



Digital Learning Aids for Nynorsk Pupils in School: - A Politically Sensitive Area or a Question of a Deeper Scientific Understanding of Learning?

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Abstract

This position paper focuses on Nynorsk in the digital era and the need for research-based knowledge about it in school settings in Norway. The Norwegian language situation is exceptional because Norway has two written standards, Bokmål (majority variety) and Nynorsk (minority variety), and both the Education Act and the Norwegian Directorate of Education require that publishers provide parallel editions of all paper-based and digital learning aids for pupils. However, a national report by Skjær, Eiksund, Fretland, Holen & Netteland (2008) revealed that few publishers have developed and offered digital learning aids in Nynorsk. In 2015 the situation appears to be largely unchanged, even though the authorities, language organisations and “leadings lights” have taken several initiatives to encourage compliance with the Education Act; however, what is needed is further research into the situation of parallel editions of digital learning aids. This is of particular interest today since the pupils in the county with the highest rate (97%) of Nynorsk-pupils has consistently been at the top of the list as one of the best performing counties in Norway in national tests since 2006 (Directorate of Education 2015). In addition, Vangsnes, Söderlund & Blekesaune (2015) find that municipalities in Norway with more than 50% Nynorsk-pupils achieve better in National tests when compared to Bokmål municipalities. The main message in our position paper is that the digital revolution might have changed some underlying premises for how we understand and use language and dialects, and the need for parallel editions of digital learning aids in Bokmål and Nynorsk is no longer

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a question of economics or of political statements for or against Nynorsk, etc., but is instead a question of a more nuanced scientific understanding of learning and achievement in today's digitized school. The achievements of Nynorsk pupils in national tests is one indicator of school performance, but to understand what causes this relationship further research is required and several indicators should be developed. In this case, it concerns Nynorsk pupils, but in a broader sense, it concerns pupils in general, and how they learn in school.

Keywords: Nynorsk, digital learning aids, the Nynorsk effect, digital divide; ICT

Introduction

In the report, "The Norwegian language in the digital age", it is clearly stated that some of our languages in Europe are in danger (De Smedt, Lyse, Müller, Gjesdal & Losnegaard, 2013), especially the minority languages are threatened by the digital revolution. The exceptional situation in Norway is that the Norwegian language is a minority language in the global context, while at the same time having two written standards, Bokmål (majority variety) and Nynorsk (minority variety). This position paper concentrates on the digital learning conditions for Nynorsk pupils in schools, and the need for research-based knowledge about this in Norway. The background for this focus is that the Norwegian Education Act (The Ministry of Education 2010) and the Norwegian Directorate of Education require that the schools offer pupils digital learning aids in parallel editions –in Bokmål and in Nynorsk. This means that the Educational Act underlines that it is an individual right for the pupil to have access to the digital learning aids in their own primary language variant (Directorate of Education 2010). Consequently, all digital learning aids should be offered to the pupils in parallel editions from the publishers, and the school owners (the counties and municipalities) have the main responsibility for securing this. Despite this, a national report from Skjær et al. (2008)ⁱ revealed that too few publishers develop and offer digital learning aids in Nynorsk in all subjects at all grade levels. In addition, official webpages, digital learning portals and digital learning platforms used in schools seldom have full language versions in Nynorsk. This means that pupils with Nynorsk as their first language have limited access to digital learning aids related to the curriculum and competence aims in their own primary language variant (Skjær et al. 2008). Even if several initiatives by the authoritiesⁱⁱ and othersⁱⁱⁱ have been carried out since 2008, for example by The Ivar Aasen Center, The National Centre for Education in Norwegian Nynorsk, Nordfjordregionen, et al., this is good initiatives but not enough. As far as the responsibility of publishers to offer parallel editions of digital learning aids in conjunction with school curricula and competence aims is concerned, there is some evidence to corroborate the claim that the situation in 2015 has remained largely unchanged over the past seven years. This is also partly confirmed in the report, "Evaluation of grants for teaching aids" (Rambøll 2009), the report "Linguistic quality in teaching aids" (The National Language Council 2013) and the report "Education Directorate Long -Term Plan for teaching aid work 2013–2016", in which Nynorsk seems to be especially neglected by the publishers in the area of digital learning aids (Directorate of Education 2013). And Ministry of Educations state that their impression is also that the digital learning aids in Nynorsk is not satisfactory (Proba Research 2014; Ministry of Education 2008). However, we need to examine this properly and benefit from updated research knowledge about the current situation (in 2015). This is of paramount importance since there is high density of PCs in the Norwegian schools (OECD 2015). In addition, the use of digital learning aids by all pupils in all subjects is compulsory; schools and teachers use digital learning platforms in all subjects; in 2012 a new definition of reading was introduced which includes digital reading^{iv}; The national tests in schools are digital; the

