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Master's thesis

Reading digital learning platforms

A study on digital texts for the English subject

Master of didactics of culture and language subjects

2MIKSAVH3

2024

Acknowledgements

I would like to thank my supervisors, Ida Jahr and Anne Karhio, for all their help and feedback, inspiring meetings, and encouragement, and for enthusiastically believing in my project.

Thanks to all my friends and family who have listened to complaints, frustrations, and long monologues about digital reading, affordances, and remediation, and who have boosted my confidence when needed.

Most of all, thanks to the ever-supporting, patient and service-minded Eivind, for discussions, proof reading, excellent meals, and comfort.

Ingrid Amundsen
Oslo, May 2024

Abstract

The digitisation of schools has brought changes to the teaching materials students encounter in classrooms. In this thesis, I discuss how the digitisation of reading materials influences the reading experiences in the English subject classroom in Norway. More specifically, I analyse what characterises the texts in the digital learning platforms for the English subject and discuss how these characteristics influence the reading experience.

The main research methods applied in this thesis are close readings of texts in the digital learning platform *Skolestudio*, which will be examined through a theoretical framework combining affordance theory and the theory of remediation. In addition, I provide a quantitative account of digital text characteristics in the digital learning platforms from Aschehough, Cappelen Damm and Gyldendal, which offer an overview of the field, and a reference point for discussing how digital teaching materials affect reading comprehension.

My findings suggest that the digital learning platforms are characterised by conventionality and multimodality, and that they utilise the possibilities and affordances of the digital medium in a limited way. Based on research on digital reading, I propose that this has a negative impact on students' reading comprehension, and urge policymakers, publishers, teachers, and school owners to fully consider the distinct character of digital texts and digital reading in further development of curricula, teaching materials, and classroom practices.

Sammendrag

Digitalisering av skolen har ført til endringer i læremidlene elevene møter i klasserommet. I denne avhandlingen diskuterer jeg hvordan digitale tekster endrer og påvirker leseropplevelsen elevene får i engelskundervisningen. Mer spesifikt analyserer jeg hva som kjennetegner tekstene i digitale læreverk for engelskfaget, og diskuterer hvordan disse påvirker leseropplevelsen.

I studien anvender jeg i hovedsak nærlesing gjennom affordanse- og remedieringsteori som metode for tekstanalyse av det digitale læreverket *Skolestudio*. I tillegg presenterer jeg en kvantitativ oversikt av tekstene i tre digitale læreverk, for å gi en bredere representasjon av eksisterende materiell, og å danne et referansepunkt i diskusjonen om digitale læremidlers påvirkning på leseforståelse.

Funnene i studien antyder at de digitale læremidlene kjennetegnes ved at de er konvensjonelle og multimodale. Basert på resultater fra forskning på lesing på skjerm, hevder jeg at dette har en negativ innflytelse på elevenes leseforståelse, og oppfordrer makthavere, forlagsbransjen, skoleeiere og lærere til å vektlegge det særegne ved digitale tekster og lesing på skjerm i utviklingen av læreplaner, læremidler og klasseromspraksis.

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Gyldendal has approved the use of screenshots from their DLP and printed textbook in this thesis.

1 A digital school for digital society

Digital devices are now a common feature in Norwegian classrooms, and it is not controversial to claim that Norwegian schools have become digitised. Digitisation has brought changes to the materials students and teachers encounter in schools. This thesis seeks to address aspects of this change. Using digital teaching materials available for the English subject classroom, I aim to discern what characterises the material for the digital reading experiences now prominent in schools. Texts are central to the English subject as a basis for language learning and literacy development. Through analysing digital text characteristics, affordances, and remediation of texts in digital learning platforms, I discuss what characterises the digital texts students encounter through digital teaching materials, and how it may influence the reading experience. In this introduction I further elaborate on the aim, relevance, and context of this thesis.

Our digital society has produced a digital school, and the definition of what reading entails is being challenged. The Norwegian government has been a primary advocate for the digitisation of schools in its goal to promote Norway as a leading country in the field (Klausen, 2023). The introduction of and emphasis on digital skills in the curriculum and educational documents, however, have not proved to revolutionise students' learning. On the contrary, an OECD-report from 2015, revealed how heavy ICT investment provided no significant improvement of students' reading, maths or science skills (Mangen & Pirhonen, 2022, p. 106). In fact, research has identified how the advantage of printed reading has increased in more recent studies (Delgado et al., 2018). The digitisation of large high-stakes tests such as the Norwegian National Tests and the PISA-test, further underline how uncritical implementation of digital devices have an impact on education in general and reading in particular. The PISA reading comprehension test was made digital in 2018, and since then, there has been a shift in what types of text are selected for testing reading comprehension. Favouring multimodal, informational, multiple source texts, the texts in the PISA-test resemble those found on the open web, i.e., internet texts (van der Weel & Mangen, 2022, p. 4). According to van der Weel and Mangen (2022), this is problematic, because it changes the definition of what reading is. Emphasising multimodal, informational, multiple source texts promotes a shift away from long-form, singular text reading. Not only in the PISA-test, but in classrooms as well, as classroom content can be subject to what is called the "PISA-effect" (van der Weel & Mangen, 2022). This refers to how high-stakes tests might lead to schools adapting their teaching to the content

of a test. This is relevant in justifying the objective of this thesis, because just as high-stakes tests, textbooks influence what is being taught, and thus characterising what the new digital textbooks now offer will add to our understanding of how these influence the reading experience.

An optimistic belief in technology has dominated the discourse of white papers, curricula and Official Norwegian Reports that has formed the digitisation of Norwegian schools (Klausen, 2023). This optimistic belief can be found to be shared by schools in how they so far have accepted the entry and implementation of digital devices and their digital content. The first digital books were seen as an enhancement of the printed book, justified through their digital nature. The continued development of digital learning and teaching materials for schools opened up a new market for publishers, as well as the emerging field of educational technology (EdTech), and not to say the least, it opened up an opportunity for tech companies to target schools marketing their products. Thus, the digitisation of schools is now not only seen as a possibility for improving education, but for some it is as an opportunity to profit economically as well. This leads to question who the digitisation is for, who benefits? In discussing the development of the digitisation of schools, Mangen and Pirhonen (2022, p. 113) urges us to acknowledge that once digital technological products are released, politicians will advocate for their integration into education. This is problematic because most politicians bring with them outdated beliefs about the nature of learning and knowledge. Due to the lack of empirical evidence in support of the benefits of digital technology in education, Mangen and Pirhonen "conclude that the digitalisation has not been done on the basis of educational purposes" (Mangen & Pirhonen, 2022, p. 113). I will use this to argue the relevance of the research aim of this thesis: if the digitisation of textbooks is not done on the basis of educational purposes, it is crucial that we analyse the digital material to identify what it is that they do offer. Because they are here to stay, we need to identify the ways in which digital teaching materials differs from print, and what it is that may negatively affect the reading experience in digital environments.

The digitisation of the English subject classroom is visible through how traditional teaching materials, such as printed textbooks, rough books, and dictionaries, are being replaced by their digital counterparts. Because of the central position of texts in the English subject, this replacement has implications for learners. In the transition from print to screen, the physical properties of the learning materials have changed, and thus the ways in which we interact with

the material are different. Researchers and public debaters alike have begun to question how the increasing use of digital devices in school are affecting learning, general cognitive development, and in particular, reading. As a consequence of critical voices raised on the issue of screen use in education, the Norwegian government appointed a committee to make recommendations for how schools should deal with digital devices in relation to learning. The panel called The Screen Use Committee published their first paper in December 2023, which outlines the research on which they will build their recommendations in the upcoming Norwegian Official Report, scheduled for release before the end of the year. Their preliminary conclusion based on research on reading on paper versus reading on screen is that students should read more on paper. However, the group emphasises that in "the purpose of reading, what type of text and who the student is should be the basis for choosing between print and screen" (Skjermbrukutvalget, 2023, p. 5, my translation). If we need to consider when to use the screen and when to use print, we must seek to examine what it is that the digital texts actually do differently than their printed equivalents. This is at the core of this thesis; to identify what it is that the digital teaching material in the English subject does, in the essence of being digital.

