

Measures

The survey consisted of a questionnaire with self-report questions and a test section with multiple-choice questions. Cronbach's alpha was used as a measure of the internal consistency of the items.

A test with 26 multiple-choice questions was used to measure digital competence. Each multiple-choice question had four alternative response options, with only one correct answer per question. We used automatic scoring of the answers, and the students received 1 point for each correct answer. A Cronbach's alpha = 0.74 indicated an acceptable level of consistency for the multiple-choice test.

The questions were developed on the basis of the competence aims in the national curriculum at the end of 10th grade. The questions covered various themes: five questions about digital responsibility, three questions about digital communication, eight questions about how to retrieve and handle digital information, and ten questions about how to create and process digital information. The items are presented in Table 2 in a following section.

In addition to the test, the students answered a self-report questionnaire about cultural capital, language integration, and mastery orientation. In order to identify students' culture capital (Bourdieu & Thompson, 1991) the student was asked about the number of books at home. There are several reasons why the number of books is used as a measure for cultural capital. First, students can give a fairly correct estimate of the number of books at home. Second, it is not a sensitive theme compared with family financial situation or education, and third, the number of books has been used in several other international studies (Frønes & Narvhus, 2011). In the coding of students' responses 1 corresponded to "no books", 2 to "1–10 books", 3 to "11–50 books", 4 to "51–100 books", 5 to "101–250 books", 6 to "251 – 500 books", and 7 to "more than 500 books".

Language integration was measured by one question about what language the students spoke at home. Only Norwegian at home was coded as 0, whereas a language other than Norwegian or another language in combination with Norwegian was coded as 1.

In order to assess students' mastery orientation, the students responded to three statements, developed from Elliot and McGregor (2001). They answered on a Likert-type agree-disagree scale, ranging from 'Strongly agree' (4) to 'Strongly disagree' (1). Most of the students agreed with the statements about mastery orientation, and therefore the answers were recoded as 'strongly agree' = 2 and all other responses = 1. The Cronbach's alpha = 0.70 indicated an acceptable level of consistency.

The students were also asked about what marks/grades they achieved the previous autumn semester in the following four subjects: Norwegian, social science, mathematics, and science. The scale of marks/grades are 1 (the lowest mark), 2, 3, 4, 5 and 6 (the highest mark). Cronbach's alpha = 0.87 indicated a high level of consistency.

Additionally, information from a national database (www.gsi.udir.no) was used to identify the number of students per computer in the participating schools. The average number of students per computer was 2.19 (sd 0.71).

Statistical Analysis

Overall, the items in the study have reasonable levels of skewness and kurtosis. Skewness refers to whether the distribution of an item or factor differs from the normal distribution, whereas kurtosis provides information whether there is a pointed or flat distribution of data. Mastery orientation recoded into two alternatives.

There can be missing data in a survey and this has implications for the analyses of the data. There are different approaches to solve this problem, for example, to remove respondents or to replace missing values. The latter approach requires that there is no systematic missing of data. Little's missing completely at random (MCAR) test (Polit & Beck, 2004) can be used to check if data is missing at random or not. The results of this analysis (chi-square = 12.9, DF = 16, and $P = 0.68$) showed that the data were missing completely at random and that, consequently, it was possible to replace missing values.

The model is tested using structural equation modelling (SEM) with latent variables (Brown, 2006; Kline, 2010; MacCallum, Jeffrey, & Kinshuk, 2014). SEM provides the opportunity to simultaneously conduct analysis of the items used to measure the factors and at the same time examine the relationship between multiple dependent and independent variables (Geiser, 2013). SEM can be run with both continuous and categorical variables (Kline, 2010). One benefit of SEM is getting the measurement model tested, i.e., analysing the relationship between the observed items/questions and the latent factors. Another benefit is having the relationship, i.e., as correlations or regression coefficients, between the latent factors tested. In this way the theoretical model in Figure 1 could be tested with an empirical dataset, and it is possible to get an estimation of the model fit of the comparison.

To evaluate the fit of the model with the hypotheses, two fit indices were used, the comparative fit index (CFI) and the Tucker-Lewis fit index (TLI). Both the CFI and the TLI compare the user-specified model with a more restricted model (Brown, 2006). Levels of CFI and TLI close to or above 0.95 are acceptable (Brown, 2006; Hu & Bentler, 1999; Kline, 2010). Further, the root mean square error of approximation (RMSEA) is calculated in order to estimate the misspecification of the model. A RMSEA level below 0.06 indicates a good fit and good specifications of the model.