PISA-test is digital^v; the use of digital tools has become the fifth key competence in the national curriculum (Norwegian Ministry of Education 2006), and recent studies reveal a very considerable amount of time spent on Facebook (Skog 2009; Skog 2013; Rotevatn 2014; Krumsvik, Ludvigsen & Urke, 2011) as well as on screen time in general among pupils in and out of school (Krumsvik, Egelandsdal, Sarastuen, Jones & Eikeland, 2013). It goes without saying that excessive use of digital learning resources has sociolinguistic ramifications. The significance of the digital revolutions impact on the underlying premises for how we understand and use language and dialects, and the possible lack of Nynorsk learning aids for Nynorsk pupils in terms of how “teachers teach and learners learn” in digitized schools, should be monitored. This matter also merits investigation in light of the fact that the county with the highest rate of Nynorsk-pupils continuously rank in the top percentage in terms of achievement in national tests and grades when they complete elementary school (tenth grade) (Directorate of Education 2006-2015; Statistics Norway 2006-2015). Therefore a pertinent question to ask is how the possible lack of Nynorsk digital learning aids in the future will influence this performance rate in the years to come when all learning aids are digital and online. Will achievement increase, remain stable, or decline if the lack of Nynorsk digital learning aids continues? However, such potential scenarios need to be assessed thoroughly and systematically by means of research studies that combine both quantitative and qualitative research designs. The research questions for this article are:

1. Why is there an urgent need for research on the consequences of the digital revolution’s impact on the underlying premises for how we understand and use a language variety as Nynorsk and dialects in Norway?
 - a. What kind of challenges arise from the lack of digital learning aids in Nynorsk in the digitized school?
 - b. Which Nynorsk areas particularly need more research-based knowledge, and how can this research be carried out?

Background

It is estimated that 600 000 of the Norwegian population, and 12, 5 per cent of Norwegian pupils have Nynorsk as their mother tongue^{vi} and main language of instruction used in schools (Grepstad 2012; Ministry of Education 2008; Store Norske Leksikon 2013). However, this situation is changing, and we find that whereas 50% of pupils in Møre og Romsdal County uses Nynorsk as their primary language variant when they complete elementary school (tenth grade), 28% uses Nynorsk at the end of upper secondary school as their primary variant (thirteenth grades) (Proba Research 2014). The same tendencies are found in Hordaland County and Rogaland County, but in Sogn og Fjordane County the situation is quite stable from lower- to upper secondary school. In the White Paper *Mål og Mening* it is estimated, on the national level, that almost half of the Nynorsk pupils will switch to Bokmål later during their schooling (Ministry of Education 2008). The reasons for this development are complex, but internationally we find that:

“... META-NET, a Network of Excellence funded by the European Commission, has conducted an analysis of current language resources and technologies in this EU-white paper series. The analysis focused on the official European languages as well as other important national and regional languages in Europe. The results of this analysis suggest that there are tremendous deficits in technology support and significant research gaps for each language” (De Smedt et al. 2013, p. iii).

It is reasonable to say that the current situation for Nynorsk in Norway is similar to these findings – especially concerning technology support for

Nynorsk pupils in school and research gaps related to Nynorsk digital learning aids.

What makes this focus especially relevant for Nynorsk is that in the county of Sogn and Fjordane, 97 per cent of the pupils in elementary school have Nynorsk as their primary variety (Statistics Norway 2012). Since 2006, the pupils in this county have continuously scored high in national tests as well as in grades at the end of elementary school (Directorate of Education 2015; Statistics Norway 2006-2015). Furthermore, Vangsnes et al. (2015) find in their Norwegian sample of 240 000 pupils that Nynorsk municipalities in Norway achieve better when compared to Bokmål municipalities in national tests. They refer to the “Nynorsk effect”: “The results ... suggest that growing up with the Nynorsk standard variety of Norwegian is a significant predictor for good school achievements in Norway. Indeed, pupils who receive their schooling in Nynorsk perform better than expected by their parents’ socio-economic background” (Vangsnes et al. 2015, p. 10). What accounts for this? Vangsnes et al. (2015) continue: “Our hypothesis from the outset has been that effects can be seen in the light of the positive developmental effects of bilingualism, for which there is massive support in the literature, and the conclusion would then be that the better school performance by Nynorsk pupils is an effect of their more varied linguistic upbringing which in turn boosts their cognitive development” (p. 10). In other words, the exposure of Nynorsk pupils to Bokmål is so extensive – due to their upbringing, both inside and outside kindergarten and in school settings (through play, children’s TV, cartoons, educational technology, media, social media, authorities, etc.), that they learn this at the same time as they learn Nynorsk. Based on research (Yttri 2015) (and some anecdotal^{vii} evidence) this effect might also be related to the strong status of teachers and Nynorsk identity in elementary schools in Sogn og Fjordane^{viii}, where teachers continuously motivate pupils to speak and write Nynorsk (or Nynorsk dialects) in their teaching and interaction with them. And concerning identity, Kleggetveit’s (2013) found that language was more important for youngsters own identity among those which had chosen to retain Nynorsk than it was among those who had switched to Bokmål. The switching to Bokmål might also be related to the fact that among fictional books for children and youngsters is just one of ten releases in Nynorsk, and of 74 non-fictional books that was published for children and youngsters in 2013 was only 6 in Nynorsk (Proba Research 2014).