This thesis contributes to the field of digital reading by offering a characterisation of digital texts for the English subject classroom. This might aid in understanding how teachers can support their students in their reading development and be of specific use to teachers, school owners and publishers. "How we read is inextricably linked to what we read" (van der Weel & Mangen, 2022, p. 1), and as what students read are changing, we need to fully understand this change in order to equip students with the relevant tools for understanding the new texts. We must understand what has changed and what has not, to help students identify how to utilise already effective reading strategies and when these come in short, as print reading skills forms the foundation for the development of digital reading skills (van der Weel & Mangen, 2022, p. 5). This thesis therefore provides analyses of what students read in connection to existing research on how it may affect their reading. Through categorising the texts in digital learning platforms according to their digital text characteristics, the aim is to distinguish the texts from other digital texts and identify if the digital teaching materials offer reading experiences which reflect the multifaceted experience of digital reading. Further, an analysis of the affordances of the digital learning materials will provide a basis for discussing how digital texts offer possibilities for different actions, and how these may affect the reading experience. Lastly, the theory of remediation offers a way to analyse how the digital learning platforms refashions both printed textbooks and other digital materials, and it is therefore a useful theoretical concept to

describe differences between the digital and the printed medium, and to find the characteristics of digital texts that may influence reading comprehension.

This thesis is structured thematically. Chapter 2, "Digital materials and digital reading", lays the groundwork for the following analyses. I clarify the key concepts informing this study and describe the situation regarding digital devices and materials in Norwegian classrooms in general, and the English subject classroom in particular. This justifies my choice of materials and highlights the relevance of the study. Furthermore, I refer to previous studies on digital learning platforms. As this thesis discusses how digital learning platforms affect the reading experience, it is relevant to describe my understanding of reading and digital reading, because it will affect how I analyse and interpret the selected materials. In the second part of chapter 2, I therefore discuss what reading and digital reading entails, connect it to the curriculum, LK20, and second language learning, and provide an overview of research on reading on screen.

In chapter 3, "Methodology and material selection", I explain the reasoning behind my choice of materials, based on the current situation of digital materials and devices in Norwegian classrooms. The methodology section outlines my research approach, as well as the limitations of the study. Due to the chosen topical structure of the thesis, further methodological approaches are described in the separate chapters.

Chapters 4, 5 and 6 contain the analyses and discussions of the selected digital learning platforms. In chapter 4, "The digital learning platforms", I give a quantitative account of the texts in three different digital learning platforms, based on the categorisation provided by Coiro (2020). In chapter 5, "Affordances", I outline the different approaches to affordance theory according to Gibson (1979/2015) and Norman (2013) and make particular use of Norman's concept of perceived affordances and signifiers in my analysis of the digital learning platform *Skolestudio*. The findings from the affordance analysis are then discussed in relation to research on digital reading to examine how digital affordances impact the reading experience. In chapter 6, "Remediation", I discuss Bolter and Grusin's (2000) concept of remediation and its driving logics of immediacy and hypermediacy. I then apply these concepts in analysing the digital learning platform *Skolestudio* and argue why remediation here can be seen as *respectful remediation* and *remediation as reform.*

Lastly, in chapter 7, “Digital reading on digital learning platforms - conclusions”, I propose that conventionality and multimodality are the defining characteristics of the digital learning platform *Skolestudio.* Finally, I discuss implications of the findings in this study to teachers, school owners, publishers, and researchers.

2 Digital materials and digital reading

2.1 Teaching materials, publishers, and digital learning platforms

2.1.1 Digital devices in Norwegian classrooms

The Norwegian school system is digitised. Numbers from the Norwegian compulsory education informational database (GSI) show that 95% of Norwegian students in year 8 -10 have access to their own personal digital devise provided by the school, i.e., one-to-one device access (Skjermbrukutvalget, 2023, p. 11). Of the one-to-one devices in lower secondary school, a majority are laptop computers (51%), followed by Chromebooks (25%), and tablets (18%) (Skjermbrukutvalget, 2023, p. 11). Though close to all Norwegian schools report that they use both printed and digital materials (Bergene et al, 2021, p. 112), the numbers on one-to-one device access illustrate the consolidated position of digital devices in Norwegian classrooms.

Furthermore, the implementation of the new Norwegian curriculum, LK20, provided an opportunity to register how schools stated that they would prioritise printed and digital teaching materials when purchasing updated versions for the LK20. In the survey *Spørsmål til Skole-Norge*, a majority of lower secondary schools would purchase both printed and digital materials, but of these, 41% would emphasise the purchasing of digital materials (Bergene et al. 2021, p. 122). Of notice, is that 35% of lower secondary schools stated that they would only buy digital teaching materials. This figure is distinctively higher than for primary (15%) or upper secondary schools (3%). Though the low number in upper secondary schools might be due to free admission to the DLP *Nasjonal digital læringsarena*, it is not sufficient to explain why lower secondary stands out the way it does.

2.1.2 Teaching materials - clarification of concepts

The Norwegian Directorate for Education and Training (2024) provides a clarification of terms concerning materials for use in school. They emphasise the difference between teaching material, learning resource, printed textbooks, and digital learning platforms. Teaching material includes all printed, non-printed, and digital materials specifically developed for educational purposes in line with curriculum aims. In contrast, learning resource, covers digital and analogue material that is not made primarily for educational settings, but may be didactically

incorporated for classroom use. Further, the Norwegian term “læreverk”, refers to a textbook series covering curriculum aims for several grades. For this thesis, the term printed textbooks will be applied to cover this aspect of teaching materials.

The digital version of a printed textbook is termed by the Norwegian Directorate for Education and Training (2024) as “læringsunivers”, “digitale univers” or “portaler for læremidler”. In this thesis, a digital textbook series will be referred to as a digital learning platform (DLP). Drawing on the definition of digital teaching materials made by The Norwegian Directorate for Education and Training (2024) and Berthelsen and Tannert’s (2020) definition of DLPs, a DLP referred to in this study is comprised of various aspects of didactic learning designs, fully arranged for classroom use. The content is structured for classroom interaction, which underscores similarities between a DLP and a printed textbook. The content in a DLP should be designed to meet all competence aims in the relevant subject curriculum, and the “courses are published on the same platform by only one publisher” (Berthelsen & Tannert, 2020, p. 3).

2.1.3 Teaching materials and texts in the English subject

Texts have been the main components in teaching materials for the English subject in Norway. Texts are here understood in a broad sense, which encompasses both written and oral texts, as well as different kinds of visual and graphical expressions. Texts are crucial in the English subject because language learning is dependent on some kind of meaningful input (Krashen, 1982). The principal source for written texts in the English subject has been printed textbooks developed in line with current curricula (Rimmereide, 2020, p.196). In a survey from 2016, 80% of teachers in year 5 - 10 stated that they had utilised a printed textbook in their last teaching session (Lund, 2020, p. 346). Another survey points to how teachers view the printed textbook as a guidance, support, or resource in their teaching, but that it can also be a constraint, if it inhibits the teacher’s choices and professional judgement (McGrath, 2006, in Lund, 2020, p. 347).