Finally, the internal structure of the model has to have high quality. We are therefore looking closely at the correlations, i.e., factor loadings, between each item and the latent variables. The levels of factor loadings have to meet the following criteria: (1) the factor loadings have to be statistically significant on a 5% level, (2) factor loadings > 0.40 are desirable, and (3) factor loadings > 0.20 are acceptable. This is in line with recommended levels of discrimination coefficient from classical test theory (Crocker & Algina, 2006; McAlpine, 2002).

Data Collection and Protection

The study followed the guidelines on data collection and privacy protection from the Norwegian Social Science Data Services (www.nsd.uib.no). We sent the Norwegian Social Science Data Services an application for the study, and we started the study when they accepted our application. Participation of students was voluntary, students had the option to withdraw from the study until they submitted the questionnaire, the questions were not considered sensitive by the Norwegian Social Science Data Services, and we did not collect any direct or indirect personally identifiable information.

Results

The data were analysed using IBM SPSS, version 21 and Mplus 7.0.

Students Background

Students answered how many books they have at home: as shown in Table 1, 2.5% answered no books at home and 10.2% had between 1 and 10 books, 15.9% had between 11 and 50 books, 15.4% had between 51 and 100 books, 22.2% had between 101 and 250 books, 17.0% had between 251 and 500 books, and 16.8% had more than 500 books at home.

VARIABLES	VALUES	FREQUENCY
Books at home	None	2.5%
	1-10 books	10.2%
	11-50 books	15.9%
	51-100 books	15.4%
	101-250 books	22.2%
	251-500 books	17.0%
	More than 500 books	16.8%
Language integration	Norwegian at home	83.3%
	Another language; other than Norwegian or combined with Norwegian	16.7%

For student responses to the question about language spoken at home a total of 83.3% spoke only Norwegian at home, and 16.7% spoke Norwegian and another language or just a language other than Norwegian at home.

Psychometric Properties: Overall Model Fit

In this design the students are nested in schools. On one hand it seems appropriate to use multi-level modelling on the data. However, most of the variance in digital competence is found within schools and not between schools. It seems therefore of limited value to use a multilevel model instead of a structural equation model.

A model of with the hypotheses from Figure 1 was converged to an acceptable solution. All parameters and relationships within the model are statistically significant. However, two items measuring digital competence had to be removed due to factor loadings below 0.20. A new analysis without those two multiple-choice items was run. The analyses of the revised model showed acceptable test fit results. The values of CFI = 0.947, TLI = 0.943, and the RMSEA = 0.024 [LO 90 = 0.020 and HI 90 = 0.027].

Table 2 contains information about the item analysis, the consistency for the self-report questions, and the multiple choice questions, as well as, the means, factor loadings, and standard errors of all items. The results of the assessment of the quality of the internal structure of the model reveal that factor loadings of the multiple choice items and the self-report items are significant ($p < 0.01$) and that they are above 0.20.

Table 2: Internal consistencies of the latent variables, and means, loadings and standard error of the items from analysis (CFI = 0.951, TLI = 0.948 and RMSEA = 0.023 [LO 90 = 0.020 and HI 90 = 0.027]).			
	MEAN	LOADING	S.E.
Mastery orientation (CA = 0.70) as latent variable			
<u>How do you agree or disagree to these statements?</u>			
I want to learn as much as possible at school.	3.70	0.83**	0.03
It is important for me to have the best possible understanding of the school subjects.	3.80	0.93**	0.03
I want to master all the subjects at school.	3.70	0.70**	0.04
Previous achievements (CA = 0.87) as latent variable			
Grade in Norwegian subject previous semester	4.13	0.69**	0.03
Grade in Social science subject previous semester	4.27	0.80**	0.02
Grade in Science subject previous semester	4.19	0.85**	0.02
Grade in Mathematics subject previous semester	4.00	0.81**	0.03
Digital competence (CA = 0.74) as latent variable			
Which statement about Wikipedia is wrong?	0.35	0.36**	0.04
<i>You believe that there should be no homework for students. How do you influence decision makers?</i>	<i>OUT</i>	-	-
You have found a poem that you will use in an assignment. What can you do?	0.65	0.61**	0.04
Which of these statements about the difference between advertising on the Internet and on TV is most correct?	0.27	0.27**	0.05
One of these is NOT a browser, which one?	0.82	0.30**	0.06
How do you best refer to the sources in the answer of the assignment?	0.48	0.65**	0.04
Can you trust the information you find on "Store norske leksikon"?	0.58	0.42**	0.05
Is it possible for strangers to find out which pages you visited and what search words you used on the Internet?	0.52	0.53**	0.04
What does it mean that the email is encrypted?	0.43	0.31**	0.05
What is a wiki?	0.43	0.22**	0.05
What is a "cookie"?	0.64	0.51**	0.04
Which digital tools to choose when communicating with students in Japan during lessons?	0.49	0.34**	0.05