Moreover, in the absence of parallel editions of learning aids in Nynorsk, teachers in Sogn og Fjordane County often make their own compendia, learning materials or “handouts” in Nynorsk.^{ix} As a result, Nynorsk pupils seem to have been “bathing” in both oral and written Nynorsk in this county for decades in kindergarten and school settings. In addition, this situation seems to have been complemented and expanded, especially during the past 20 years; adolescent pupils (digital natives and millennials^x) have been hugely influenced by Bokmål, in both oral and written form, because of the digital revolution with the advent of the Internet, Web 2.0 and social media. This was not the case prior to the digital revolution around 1995, when young people did not have access to the Internet. Also at this period of time the prevailing influence of media in rural parts of Norway – such as this county – was the state TV/radio channel NRK and TV2. Some of this technological development and ICT impact might be related to the findings of Vangsnes et al. (2015) pertaining to the bidialectal effect, but it is extremely difficult to pinpoint an individual factor that constitutes a causal effect in this area – and it may in any case be unrelated to access to technology. In fact, the increased use of digital tools, digital platforms and digital learning aids in Nynorsk counties today may “threaten” this “Nynorsk effect” on achievement in many ways, not least because these seem to be developed mainly in Bokmål, and this will result in an increased use of Bokmål and, conversely, a decrease in the use of Nynorsk in the schools and counties in question. It is therefore legitimate to ask whether the effect of bidialectal literacy on school achievement might decrease

as a consequence of less Nynorsk in school, even in Nynorsk counties such as Sogn og Fjordane (if this is in fact the cause or one of the causes of their high academic achievement).

From the foregoing, it is evident that the need for parallel editions of Bokmål and Nynorsk is no longer a question of economics or resistance against two language varieties, but rather a question of a more nuanced understanding of learning and achievement among Nynorsk pupils in today's digitized school. Since this is a preliminary hypothesis based on some research in a rather "under researched area", it should be emphasised that these are still preliminary positions. Nonetheless, from our vantage point these are important positions concerning an interesting language- and learning phenomenon that requires our urgent attention and research-based knowledge.

Against this backdrop, this particular field of research and the associated issues need to be studied systematically through research (e.g. psychometrics, Learning Analytics, randomized controlled trials, neuroscience with the use of FMRI^{xi}) to reveal whether the "Nynorsk effect" is based on a cognitive component (e.g. similar to the cognitive advantages Costa, Hernandez, Costa-Faidella & Sebastian-Galles (2009) found in their study of Catalan-Spanish bilinguals). In addition, other possible explanations for the high performance of Nynorsk pupils in national tests and elementary school grades (tenth grade) also have to be evaluated, as well as the significance for pupils in general of the possible absence of digital learning aids in Nynorsk, and what this means in the light of the findings by Vangsnes et al. (2015) and Vangsnes & Söderlund (2015) concerning the "Nynorsk effect". We will elaborate on this further from different perspectives in the following sections.

Some tendencies and paradoxes

One of the goals of this position paper is to raise awareness about the lack of research in Nynorsk as a minority variety of Norwegian in the digital era, a matter that deserves our attention and further research. Of course, we do have some knowledge about this development, but it seems that research in general may have overlooked (or ignored) the absence of digital learning aids in the Nynorsk area, and the consequences and side effects of this. This is especially relevant in light of the Education Act and recent research findings from typical Nynorsk counties and municipalities. On one hand, we know that municipalities with a high Nynorsk rate^{xii} (more than 50 per cent) do better in national tests than Bokmål municipalities (Vangsnes et al. 2015)^{xiii}. On the other hand, there is some evidence that Nynorsk experiences language shift to Bokmål after secondary school, or a tendency towards "digital death" of Nynorsk in formal school settings. A report from Proba Research (2014) reveals this tendency and the researchers state that: "We find that pupils largely pointing at the massive Bokmål impact as a primary reason for switching language form" (Proba Research 2014, p. 10). This report also finds that schools do too little to prevent Nynorsk pupils from switching to Bokmål: "Neither teachers, school management or parents seem to have affected the change of language form. At the same time we find that the school has not taken steps to strengthen Nynorsk or prevent language exchange" (Proba Research 2014, p. 10). Proba Research have also studied how teacher education handles this: "The analysis shows that assessment methods in Nynorsk in teacher education for primary and secondary education are rarely equivalent to the assessment methods in Bokmål. In most cases teacher educational institutions have a summative assessment system which does not ensure that the final grades are documenting expertise in both the Norwegian written languages in the same way" (Proba Research 2014, p. 10). These results from Proba Research indicate that our educational system reflects some of the attitudes in the Norwegian population in general where there appears to be a relatively strong opposition^{xiv} to having two written language