The printed textbooks in the English subject are typically organised in a chapter structure, in which different types of texts are selected to fit the overall topic of each chapter. The texts in each chapter are accompanied by glossary and reading comprehension tasks, as well as tasks addressing grammar, vocabulary, or other language and literacy skills. In her dissertation *Mapping the text culture of the subject of English,* Ørevik (2018) points to how the text culture

in the English subject is characterised by a certain conventionality in the development, selection, and use of texts in the English teaching classroom. This is demonstrated by a stability in genre patterns in printed textbooks despite curricular changes and is particularly evident in how digital teaching materials for the English subject tend to imitate traditional textbooks (Ørevik, 2018, p. 44). How this is done in the DLP *Skolestudio* will be analysed in light of remediation in chapter 6, however, a quick look at the textbooks and DLPs for the lower secondary school from the three major Norwegian publishing houses proves to illustrate this point; The DLPs from Gyldendal, Aschehoug and Cappelen Damm share the same topical chapter organisation as their respective corresponding printed textbooks, and the DLPs contain subchapters with texts and tasks emulating those in the printed textbooks. The ongoing shift from printed to digital teaching materials has largely occurred due to the increased focus on digital technology and digital skills in the two most recent curricula, LK06 and LK20. As teaching materials are designed according to the presiding curriculum, the strong, conventional text culture of the English subject sheds light on how this change is happening.

Because teaching materials are designed in relation to the curriculum in force, the texts developed for these materials are formed by the definition of texts in the curriculum. In the current English subject curriculum of LK20, "working with texts in English" is defined as a core element of English language learning. Here, texts are understood in a broad sense, entailing that

> texts can be spoken and written, printed and digital, graphic and artistic, formal and informal, fictional and factual, contemporary and historical. The texts can contain writing, pictures, audio, drawings, graphs, numbers and other forms of expression that are combined to enhance and present a message. (Ministry of Education and Research, 2019a)

This broad view on texts is reflected in the teaching materials for the English subject in the great emphasis on multimodal texts found in both printed textbooks and DLPs (Ørevik, 2018). Multimodal texts are texts that employ two or more different modes, or semiotic resources, to communicate meaning (Rimmereide, 2020, p. 192). As such, teaching materials in the English subject are characterised by how they combine different textual and visual components and are thus "multimodal by nature" (Rimmereide, 2020, p. 196). The strong relationship with printed textbooks in the English subject classroom in Norway is reflected in the range of published

teaching materials for schools, and in the next section I will therefore have a closer look at the publishers in the Norwegian market for teaching materials.

2.1.4 Publishers

When characterising the digital reading experiences in the English classroom in Norway, it is relevant to consider the Norwegian publishing market for teaching materials. The largest publishers dominate not only the printed market, but the digital market as well. This makes them primary distributors for digital texts in the classroom, and how they design their digital content has a large impact on students' digital reading. The Norwegian market for teaching materials is dominated by four main publishing houses: Gyldendal, Cappelen Damm, Aschehoug and Vigemostad and Bjørke. Numbers from the Norwegian Publishers Association (2023) show that Gyldendal has the largest market share for printed teaching materials at 39%, followed by Cappelen Damm at 35%, and Aschehoug at 25%. As Vigemostad and Bjørke are not part of the Norwegian Publishers Association, they are not included in the statistic, and information about their share of the market has not been possible to access.

When including numbers for digital teaching materials, Gyldendal's market share increases to 43%, while Cappelen Damm sinks to 32%, and Ashcehoug to 21%. These numbers do not account for actual use, and though Gyldendal has the largest market share, it is not given that Gyldendal's DLP, *Skolestudio*, is the most widespread DLP in the lower secondary school. In addition, The Norwegian Association of Local and Regional Authorities (KS) is piloting a new financial model to pay for digital teaching materials, in which the participating schools are given access to what is called the ecosystem for digital teaching materials and resources (Osloskolen, 2021). This contains more than 30 different digital objects, from which schools are free to choose from, as payment is calculated according to use. Though the participating schools account for less than 6% of Norwegian primary and lower secondary schools, it contributes to the vague picture of which digital learning platforms are mostly used.

2.1.5 Previous studies on digital learning platforms

There is an increasing amount of research regarding different aspects of learning in digital environments. Within the great variations in methodology, theoretical perspectives, and research focus, I have found two studies that are particularly relevant to this thesis. In their study called *Analysis of digital textbooks*, Rodriguez-Regueira and Rodriguez-Rodriguez

(2022) describe the situation concerning digital textbooks in Spain. Though they apply the term *digital textbook* to describe the digital teaching material in their study, this notion is in concordance with that of digital learning platform employed in this thesis. The authors develop a tool guide to characterise digital textbooks by analysing technological, pedagogical, and functional aspects of the selected material, and applies their analytical tool on 33 different digital textbooks published for the Spanish primary school. The digital textbooks were found to offer no options for promoting accessibility, such as altering font size or background colour, and there was limited use of specific digital affordances, such as videos, audiovisuals, and hyperlinks. Their study therefore concludes that the digital textbooks in the Spanish market follow the graphic and editorial tradition of printed textbooks, and that their only found advantage is the possibility for digital access.

These findings correspond with those of Berthelsen and Tannert (2020), who studied how affordances were utilised in a digital learning platform for Danish L1. They found that the DLP offered few and basic virtual affordances, meaning the different possibilities for action that are offered by the DLP (this will be further elaborated on in chapter 5, "Affordances"). However, the DLP in their study provided tools for supporting struggling readers, such as audio recorded texts and the possibility to resize fonts and other textual elements. Berthelsen and Tannert (2020) still conclude that the learning designs in the DLP do nothing but replicate traditional learning designs, and as such, the implementation of digital learning platforms in classrooms restricts rather than expands possibilities for learning.

2.2 Reading

2.2.1 What is reading?

This thesis aims to characterise the texts in digital learning platforms. As the digital mode influence how we read, it is necessary to first outline what defines reading, for then to be able to discuss what defines digital reading. Reading is a skill necessary for managing contemporary life and provides a foundation for both learning in general and for language learning in particular. Though reading is a receptive skill, it is by no means a passive skill. As a basis for understanding reading, I will apply the definition of reading comprehension offered by the RAND reading study group (RRSG). Now more than 20 years ago, the US government funded RRSG developed a framework for improving research on literacy. In their report they define

reading comprehension as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (RAND, 2002, p. 11). This definition emphasises the reader's active role in constructing meaning from texts. Furthermore, it displays how reading is a complex process, relying on, firstly, the ability to extract information, which entails recognising and decoding letters, words, and sentences, and secondly, the ability to construct meaning by combining information from increasingly complex texts (Tishakov, 2020). Further, the RRSG define reading comprehension as consisting of three elements: the reader, the text, and the activity, which are interrelated in a sociocultural context. I will further discuss these elements in relation to digital reading in section 2.2.3 below.

The RAND reading study group's definition of reading resonates with the description of reading as a basic skill in the Norwegian curriculum, LK20. The English subject curriculum states that reading in English "means reading and finding information in multimedia texts with competing messages and using reading strategies to understand explicit and implicit information" (Ministry of Education and Research, 2019a). Both the Norwegian and the English subject curriculum describes the basic skill of reading as entailing comprehension of various texts in both print and digital forms. By applying relevant reading strategies, reading advances from basic language exploration to fluency in understanding and reflecting on complex texts, and in assessing them critically (Ministry of Education and Research, 2019a; 2019b). While the Norwegian subject curriculum is emphasised as the main contributor to the development of reading skills, the English subject curriculum unsurprisingly gives prominence to language learning. However, English is the only subject curriculum that refers to readers' enjoyment. As reading for pleasure is an important factor in maintaining and developing reading skills and language competence (Carlsen, 2020), this aspect enhances the contribution and importance of the English subject on student literacy.

2.2.2 Reading and digital skills as basic skills in LK20

This thesis centres on digital reading in the context of the English subject, and it is therefore important to have a look at how the curriculum, LK20, describes digital skills as a basic skill in relation to reading. Digital skills in the English subject involve using online tools for language learning and interacting with authentic English sources to strengthen language acquisition, knowledge construction, and critical thinking. Digital skills in English progress from language

exploration to evaluating information from diverse English sources (Ministry of Education and Research, 2019a). Though similar to reading as a basic skill, digital skills also encompass communication with others, as well as the creating of texts. Central to both reading and digital skills as basic skills are language learning, developing students' ability to find and understand information, and their ability to reflect on and assess the different sources encountered.