Table 2: Internal consistencies of the latent variables, and means, loadings and standard error of the items from analysis (CFI = 0.951, TLI = 0.948 and RMSEA = 0.023 [LO 90 = 0.020 and HI 90 = 0.027]).			
	MEAN	LOADING	S.E.
Mary will post a presentation online. Can she use any image from a photo sharing service in her presentation?	0.68	0.52**	0.04
Why should you refer to sources in a project?	0.60	0.64**	0.04
What is the best way to refer to sources in an assignment?	0.34	0.40**	0.05
<i>Who owns the images John posts on his profile on Facebook?</i>	<i>OUT</i>	-	-
Can John delete his profile on Facebook? What is the most correct?	0.52	0.47**	0.04
Marie wants to include a film as a part of her presentation. How to enter the film so that it becomes part of the presentation?	0.32	0.30**	0.05
When downloading a picture from the Internet, can a virus attack your digital device?	0.58	0.33**	0.05
How can you use the computer to replace names of countries in a text?	0.14	0.26**	0.06
You should sum the numbers from 30 cells in column H. Which formula is correct?	0.41	0.38**	0.05
You should sum the numbers from 20 cells in row 7 Which formula is correct?	0.33	0.23**	0.05
You are asked to copy the text into a word processor and identify how many times the word "Climate" is repeated.	0.61	0.53**	0.04
Which number is misspelled in the text? Tip: Use the spell checker in Word or similar.	0.45	0.60**	0.04
A table shows the revenue for a store run by students. What is the total income for the whole week?	0.46	0.58**	0.04
A table shows the revenue for a store run by students. What is the total income for Friday, Saturday and Sunday?	0.30	0.24**	0.05
Single items (manifest variables)			
Language integration	3.79	-	0.11
Cultural capital	3.13	-	0.07
* p < .05, ** p < .01			

Figure 2 contains the regression paths between the factors in the model and the explained variance in the dependent variables. All the regression coefficients are significant. The data explains 14% of the variation in mastery orientation, 12% of the variation in previous achievements and 30% of the variation in digital competence.

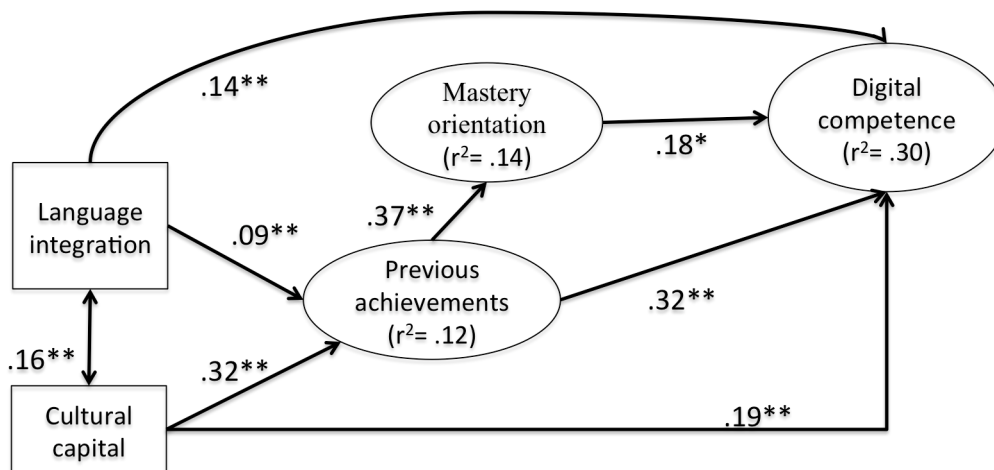


Figure 2: Results from the testing of the theoretical model with the seven hypotheses about relationship between students’ language integration, cultural capital, previous achievements, mastery orientation and digital competence (a rectangle represent a manifest variable and an ellipse represent a latent variable)

Discussion

This paper addresses a model describing the relationship between students’ family background, previous achievements at school, mastery orientation, and digital competence. The model was developed with eight hypotheses emphasising cultural capital, language at home, strategic use of information, previous academic achievements, and predicted competence. The analysis of the model shows that all the eight hypotheses are supported.