varieties of Norwegian. From this it is worth considering whether school owners, schools and teacher educational institutions should evaluate their own positions in the area of having two written standards, Bokmål and Nynorsk in light of the Educational Act in the years to come to avoid side effects (e.g. increased language exchange and “digital death” of minority varieties).

In addition, we have some qualitative insight regarding tendencies of the pupils’ positions in this area; what emerges from our own studies is that pupils in upper secondary schools often feel quite strongly about the matter even though their thoughts may be expressed at an anecdotal level – regarding the change from Nynorsk to Bokmål as their main school language after elementary school. In our general field dialogue with pupils (fieldwork^{xv}) in the SMIL-study and the Rogaland study (Krumsvik et al. 2013, Krumsvik et al. 2011), pupils said that English had become the “global language” in digital communication across cultural and country borders. Thus they feel that minority languages are becoming increasingly rare as languages of digital communication. These pupils indicated that we can see the same tendencies inside – that similar tendencies are visible in Norway, where the majority variety Bokmål seems to be becoming even more predominant gaining the upper hand compared to Nynorsk because of the extensive digitization of school and society in Norway. It has also become increasingly mainstream and socially acceptable to use the written variety Bokmål rather than Nynorsk among Nynorsk-youngsters. They also asserted that they switch to Bokmål as their main written variant because Bokmål constantly surrounds them – whether in society, in the media, in TV, in school, in digital learning aids, in social media, at the cinema, in advertisements, or in cartoons, etc. Nynorsk pupils seem to join the majority variety (Bokmål) after finishing lower secondary school as a result of this huge influence exerted by their surroundings. In this development, their digital lifestyle appears to be especially important (Krumsvik et al. 2013).

However, there are still several paradoxes in this area; while Nynorsk pupils increasingly shift from Nynorsk to Bokmål as their main written variety after elementary school, current trends indicate an excessive use of dialects among Norwegian children, youngsters and adults in social media, such as Facebook, blogs, Snapchat, Instagram, SMS, etc. In a Norwegian study undertaken in 2013 based on high school pupils aged 18–20 (N=142), from the West Coast of Norway (in the four counties Møre og Romsdal, Sogn og Fjordane, Hordaland and Rogaland), the majority of the informants (70%) in this study were pupils with Nynorsk as their main variety (so this was not a representative sample). The study found that three out of four high schools pupils on the West Coast of Norway use dialect when they write on Facebook (Rotevatn 2014, p. 84). The study also showed that: “Pupils explains the use of dialect with “that’s how I talk” and because “it is informal” (Rotevatn 2014, p. 85). Another study from Skog (2008) examined Norwegians in the age between 18-30 years use of Facebook and found that 80 % of the 15 years old pupils wrote in dialects on Facebook (Skog 2009). Skog concludes with this statement:

An important point is that although Facebook is an English-language online community, Norwegian dominates in the messages and greetings conveyed. Another key finding is the strong dialect element that characterizes communication on Facebook. This reflects interesting feature of Norwegian language development. Here the focus has mainly been on the influence of English. The widespread use of dialect in written language in new digital media has received far less attention (Skog 2009, p. 25).

In another study from Skog (2013) where 655 persons (from 13 and younger to 39 year an upwards) participated, she found that 77 per cent answered that they “write in dialect” when using Facebook.

While these tendencies are interesting, they portray a rather blurred and mixed picture of what we know about shifts in these varieties. However, the increasing use of dialects among pupils and youngsters when they write on

Facebook seems to be an interesting tendency in light of the extensive use of this kind of social media in their digital lifestyle (Krumsvik et al. 2011). Nevertheless, future large-scale research needs to examine if the use of social media gives new sociolinguistic ramifications and how this affects teaching and learning in school.