On their website, the Norwegian Directorate for Education and Training offers users a tool to identify competence aims related to each of the basic skills. When selecting competence aims after year 10, the relevant competence aims for reading and digital skills are close to identical. The one competence aim that is unique to reading involves raising students' metacognitive awareness in language learning, while the one unique to digital skills involves writing and creating texts. The remaining 10 competence aims are the same for reading and digital skills, which may imply that though reading entails reading on paper and on screen, the competence aims related to reading may be achieved by focusing on digital skills. However, research addressed in the next section clearly states that there is a difference between reading on paper and reading on screen, and it is crucial to identify what this difference is and how it affects reading comprehension. It may also indicate that digital reading should encompass different competence aims, or that reading as a digital skill should be more clearly defined. On that note, in the following section I will outline a model for characterising digital reading as proposed by Coiro (2020).

2.2.3 Digital reading

The development of digital tools opens up ways to new forms of reading and necessitates a reformed view on what reading is, and what affects and influences reading comprehension. In their literature review of existing research on paper vs. screen-based reading, Singer and Alexander (2017) found that a large majority of studies were missing definitions of reading, and especially so concerning digital reading. According to Singer and Alexander (2017), this lack of defining digital reading could be a result of researchers considering reading to be the same skill across different modes. However, reading is a complex process, and digitisation adds layers of complexity to that process. In her conceptualisation of digital reading, Julie Coiro (2020) argues that we should broaden our understanding of reading in order to grasp what digital reading entails. She expands on the model of reading comprehension defined in the RAND Reading Study Group's report, by defining the four elements of reading comprehension

(the text, the reader, the reading activity, and the sociocultural context) in accordance with digital reading experiences and research. She proposes a multifaceted heuristic to characterise the spectrum of digital reading experiences (hereby called Coiro's model) seen in figure 2.1 below. In the following I will briefly outline Coiro's model of digital reading. Though this thesis focuses particularly on the elements of text and context of medium, it is relevant to outline all four components in Coiro's model, as reading comprehension is affected by all of them.

Coiro (2020) classifies texts according to traditional and digital characteristics. Traditional texts, according to Coiro (2020), are categorised as either literary, informational, or a hybrid of the two. They can be multimedia and multimodal texts, and these are separated to distinguish between "multimedia texts that are primarily static (printed words and graphics) and multimodal texts that are more dynamic, in ways that are more typical of digital texts." (Coiro, 2020, p. 19). The characteristics of digital texts are shaped by where the text can be found, e.g., whether it is encountered in an app or on the internet, and the level of text-reader interaction, e.g., whether it includes hyperlinks or other interactive activities. Digital texts are therefore classified as on-screen texts that resemble printed texts in their linearity, hypertexts and hypermedia texts which incorporates different levels of interactivity and multimodality, internet texts that are found on the open internet, and augmented reality texts which intertwine perceptual reality with digital reality. I will further discuss the categorisation of traditional and digital text characteristics in Coiro's model in relation to digital learning platforms in chapter 4, "The digital learning platforms".

"Activity" is an element of Coiro's model because reading activities influence reading comprehension through what they prompt the reader to do. On word and sentence level, activities include decoding, or a in a teaching situation it involves focusing on specific parts of the text. Comprehension-related activities may be categorised according to the complexity of the actions asked. These start with locating and finding concrete information, and progress to cover more challenging activities prompting the reader to make inferences, interpret, and critically evaluate information from different types of texts (Coiro, 2020, p. 20). Furthermore, readers may be encouraged to use their comprehension in creative activities, and complexity increases when these include the use of several different semiotic and modal systems.

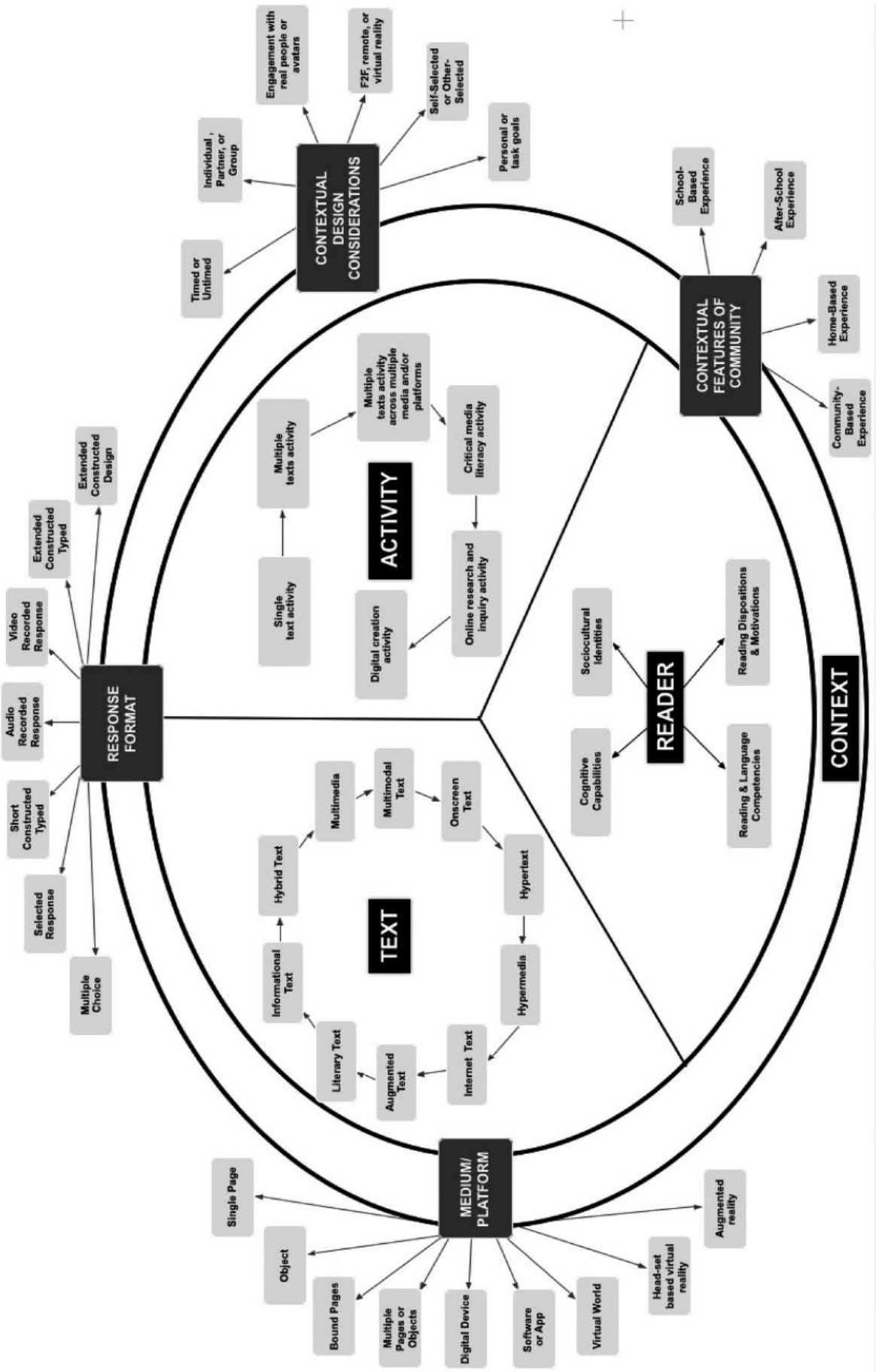


Figure 2.1. *Coiro's model for characterising the spectrum of digital reading experiences (Coiro, 2020, p.11)*