The findings from the SEM approach reveal that students’ cultural capital and language integration at home is positively related. Further, the model shows that students’ cultural capital and language integration at home have a positive prediction of digital competence. The findings are in line with other studies (Claro et al., 2012; Ministerial Council for Education, Early Childhood Development and Youth Affairs, 2010; Tondeur, Sinnae, van Houtte, & van Braak, 2011) reporting that indicators of students’ family background play a role when explaining variations in digital competence. Boyd (2014) underpins that social differences in society do not disappear when students use technology. Cultural capital and language integration at home can be understood as proxies of students’ family background (Erstad, 2010; Selwyn, 2008). This means that school leaders and teachers have to be aware of students’ family background when planning and conducting teaching.

The analysis shows that students’ mastery orientation has a positive prediction of digital competence. It is important that students develop a motivation for learning at school. However, we still need more information about how teachers can help students to develop adaptive strategies for information use.

Finally, digital competence is predicted by students’ previous academic achievements. One explanation can be that succeeding at school is more likely to benefit from the introduction of ICT

at school. It appears that differences in academic achievement contribute to explaining differences in digital competence between the students. It seems difficult to obtain digital equity between the students because digital competence and digital equity follow the pattern of results from other academic studies (Boyd, 2014; Fraillon et al., 2014; Pedró, 2007; Selwyn, 2008). Further, these analyses indicate that competence and academic performance do not oppose each other. Instead it is apparent that previous school performance can predict students' ability to perform on a test measuring digital competence.

Nevertheless, when it comes to explaining digital competence, the results from multilevel analysis indicate that students' family background and students' characteristics, measured by strategic information use and previous achievements, are the most important factors for understanding digital equity and student achievement in digital competence.

Conclusion

Limitations

The study has some limitations and they have to be mentioned. First, the response rate is 25.3% at school level. Second, when using an online survey, the students and schools having a positive attitude towards technology could be overrepresented. The average number of students per computer was 2.19 in the participating schools and 2.30 on the national level. It does not look like the sample differs greatly from the national average. Third, a self-selection bias could occur because it was not mandatory to participate in the study. However we find variation in digital competence between the students. It seems that a rather heterogeneous sample of students has participated, and that the schools are rather similar. Nevertheless, the results from the study give insight into factors predicting digital competence.

Concluding Remarks

To conclude, some of the students in the study could answer most of the questions correctly, whereas other students did not know the correct answer to many of the questions. Such findings indicate diversity in digital competence among the students. The difference in achievement between students is supported by many national tests and international studies of, for example, reading, mathematics, science, and information literacy (Fraillon et al, 2014; The Norwegian Directorate for Education and Training, 2014; OECD, 2011; Wiborg, Arnesen, Grøgaard, Støren, & Opheim, 2011).

According to Boyd, it "*is dangerous to assume that youth are automatically informed. It is also naive to assume that so-called digital immigrants have nothing to offer.... Becoming literate in a networked age requires hard work, regardless of age*" (Boyd, 2014, p. 177). Digital skills and competence requires hard work and persistence as does developing other key competences such as reading, writing, or doing calculations.

How schools and teachers deal with diversity in students' digital competence is a two part question. First, are the schools and teachers capable of identifying the diversity in students' digital competence? Second, if the schools or teachers are able to identify digital diversity, are they able to take action in order to increase their students' digital competence? Clearly, identifying digital diversity requires that the schools and the teachers prioritise digital competence during lessons and school activities. A recent international study (Fraillon et al, 2014) shows that, among Norwegian 9th grade students, there are 75% using ICT at home daily whereas 8% are using ICT at school daily. This could indicate that using ICT is not given high priority when learning subjects in 9th grade. One suggestion is that schools could give higher priority to teaching students how to use ICT in order to fulfil the competence aims in the curriculum. It could perhaps reduce dispari-

ties, if the teachers and school leaders emphasize training students in digital competence at school. Additionally, it seems worthwhile to examine what characterizes the people responsible for ICT in schools and if they experience pedagogical and technological personal empowerment (Avidov-Ungar & Shamir-Inbal, 2013).

Family background, measured by cultural capital and language integration, is related to digital competence. Family background can explain the lack of digital equity. Researchers (Boyd, 2014; Selwyn, 2008) conclude that social differences outside school are having an impact on online activities, self-representation, and digital equity.

Finally, students' previous achievements at school and their mastery orientation seem important. Motivation for learning at school is related with both digital competence and previous achievements. Additionally, students' benefit from their previous results on tests, and previous achievements are important for digital competence. It turns out that some students succeed consistently in subjects and across subjects, while other students have greater difficulty succeeding on tests.

Future studies are required in order to examine more closely how the relationship between students average grades, student strategic use of information, and student digital competence changes through secondary school.

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