The importance of monitoring the development

In order to acquire more research-based knowledge about Nynorsk in the digital era we have to operationalize and understand why digital learning aids in general are important for teaching and learning. With the progressive shift from paper-based to digital learning aids in schools, it is essential to understand how the relationship between intended learning outcomes (competence aims) and objective learning outcomes (summative assessment) are influenced by digital learning aids (or the lack of it among Nynorsk pupils). More specifically, we can define instructional technology as “educational technologies teachers and others employ to support learning” (Spector, Merrill, Elen & Bishop, 2014, p. 959) where digital learning aids are an important part of this instructional technology. In the report “Education Directorate Long-Term Plan for teaching aid work 2013–2016”, digital learning aids are defined as “... a learning resource where the content includes different types of media like text, pictures, video, animations and simulations. The different types of media have been selected and integrated in a pedagogical way (Directorate of Education 2013, p. 10, our translation). However, from a critical point of view the importance of digital learning aids can be questioned. Nynorsk pupils seem to handle the situation quite well judging by performance in national tests, etc., so it is perhaps valid to ask what the problem is (aside from their individual rights under the mandates in the Education Act). It should be taken into account that the use of Nynorsk in schools may decline if almost all digital learning aids in school are in Bokmål in the coming years and this might influence the “Nynorsk effect” (as mentioned above). Especially is this important to monitor in light of the high technology density in Norwegian schools and homes, where 73% of Norwegian pupils have access to laptop at school, 90 % have access to internet at school and 99% have access to laptop and internet at home (OECD, 2015). The first digital divide (access to technology) seems to be less a problem in Norway, but does this also reduce the second digital divide (Attewel 2001) (which deals with how socio-economic status impacts on pupils can use the digital technology for learning purposes)? To handle the digital technology for learning purposes the pupils digital reading skills are required to handle digital learning aids properly. In the recent published PISA 2012-study the importance of digital reading skills is underlined:

In contrast to typical print documents, however, typical online documents are characterised by multi-modality (the combination of text, static images, animations, embedded videos including sound, etc.) and by the presence of hyper-links that create non-sequential page structures. Thus, not only are certain text-processing skills particularly important when reading on line, readers must also *navigate* through and among different texts (OECD, 2015, p. 108).

Despite high technology density in Norway, both the PISA 2009 (Frønes & Narvhus, 2012) and PISA 2012 (OECD) shows that the digital reading skills among Norwegian pupils (15 years old) have clear weaknesses and are close to the OECD-average. One important finding is that the first digital divide (access to technology) seems not to reduce the second digital divide (socio economic impact), and Norwegian pupils digital reading achievement is still clearly related to parents socio economic status^{xvi} (OECD 2015). One interpretation of these rather poor results might be the ignorance of this area in school and the “Google-effect” (Sparrow, Liu & Wegner, 2011) which seems to be quite common among pupils in their digital lifestyle of today. These PISA-studies

have no results especially for Bokmål -and Nynorsk pupils, but it is stated in the latest PISA-report that “While some similar skills are required to read both online and printed documents, online texts often pose greater challenges to readers than printed texts” (OECD 2015, p.108). In light of this one can ask how the lack of digital learning aids in Nynorsk affects Nynorsk pupils digital reading skills in general, but also how they perform on digital reading tests in PISA when they have to “prepare and train” as well as take the test in a another variety (Bokmål). Nevertheless, Frønes, Narvhus & Aasebø, (2013) have examined digital reading in Norway and the Nordic countries on the basis of PISA 2009 and find a clear potential of improvement:

“The findings (...) send a warning that the school system faces challenges related to provision of relevant training in a number of other types of texts (...) There also seems to be a need for systemic approaches in both teacher and school leadership educations to meet the challenges in school of digital technology in rapidly changing and transforming the literacy practices needed for modern citizenship (Frønes et al. 2013, p. 29).

From this we can recognize that not enough is known about how digital reading is handled among Nynorsk pupils today and the effects, or side effects, of not having proper access to such digital learning aids in Nynorsk. Another element in this context that has sociolinguistic consequences is the fact that research on learning outcomes from digital learning aids shows that it is not irrelevant if the pupils only have access to paper based-learning aids. Experimental research by Richard Mayer and his colleagues into multimedia and multimodal digital learning aids seems to be of certain relevance in this context and below we present some of the research findings from three meta analysis (Mayer, 2014; Mayer & Fiorella, 2014; Mayer & Pilegard, 2014) which take the above mentioned digital reading a step further:

*According to the Cognitive Theory of Multimedia Learning (CTML) and the Multimedia principle, pupils learn better from words and pictures rather than words alone ($d^{xvii}=1,39$)^{xviii}

* According to the Coherence Principle, pupils learn better when unnecessary words, pictures or sounds are excluded rather than included ($d=0.86$).^{xix}

*According to the Modality Principle, pupils learn better from animation and speech, than from animation and screen texts ($d=0.75$).^{xx}

*According to the Personalization Principle, pupils learn better when the digital learning aids are adapted to their individual needs and learning context ($d=0.79$)^{xxi}.