Reading is always something that engages the individual, and individual differences between readers will therefore affect their reading comprehension. In Coiro's model of digital reading, individual differences are categorised according to cognitive capabilities, reading and language competencies, reader dispositions and motivations, and sociocultural identities. These are, more often than not, interrelated and are impacted by text type, reading activity, and context. Readers' general cognitive capabilities are the cognitive processes connected to memory, self-regulation, critical evaluation and integration, and information processing. These are found to affect reading comprehension in both printed and digital reading environments (Coiro, 2020, p. 21). Furthermore, readers do not only differ in their general cognitive capabilities, but in their reading and language competencies as well. The proficient reader has adequate decoding skills and vocabulary, knows why and how they are reading a text, applies suitable reading strategies, and is metacognitively aware (Engen & Helgevold, 2006). These skills are acquired and developed over time, and readers' experiences and engagement with different types of texts influence these processes. Digital reading is thus affected by the same linguistic and meta-cognitive skills and strategies as reading in print, but the navigational complexity of digital texts influence strategies differently. In addition, what we think about reading and of ourselves as readers, i.e., reader dispositions and beliefs, influence what we take away from the reading experience. Related to digital texts, research has shown that readers' beliefs, attitudes and mind-sets about technology and internet use are crucial to how successfully they navigate and engage with internet texts (Coiro, 2020, p. 23). The fourth distinction "of reader differences relates to the varied sociocultural identities that readers adopt in the context of specific print or digital reading environments, and how these interact with other reader variables" (Coiro, 2020, p. 23). In relation to digital reading, this implies looking at how the different digital discourses contribute to identity construction and thus how it influences reader dispositions and motivations for different kinds of digital reading. As reader dispositions and motivation affects reading comprehension, sociocultural identities can be seen to have an impact on reading comprehension as well.

The context of reading influences how readers engage with texts, and thus reading comprehension. In Coiro's model this is outlined in four contextual elements that affect the reader, the text, or the activity. These are medium/platform, which informs on the different formats and devices a printed or digital text may be found in; response format, which concerns the different ways response can be given for both digital and printed texts, e.g., multiple choice or video recorded response; contextual design considerations, which refer to how the reading

activity is organised, e.g., individual/group or timed/untimed; and contextual features of community, which sheds light on where reading is happening and how this context might affect the reading experience, e.g., a school- or home-based experience (see figure 2.1). As this thesis seeks to characterise the digital reading experience by looking at texts in DLPs, the contextual element specifically relevant is medium/platform. To gain a broader understanding of how medium/platform affects reading, a perspective missing from Coiro's proposed model is needed, namely embodiment. In the next section, I will provide a brief outline of embodied reading before applying this perspective in the discussion of affordances in relation to reading in chapter 5.

2.2.4 Embodiment

To understand what fully encompasses reading, we must understand how the body influences our reading experience. Viewing reading as a multisensory and embodied act provides a way to look at how affordances affect reading. "A main point within embodied cognition theory is that perception and cognition is influenced and partially constituted by the body's engagement with the environment" (Hillesund et al., 2022, p. 2). When we read, we engage the brain not only through our eyes, but also through hands, fingers, as well as head, arms, and the general body posture. Depending on what we read, whether a small, light book, or a large, heavy book, we position our bodies differently for reading. When learning to read, we also learn how to coordinate eye- and body movement for best possible adjustment to the reading situation. In doing so, the brain develops body schemas; collections of motor programs involving physical motor capabilities, skills, and habits (Hillesund et al., 2022, p. 4). The body schemas developed are relative to the affordances of the reading technology in use, and so body schemas for reading a book will be different from body schemas for reading on a smart phone or a laptop computer. Research in neuroscience has shown that the brain activates and recycles close neural networks for conceptual and sensorimotor mechanisms (Hillesund et al., 2022, p. 2). Though much research is still needed to explain the complex mechanisms of the brain, the findings may at least lead to an understanding of how cognitive processes, such as reading, is not only a matter of the brain, but also that of the body.

2.2.5 Reading in English

As this thesis relates to reading of teaching materials in the English subject, it is timely to bring attention to reading in a second language. To address reading in English in a Norwegian context, we must first identify the role of the English language in Norway. Traditionally, English has been described as a foreign language (EFL). This definition is commonly used in countries where a considerable part of the population does not use English as a community language for everyday communication. Discussing the changing position of the English language in Norway, Rindal & Brevik (2019, p. 434) point out that the English language now shares more characteristics of a second language (ESL), than a foreign language, especially for younger generations. Through extensive use of English in digital and social media, the English language is becoming part of identity construction and repertoire, and as such, sharing second language characteristics (Rindal & Brevik, 2019, p. 435). However, Norway does not share the characteristics of a traditional ESL country; English is not an official language, "and we do not have a history of colonialism that has led to English and one or more local languages being associated with different social classes and societal functions" (Rindal & Brevik, 2019, p. 435.) English in Norway can therefore be described as being *in transition* between EFL and ESL. For this thesis, I will follow Rindal and Brevik's conclusion and use "the more generic label 'L2 English'. (...) This description does not specify the order in which a student learns a language, but rather reflects that language proficiency is often developed in more than one language simultaneously" (2019, p. 435). Related to reading, this is in line with research which over the years has identified how L1 reading competency predicts reading competence in L2 (Koda, 2007).

L2 reading differs from L1 reading by being crosslinguistic (Koda, 2007). Outdated beliefs about the separation of languages in the brain is countered by research finding strong evidence for both languages being automatically activated during L2 lexical processing, and further neuroscientific evidence showing that phonological processing exhibits the same neurological patterns in both L1 and L2 (Koda, 2007). Put simply, this means that when L2 is activated, so are similar features in L1. This can indicate that the crosslinguistic effect of reading in L2 enhances the cognitive load and thus the strain on working memory. In a study on reading comprehension in L1 and L2, Li and Clariana (2019) include an exploration of how working memory affects reading comprehension in L2. They provide evidence from research suggesting that L2 readers employ a broader range of cognitive resources, especially working memory, for

successful reading comprehension. Further, studies have shown a positive relationship between working memory and L2 reading comprehension, in that higher working memory capacity may lead to better L2 reading comprehension. As digital reading may increase the cognitive load and thus demand a stronger working memory from the reader (DeStefano & LeFevre, 2007), it could be implied that internet or hypertext reading is more challenging when reading in a second language.

Though most Norwegian students are still more proficient readers in their L1, Brevik investigated a group of outliers that performed significantly better in L2 reading (Brevik, 2019). In her study, she found that the students reported extracurricular extensive use of English as the reason behind their L2 reading being superior. These extracurricular activities were stated to be motivated by personal interests. This study points to the changing position of the English language in Norway, and not only by informing on how everyday extracurricular English is becoming more common, but also in how reader dispositions influence reading comprehension.

The growing body of research on digital reading has first and foremost concerned L1 readers. The main findings from this research will be outlined below, and though this thesis focus on L2 reading, the findings from L1 digital reading research are applicable to digital reading in an L2 as well. The main reason for this, as stated above, is that reading is not fundamentally different in L1 and L2. This is not to undermine that there are in fact differences, e.g., lexical, and grammatical knowledge, and thus fluency, but to emphasise the similarities when looking at digital reading materials. When regarding differences between printed and digital reading, the main differences are not bound to which language a text is written in. The differences between a paper text and digital one may be the same whether the text is written in Norwegian or in English; a printed text in Norwegian has the same affordances as a printed text in English, and a digital text in Norwegian may demand the same scrolling experience as a digital text in English.

2.2.6 Research on reading on screen - an overview

After more than a decade of researching reading on paper and screen, findings are becoming more and more conclusive: medium matters for reading. This section will provide an overview of some of the main findings from research comparing digital- and paper-based reading. It is worth mentioning that several researchers now argue against the printed vs. digital reading

dichotomy and claim it is urgent to focus on identifying what it is that characterises digital reading. The question should not be about which reading mode is better, but rather when to choose print and when to choose the screen (see Coiro, 2020). However, my claim is that it is still useful to distinguish digital reading from printed reading as a starting point because this information may aid in identifying the characteristics of the digital reading experience in where it differs from printed reading.

According to Baron (2021a, p. 76), there are mainly two types of studies regarding reading single texts on paper and on screen. Single text reading is here defined in contrast to multiple text reading, which often characterises the reading of internet texts. The first kind investigates students' perceptions and preferences in the use and choice of medium. Results from several different surveys done among students ranging in age from 11 to 26 show that print was the preferred medium for overall learning, due to better concentration and less multitasking (Baron, 2021a, pp. 77–78). However, students also report that they prefer digital texts, as they look shorter and are more entertaining. In addition, students predict they will do better when reading and being assessed digitally, often overestimating their abilities (Baron, 2021a, pp. 90–91; 2021b). The latter continues to be confirmed in studies on the matter (Singer Trakman et al., 2023). This may have an impact on mindset and thus how students execute the reading exercise, and it might suggest that developing students' metacognitive awareness on a specific reading mode could have a positive impact on their digital reading.

The second kind of research on reading assesses and compares learning outcomes after reading linear texts on paper or on screen and looks either at affordances of the medium or at different moderating variables to explain results. Several meta-analyses of recent studies on the effect of medium on reading (Clinton, 2019; Delgado et al., 2018; Kong et al., 2018) found conclusive evidence for the advantage of printed reading on comprehension. Combined, the significant findings from the meta-analyses pointed to the following moderating factors: time-restriction, text length, text genre and the studies' year of publication (Baron, 2021b). There was an enhanced difference in students' test results when reading and comprehension testing were time-restricted, showing a clear advantage for reading on paper. This advantage was clear in studies conducted on informational texts but was not apparent in studies done on literary texts. This could provide explanations for the decreasing scores on digital high-stakes reading comprehension tests (van der Weel & Mangen, 2022).

Baron (2021a, p. 79 - 80) suggests two reasons for the growing advantage of paper-based reading. The first is what researchers now call the shallowing hypothesis. It is founded on the idea that the use of social media and phone-based digital reading facilitates shallow, rapid reading and prevents reflective thought (Annisette & Lafreniere, 2017, p. 1). As social media use is growing, the shallowing hypothesis might offer an explanation as to why digital reading is becoming inferior to reading in print. The second reason suggested by Baron (2021a, p. 79 - 80) is that the choice of questions for testing reading comprehension matters. Recent research implies that in answering questions seeking a concrete answer or an outline of the main ideas of a text, medium does not matter. However, in answering questions that require the student to make inferences or execute a closer reading, print showed to be the better medium (Baron, 2021a, p. 80). As the LK20 curriculum outline inference making as constitutive of higher-level reading skills, these findings should be considered when choosing between print and screen in the classroom.

In their mode effect study Støle et al. (2020) found that scores from reading comprehension tests were higher when executed on paper. Their study investigated and compared results from paper-based and computer-based assessment, using Norwegian National reading tests for 5th graders in 2015. Both tests were multimodal, resembling texts students meet in the every-day classroom, and all of the 1139 participants took part in both paper and digital testing. Analysis showed that there was a significant difference between the results from the paper-based and computer-based test, displaying a better reading comprehension from the paper-based test. Even though more than half of the students had similar results on both tests, almost a third had a better performance on paper (Støle et al., 2020, p. 6). When calculating for skill-level differences, results exposed a greater mode-effect for high-achieving students, and especially so for high-performing girls (Støle et al., 2020, p. 7). Støle et al. suggest that one of the reasons for the differences between results from the two modes is the use of scrolling in the digital assessment. Research implies there is a negative effect of scrolling on reading comprehension (Delgado et al., 2018; Sanchez & Wiley, 2009), preventing spatial orientation and thus complicating the reading process (Baron, 2021a, p. 87). I will further elaborate on this aspect in relation to embodiment, in chapter 5, “Affordances”.

3 Methodology and material selection

3.1 Material selection

The materials selected for this study are digital learning platforms developed for the English subject in Norway in year 10. To limit the scope of the study, I chose to focus on one DLP for in-depth analyses. In this section, I will first justify the choice of material, before going on to describe what these are and which part of the material that is subject to the study.

This thesis' focus is on the DLP *Skolestudio* by Gyldendal. There are mainly two reasons for this choice. First, the English subject material in Gyldendal's DLP *Skolestudio* has the same organisational structure as their printed textbook called *Enter*. This provides an opportunity to explore how the content has been remediated to a digital platform, as the content is identical according to the publisher (Gyldendal, n.d.b). The second reason builds on the former; Gyldendal presents their printed and digital materials as equal. On their website, possible customers are prompted to choose freely between the printed and digital material, or to purchase both, as if there are no differences between them, and thus the choice is only a matter of mode preference. How Gyldendal promotes this on their webpage can be seen in figure 3.1 below.

Figure 3. 1 *Screenshot from www.gyldendal.no promoting teaching materials for the English subject. (Gyldendal, n.d.b)*

A third reason is the fact that Gyldendal has the largest market share for teaching materials (The Norwegian Publishers Association, 2023). However, the numbers from the Norwegian Publishers Association do not mention materials for the English subject specifically, and they do not provide any evidence of actual use. Still, they do imply that Gyldendal has a certain influence on the development of teaching materials, being the largest publisher in the field.

As previously mentioned, numbers from the survey *Spørmål til Skolenorge* show that lower secondary schools emphasise digital materials to a greater extent than primary and upper secondary schools when choosing between printed and digital materials for the new curriculum (Bergene et al. 2021, p. 122). This provides a reason for selecting and investigating digital materials developed for the lower secondary levels, and to identify what it is that they offer. To limit the scope of the study, only materials for 10th grade were selected.

In addition to *Skolestudio* two other DLPs play a part in this study. These are *Aunivers* by Aschehoug and *Skolen* by Cappelen Damm. Together with Gyldendal, these two publishers make up three of the largest publishing houses for teaching materials in Norway. *Aunivers* and *Skolen* have been included to provide an overview and better understanding of the DLPs in the market, and to be a point of reference when discussing Gyldendal's DLP *Skolestudio*. They are therefore not subject to close readings or qualitative analysis but is included in a quantitative categorisation of the texts in the DLPs.

3.1.1 Material description and considerations

The DLPs contain material covering all subjects of the curriculum aims after 10th grade. Each subject's content is structured thematically, resembling chapters in a printed textbook. These themes, or chapters, are comprised of a selection of different texts, tasks, and activities. The texts and belonging tasks are organised together, and in *Skolestudio* and *Aunivers* these are combined and displayed as tiles on the page. Each tile represents a coherent unit of texts, tasks, and activities, to underline how they fit together. *Skolen* also groups together texts and tasks, but these have a different layout than the other DLPs, where each text and set of tasks have their own tile, though the interface design clearly signals which texts and tasks belong together. In addition to the main content, all DLPs have extra material on reading, writing, grammar, and oral skills. To limit the scope of the study, the focus of this thesis is on the texts in the main chapter structure. When referring to "the texts" in the DLPs, what is meant is the text units, or chapter texts, excluded the tasks and activities. Thus "a text in the DLP" means what is displayed on the website during reading, including all the different modes of expression. Furthermore, it is important to clarify that the analyses of the DLPs in this study are done through access on a laptop computer, as these are the most common digital devices applied for learning in lower secondary schools (Skjermbrukutvalget, 2023, p. 11).

To access the digital learning platforms, users need to log in with either a student or teacher account. These differ slightly, as teachers have access to assignment and assessment tools, in addition to teacher resources, such as lesson plans, midterms, and worksheets. This thesis aims to address the reading experience from the students' point of view, though for practical reasons the DLPs have been accessed through a teacher account. In the next section I will briefly describe the differences between the two account's access and explain why it is not found to have an impact on the close readings of *Skolestudio*.