As can be seen, these studies by Richard Mayer and colleagues have large effect sizes (in other words they have considerable effect on learning) and clearly show that multimodal digital learning aids can contribute to good learning outcomes in experimental studies. Mayer and colleagues show that paper-based learning aids have their limitations and that digital learning aids can (under certain conditions) have a very good impact on learning. However, remarkably little is known to date about how this research, these principles and digital learning aids are related to Bokmål versus Nynorsk and how this research can influence the learning outcomes of Nynorsk pupils. Will such research reveal an increase or decrease in the “Nynorsk-effect” over time? Vangsnes et al. (2015) underlines that the key issue seems to be simultaneously writing both Bokmål and Nynorsk and that oral use alone does not appear to have the same effect. Does this affect the multimedia- or personalization principles of Mayer et al. or do these research findings play no role in the “Nynorsk effect” in digital learning contexts? In any events, in order to understand learning in the digital age, there is an urgent need to undertake systematic explorations of the relationship between multimodal digital learning aids in Nynorsk (based on Mayer’s et al. principles) and learning outcomes in digital learning environments in schools.

In the above-mentioned report from the Directorate for Education and Training, it is stated that “There is a large range of digital resources that can be used in learning activities, but a more systematic overview of these is lacking (...) Many publishers want to enhance their competence in developing digital teaching aids” (Directorate of Education 2013, p. 12, our translation). From our point of view research-based knowledge recently carried out by Mayer (2014) and his colleagues could inform and enhance publishers’ competence in developing digital learning aids in schools. The same report concludes: “Results from Monitor 2011 and 2012 show that there is still a great need for digital teaching aids” (Directorate of Education 2013, p. 15, our translation). And the White Paper “*Mål og Mening*” suggests several initiatives to increase the number of digital learning aids in Nynorsk (Ministry of Education 2008). However, in some subjects it seems like the situation is improving: “Asked if digital learning aids are available in Nynorsk, the majority [of teachers] answered that it was available in the Norwegian subject, but that they were unsure whether there were in other subjects” (Proba Research 2014, p. 50).

We maintain that there are still many issues that need to be addressed, and while the Directorate of Education’s announcement of funding (as part of this plan) is of course a positive step, if we are to meet all these challenges it is reasonable to expect publishers and school owners to take responsibility. This is even more necessary especially if we look closer at the requirements specified in the Education Act. Thus it is possible to claim that we have limited knowledge about whether the dearth of digital learning aids affects the learning outcome of Nynorsk pupils in the subject of Norwegian, or other subjects, as well as how this influences (or not) the “Nynorsk effect” (Vangsnes et al. 2015). However, it is worth considering how greater knowledge in this area might be gained.

Based on our previous SMIL-study (Krumsvik et al. 2013), which represents the largest ICT-study in Norway ($N= 20089$), we will suggest that a first step towards achieving more knowledge in this area may be to develop indicators in the digital area in schools. An indicator can be defined as: “an indication of something that is not directly observable” (Pelgrum, 2009, p. 58). National tests and elementary school grades (tenth grade) represent two indicators for school achievement, but the relationship between Nynorsk pupils and achievement in national tests and elementary school grades (tenth grade) needs to be examined in greater depth in order to reveal what factors underpin this relationship. On the basis of the theme of this article it is possible to assert that the report by Skjær et al. (2008), which revealed a lack of parallel editions of digital learning aids in Bokmål and Nynorsk, represents a certain indicator of a discrepancy between the demands in the Education Act and reality in the schools. Furthermore, the previously mentioned reports confirm that in recent years this situation does not seem to have improved. Although research shows that Norway has a very high technology density in homes and schools (Frønes Narvhus & Jetne, 2011; OECD 2015), we cannot assume that this in itself is enough for improving the learning outcomes of pupils (Krumsvik et al. 2013). The SMIL-study showed that it is necessary to make a distinction between primary indicators for technology in education (computer density, infrastructure, ICT-use per week at school, access to digital learning aids, etc.) and secondary indicators (digital competence, subject use of ICT, quality of teaching, e-assessment, etc.) (Krumsvik et al. 2013). This SMIL-study allowed us to establish primary indicators, such as infrastructure and access to computers in upper secondary school were very good (1:1 and possibly the best in Europe). However, at the same time, the secondary indicators, such as teachers’ digital competence and class management varied greatly within the teachers’ collegium from classroom to classroom. This means that access to technology is not a reliable indicator of teaching quality and learning outcomes for the pupils, and thus secondary indicators are of particular interest to researchers studying today’s digitized school, both nationally and