The DLP *Skolestudio* as experienced in the teacher view was continuously cross referenced with images from student accounts provided by the publisher. This contributed to identifying how the "teacher view" differs from what student users are seeing, and the comparison showed that the text units are displayed in the same way apart from the teacher tools in the tool bar. This can be seen in figures 3.2 and 3.3, in which the different tool bars are marked by orange rectangles. Student users have fewer tools than the teacher user. They both have the sidebar icon which toggles the side menu, and the bubble icon in the student window enables comments from the teacher. In addition, a difference between the two are the green checkmarks that students are given upon finishing a task. These differences do not affect the main layout, navigation, or content of the main text, and the conclusion is therefore that the teacher access does not disturb the exploration of the text units in a way that can alter the results of this study.

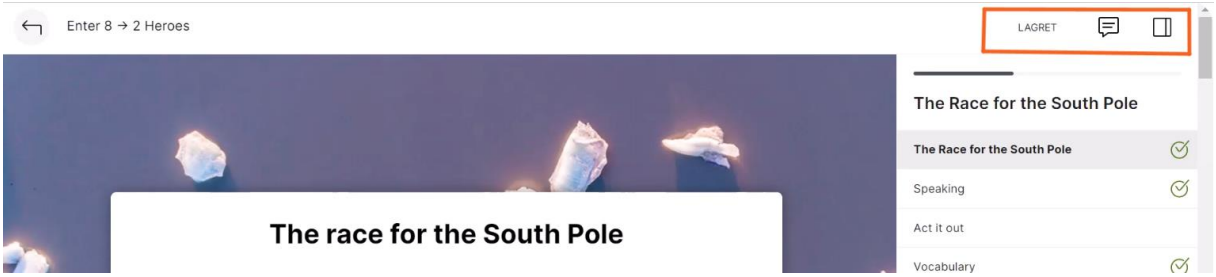


Figure 3.2 *Student view of a text in the DLP* Skolestudio. *(Gyldendal, n.d.a)*

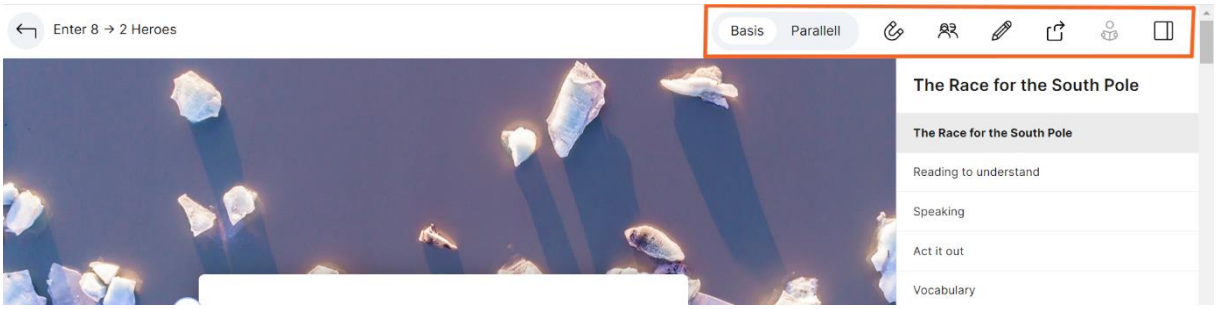


Figure 3.3 *Teacher view of a text in the DLP* Skolestudio. *(From "The race to the South Pole",* Gyldendal Skolestudio, Enter Fagrom *(2020). Background photo copyright: Shutterstock).*

3.2 Analytical approaches

To identify what characterises the DLP *Skolestudio*, and to address the research objectives of this thesis, I have chosen to include a quantitative overview of the text characteristics in DLPs from the three major publishers, and two separate qualitative analyses of the DLP *Skolestudio*. The type of research committed is descriptive. It therefore seeks to describe the object of study to provide an understanding of how features of the DLPs affect students' reading experiences in a digital environment. As a research strategy, I have taken an abductive approach. This means that the research process is formed by the continuous shift in focus between theory and data (Anker, 2020, p. 78 – 80), and that what is discovered in the data is interpreted in light of the theory and vice versa. I have therefore continuously shifted between reading, analysing, and interpreting the DLPs and applying and understanding the chosen theoretical concepts. In the following I will describe the analytical approach in further detail.

3.2.1 The quantitative approach

The quantitative approach in this study seeks to obtain an overview of what characterises the digital reading experience of DLPs, and to provide a point of reference for the qualitative analyses of the DLP *Skolestudio*. This is also to investigate if the DLP *Skolestudio* is representative of the DLPs in the market. DLPs from the three major publishing houses of Gyldendal, Aschehoug, and Cappelen Damm are included in the quantitative overview.

The content in textbooks and DLPs were cross referenced to look for similarities and differences in thematic organisation and textual selection. Categorisation was then done according to traditional and digital text characteristics in Coiro's model for defining digital reading experiences (Coiro, 2020). Subcategories of multimodal texts and hypertexts were added in line with results from the quantitative account and aim to describe the type of multimodal or hypertextual content found in the DLPs. I will further discuss the quantification of the texts in the DLPs in the next chapter.

3.2.2 The qualitative approach

The textual content of the DLP *Skolestudio* and its printed equivalent *Enter 10* have been declared as identical by their publisher Gyldendal (Gyldendal, n.d.a). This is verified by cross-referencing the two sources. The focus of the qualitative approach is therefore on the differences between modes: how the DLP presents its texts in the digital environment, and how the turn

from print to screen may affect the reading experience. Therefore, the qualitative analyses based on close readings do not focus on the textual content of the DLP, but on its affordances and remediation. I have applied these two perspectives as theoretical lenses for understanding how the DLP influences and changes the reading experiences from paper to screen.

Affordance theory provides a way to identify how the DLP *Skolestudio* influences reading through offering possibilities for different actions. The affordance analysis in this thesis is therefore an analysis of the how the physical properties and virtual tools of the DLP provides possibilities for action, and how this affects the reader. Through the theory of remediation, on the other hand, I can identify how the DLP incorporates different media in its presentation of materials. This theoretical perspective is useful for identifying the characteristics of the DLP *Skolestudio*, because it provides a way to describe how the DLP relates to the printed textbook, as well as other analogue and digital media. I will further outline, discuss, and apply both theories in their respective chapters.

3.3 Limitations of the study

The analyses are based on my interpretation of the theoretical concepts and the objects in the study. In the name of reliability, I would therefore like to address an aspect that might influence the results. I have worked as a teacher for several years, and my view of the DLPs is therefore coloured by my own as well as my students' experiences with them. However, I have not applied the DLP *Skolestudio* in the classroom, which favours the choice of this DLP for in-depth analyses. In addition, results from the three different approaches to the DLP, categorising text characteristics, and theories of affordances and remediation, point in the same direction, and therefore improves the reliability of the findings.

To analyse teaching materials outside the context of the classroom is to analyse the intended curriculum. This can be interpreted as a limitation of this study: this approach can be criticised for looking at the material out of context, and as such, does not include data and analyses of that data which describe students' or teachers' actual use and interpretation of the DLPs and their content. In addition, the study includes a close reading of only one of the DLPs in the market. Though the quantitative account of the DLPs from the two other major publishing houses seeks to make up for this, it is still an aspect that limits the scope of the study.