internationally – as well as in the research area of “digital death” of minority languages and varieties. The report titled “Assessing the effects of ICT” by Scheuermann & Pedro (2009) underlines the need for a greater focus on indicators: “Despite the fact that education systems have been heavily investing in technology since the early 1980s, international indicators on technology uptake and use in education are missing” (Scheuermann & Pedro 2009, p. 5). And “... policymakers and researchers cannot be in a position to monitor what is truly going on in schools unless critical indicators about intensity, purpose and context of use of technology in education are available” (Scheuermann & Pedro 2009, p. 6). This means that there is a need to examine, first, whether there is still a discrepancy between Section 9-4 in the Educational Act and the reality in schools with regard to Nynorsk digital learning aids; and second, how the lack of digital Nynorsk learning aids might influence primary indicators (e.g. textbooks and digital learning aids) and secondary indicators (e.g. the quality of teaching and learning) for learning outcomes for Nynorsk pupils in different subjects. Gaining knowledge about this may well be of high importance, since the use of digital tools has become the fifth key competence in the national curriculum (Ministry of Education 2006), and while Bokmål pupils seem to have access to a wide range of digital learning aids in Bokmål, Nynorsk pupils seem to have very limited access to Nynorsk digital learning aids (attached to the curriculum) in school settings.

This might create a situation where a primary indicator for learning outcomes is in place for Bokmål pupils, but not for Nynorsk pupils. This might also influence secondary indicators for learning outcomes for Nynorsk pupils (and potentially the “Nynorsk effect”), and it is therefore important to obtain more research-based knowledge on this topic and move away from mere speculation to systematic and large scale research findings. This appears particularly important in light of the clear demands in the META NET reports (De Smedt et al. 2013).

Implications

As we have seen in the META-NET report (De Smedt et al. 2013), and in Scheuermann & Pedro’s (2009) report, it is important to develop reliable indicators in the area of instructional technology in education. Pelgrum (2009) asserts clearly that this ICT-area needs attention in research and national monitors, and states that one of the main focuses should be towards: “... whether inequities exist between sub-populations of students and how these are changing over time” (Pelgrum, 2009, p. 47). Nynorsk-pupils can be defined as sub-populations and might be vulnerable for digital inequalities and the first digital divide (Attewell 2001) when we talk about access to digital learning aids. Will this impact the second digital divide in any way? Nevertheless, for the rapid implementation of ICT in Norwegian schools, there is an urgent need to monitor this development in relation to Nynorsk pupils. We suggest that such monitoring and research studies should be carried out in line with the recommendations from the Pelgrum (2009), and should cover at least three core areas, namely: 1. *Intended learning outcomes*; 2. *Opportunities to learn (OTL)*; 3. *Competencies/attitudes of students* (Pelgrum, 2009, p. 46). These definitions of intended outcomes appear in the national curriculum as competence aims in the subjects; these are needed for steering educational processes that result in OTL. We have to examine how the availability or the absence of digital learning aids to Nynorsk pupils is related to OTL. This is important because OTL are supposed to influence the competencies and attitudes of Nynorsk pupils, and we need research-based knowledge to examine whether digital inequalities, related to both the first and second digital divide (Attewell 2001) occur as a consequence of the lack of OTL in sub-populations among pupils or if this is unproblematic for the Nynorsk pupils. We need more knowledge about OTL “to be able to construct tests for measuring the extent to which the intentions are realized” (Pelgrum 2009, p.

47). Thus we avoid this area from being a “black box” and can over time monitor how school performance increases or decreases. This seems particularly important in examining if the intentions in the Educational Act are realized in school for the Nynorsk pupils, and if digital learning aids in Nynorsk are available. This is of course of great interest in relation to examining the “Nynorsk-effect” (Vangnes et al. 2015) in greater depth, and in light of the influence of digital learning aids on Nynorsk pupils’ achievement in school in the future.

Based on such monitoring and research, we may be able to develop indicators for the use of instructional technology in teaching and learning for Nynorsk pupils and their influence on school achievement in the best performing counties in Norway. It is necessary here to make a distinction between primary indicators for technology use among Nynorsk pupils (access to Nynorsk digital learning aids) and secondary indicators (teachers’ digital competence, subject use of ICT, teaching quality, and class management). Moreover, a central aim of such research should be to carry out monitoring and examinations of indicators to obtain both an international perspective and also a specific national and regional perspective (Nynorsk regions), which will allow Nynorsk schools in the municipalities and in the counties to carry out many of these interventions by themselves in collaboration with researchers:

It should be noted that interventions do not necessarily need to be top-down: if schools in a country could see how they perform on the primary indicators (by means of school monitoring) and make inferences about the existence of potential weaknesses and their likely causes, these initiatives might be designed and generated at school level (Pelgrum 2009, p. 46).

To sum up, the research questions for the article was:

- 1 Why is there an urgent need for research on the consequences of the digital revolution’s impact on the underlying premises for how we understand and use a language variety as Nynorsk and dialects in Norway?
 - a. What kind of challenges arise from the lack of digital learning aids in Nynorsk in the digitized school?
 - b. Which Nynorsk areas particularly need more research-based knowledge, and how can this research be carried out?

We have attempted to answer these research questions throughout the paper and the one-line summary, and the main message from our position is that the need for parallel editions of digital learning aids in Bokmål and Nynorsk is no longer a question of economics or political statements for or against Nynorsk, etc. – it is rather a question of a deeper scientific understanding of learning and achievement in today’s digitized school. In this case, it concerns Nynorsk pupils, but in a broader sense, it concerns pupils in general and how they learn in school. Our position paper has raised several preliminary hypotheses based on both anecdotal evidence and research. It should be emphasised that these are still preliminary positions – but from our point of view – they represent important positional insights regarding a quite an interesting and relatively underexplored learning phenomenon, the “Nynorsk effect” in the digitized school, a subject certainly meriting further attention and research.

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ⁱ This report did not examine the quality of the digital learning aids (see, e.g. here for more information about this: <http://iktsenteret.no/ressurser/kvalitetskriterier-digitale-laeringsressurser>).

ⁱⁱ For example, the Directorate for Education and Training has recently announced that in the case of parallel editions of digital learning aids, and organizations, etc. can apply for funding if they want to develop such parallel editions: <http://www.udir.no/Utvikling/Laremidler/Tilskudd-til-smale-fag/>

ⁱⁱⁱ These initiatives have resulted in the development of several webpages; www.sophusportalen.no, www.allkunne.no, <http://www.nynorsksenteret.no/nyn/ressursbase-for-skulen/>

^{iv} See the Directorate of Education 2012, p. 10. Norwegian pupils are performing rather poor on the digital reading assessment in PISA (2009) and PISA (2012), but we don't know how the lack of digital learning aids in Nynorsk affects this situation.

^v The PISA-test has been increasingly digital since 2006 and from 2015 it will only a digital version will appear.

^{vi} Also called first language, primary language variant or native language.

^{vii} This is based on the many guest lectures one of the authors has given to teachers in schools in this county in the period 2007–2015, as well as collaboration with the consortium “Nordfjordregionen”, where we applied to the Norwegian Research Council for funding in 2012. We also had a meeting with the Secretary of Education, Ministry of Education on 29 October 2012 regarding our concerns about digital learning aids in Nynorsk. One of the authors has taught in the county of Sogn og Fjordane (1987–1989).

^{viii} 1/6 of the Nynorsk pupils i Norway lives in Sogn og Fjordane. Vangsnes et. al (2015) examined the whole Norwegian population (240 000 pupils) – not only Sogn og Fjordane.

^{ix} For example, Sophusportalen is a consequence of the engagement of teachers in this county to create their own digital learning aids in Nynorsk (www.sophusportalen.no). However, one cannot expect such good initiatives and “dugnad” (voluntary work) to cover all subjects at all grade levels (1–13) in our elementary schools, and thus there is an urgent need for publishers to comply with the Education Act's superfluous mandates and regulations.

^x Millennials: “People born in or after 1982 (approximately) who are members of the first generation who were born after the advent of digital media and who have grown up with these media; also called digital natives”. (Spector et al. 2014, p. 960).

^{xi} fMRI: “Functional magnetic resonance imaging, which is a neuroimaging technique that uses the change in magnetization between oxygen-rich and oxygen-poor cerebral blood as its basic measure of brain activity” (Spector et al. 2014, p. 957).

^{xii} In Norway pupils from the first through seventh grade must use the school's main language variant (which depends on what area of Norway the school is located in); but from the eighth through the thirteenth grade, the pupils can choose between Nynorsk and Bokmål as their primary language variant.

^{xiii} From a critical point of view it is not a big surprise to find significant results in a large sample of 240 000 pupils and such results must be interpreted with a certain carefulness. Further research is therefore needed to examine such correlations with other types of research design.

^{xiv} However, 48% of Norwegians favour the co-existence of Bokmål and Nynorsk (Grepstad 2015).

^{xv} This was not the research focus in these studies, but was brought up in relation to discussions around NDLA (National Digital Learning Arena), regarding whether it was necessary to have this digital teaching aid in both Bokmål and Nynorsk (see more about NDLA here: <https://ndla.no/>).

^{xvi} In light of the relatively low socio economic status in Sogn og Fjordane county (compared to other high performing counties in Norway) and pupils high performance on national tests and elementary school grades (tenth grade), this second digital divide

should be explored in more detail to reveal if the same tendencies occur in digital reading skills in this county. Or if the lack of digital learning aids in Nynorsk makes any impact on this issue.

^{xvii} *d* means effect size

^{xviii} This is an average effect size based on 11 experimental studies

^{xix} These results are confirmed in 22 of 23 experimental studies

^{xx} These results are confirmed in 13 out of 16 experimental studies

^{xxi} These results are confirmed in 14 out of 17 experimental studies