4 The digital learning platforms

4.1 The variety of texts in DLPs

To conceptualise digital reading, we need to identify what is being read, as how we read is a product of what we read. The aim of this thesis is to contribute to the description of the teaching materials offered for the English subject in Norway, and to discuss how they shape the digital reading experience. The focus is therefore on texts as an element of reading comprehension. Though the main object of study is the DLP *Skolestudio*, two other DLPs have been included in this section to offer a point of reference; to place *Skolestudio* in the context of other digital learning platforms published in Norway. Thus, this chapter will present a quantitative categorisation of the texts in the DLPs from three of the largest Norwegian publishers: *Aunivers* by Aschehoug, *Skolen* by Cappelen Damm, and *Skolestudio* by Gyldendal. These consist of a multitude of different texts, and Coiro's model of digital reading provides a useful tool to identify these.

As previously outlined, in her model of digital reading, Coiro (2020) classifies texts according to traditional and digital characteristics, and the arrows in figure 2.1 address an increase in text complexity. Using reading of printed texts as a starting point, Coiro calls attention to the intricacy of the digital reading process. This is partly due to the digital environment's possibility of incorporating and combining several different types of texts at the same time (Coiro, 2020, p. 20). Naturally, a printed book may also combine different types of texts, or a single text may integrate several different modalities, but the digital format expands the possible various combinations by offering additional different modes and options for accessing these modes. As such, Coiro (2020) emphasises the variety of digital texts. This section therefore seeks to identify the variety, or lack of variety, in the three DLPs *Aunivers*, *Skolen*, and *Skolestudio*, by discussing traditional and digital text characteristics of their different text units. Thus, to place them in the array of digital materials and assess whether they provide reading experiences that resemble the diversity of digital reading. As outlined in the previous chapter, when quantifying the texts in the DLPs what is counted is the text modules that are presented as separate units across the three DLPs. In the following I will present and discuss results from the quantitative categorisation.

4.2 Text characteristics

The results in table 3.1 show that *Aunivers* has a total of 44 texts, *Skolestudio* has 56, while *Skolen* has 62 texts. In the section below, I will first discuss the categorisation of texts according to genre (informational, literary and hybrid), before looking at the difference between multimedia, multimodal and hypermedia texts. This categorisation is not straight forward, and therefore the latter will be succeeded by a discussion of hypermedia text and hypertext before I go on to discuss the categorisation of texts in the DLPs as on-screen and internet texts.

		Aschehoug *Aunivers*	Cappelen Damm *Skolen*	Gyldendal *Skolestudio*
	Texts in total	44	62	56
Traditional text characteristics	Informational	22	51	26
	Literary	16	9	25
	Hybrid	7	2	4
	Multimedia	44	60	56
	Multimodal	44	62	56
	Audio	44	60	56
	Video	0	6	3
	Dynamic images	0	6	0
	Interactive elements	1	0	2
Digital text characteristics	On-screen	43	51	56
	Hypertext	44	62	56
	Glosses	43	42	52
	Navigation	44	62	56
	External hyperlinks	0	8	2
	Hypermedia	0	0	0
	Internet texts	0	8	2
	Augmented reality	0	0	0

Table 4.1. Overview of traditional and digital text characteristics in the three DLPs.

4.2.1 Genre

In Coiro's model of digital reading, texts are categorised according to traditional characteristics: informational, literary and hybrid (Coiro, 2020, p. 28). As a way to differentiate between texts according to genre, this may appear simplistic. However, this basic genre distinction is commonly used in reading research (Baron, 2021a, p. 26). Though terminology differs, the contrast is between texts that tell a story, labelled narrative, literary or sometimes fiction, and

texts that seeks to inform, describe, or explain, labelled informational, expository or non-fiction (Baron, 2021, p. 26). The previously mentioned meta-analyses on reading on paper and on screen found genre to be an influential factor on screen inferiority, and these studies differentiated between informational, narrative or a mix of the two (Delgado et al., 2018), or between narrative and expository (Clinton, 2019; Kong, 2018). To distinguish between the texts in the DLPs, the terms applied in the quantitative categorisation correlate with those proposed by Coiro, i.e., informational, literary, and hybrid.

All three DLPs have a greater quantity of informational texts and a varying number of literary and hybrid texts. The low number of literary texts in *Skolen*, i.e., 9 out of 62 texts, might be due to the fact that they offer several literary texts under their "in depth"-sections, sections that are not part of the main chapter structure, and has therefore not been included in the quantitative account of the texts. *Skolestudio* has a more equal distribution of informational and literary texts, with 25 literary and 26 informational texts, while *Aunivers* has a larger overweight of informational texts, with 22 informational and 16 literary texts. The greater number of informational texts in both *Aunivers* and *Skolestudio* is due to the hybrid texts, of which most are marked by the publishers as literary texts. However, as they encompass both literary and factual passages of text, they have been categorised as hybrid.

4.2.2 Multimedia, multimodal and hypermedia texts

All the texts in the DLPs consist of both written text and images. Texts that are composed of two or more modes are commonly referred to as multimodal texts. However, Coiro (2020, p. 28) argues that when categorising digital texts, a distinction should be made between multimedia and multimodal texts, due to different levels of complexity. A multimedia text would be identified as being more static than a multimodal text, and as such, resemble a printed text. A multimodal text would be one that incorporates dynamic modalities, for instance audio, video, or animations. Furthermore, Coiro (2020, p. 29) explains how a hypermedia text is the digital version of a multimedia text, and the term originates in the combination of hypertext and multimedia (Ensslin, 2014, p. 258). Based on this, I interpret the distinction between a multimodal text and a hypermedia text to lie in the hypertextual features of a hypermedia text. The different modalities of a hypermedia text are located behind layers of hyperlinks, while a multimodal text has incorporated several modalities embedded in the main text.

Applying this distinction in categorising the texts in the DLPs, all but one of the texts would at first glance be multimedia texts, as their main bodies of text consist of typed text and static images. However, close to all the texts also contain audio recordings, which are dynamic, thus making them multimodal texts. A small minority of the texts include several dynamic modalities and have a level of interactivity that instantly categorise them as multimodal texts; they include videos, have interactive maps or statistics, or contain animated backgrounds. *Aunivers* has the least of these features, with only one text displaying content that it not static text and images. However, in this text, the interactive map which users are prompted to click on, only allows them to point out the country of Nigeria, and once correctly identified, the map becomes static.

Six of the texts in *Skolen* and three of the texts in *Skolestudio* incorporate videos, while an additional six texts in *Skolen* have dynamic images, placed in between passages of written texts. These are labelled "dynamic images" in table 3.1. They run in a continuous loop on the page and do not require any action from the reader other than observing. As all the multimodal elements mentioned in this section are embedded within the same page, it is not evident that the texts in the DLPs qualify as hypermedia texts. However, there are content which are accessed through hyperlinks, and a look at these is necessary before determining the hypermediated nature of the texts in the DLPs.

4.2.3 Hypertext and hypermedia

Digital text characteristics for hypertext are found in all the three DLPs. Hypertexts are texts that incorporate layers of text, structured around, and accessed through hyperlinks. They promote interactivity by inviting readers to click on links, navigational buttons, or, if multimodal, interactive elements such as animations, images, videos, and interactive maps. The DLPs main hypertext function relates to navigation. This hypertext structure provides navigation between the main page, the text, and the belonging activities. However, *Aunivers* is the only DLP that does not contain any hypertext linking to the web outside. This feature of hypertextuality is labelled "external hyperlinks" in table 3.1. There are two texts in *Skolestudio* that incorporate hyperlinks which brings the user outside the DLP. These are found as hyperlinked sources on the bottom of the page. In addition, eight of the texts in *Skolen* provide the same "external hyperlinks". Seven of these texts have hyperlinked sources, while one

contains a hyperlink inside the main text body, taking the user outside the DLP for additional reading.

A common hypertext feature in the DLPs is hyperlinked glossary displaying definitions in Norwegian for a selection of words. For *Aunivers* and *Skolestudio*, the texts without e-glosses are few, and when not included it is due to how the text is mainly aural, or because it focuses on learning vocabulary through context. In contrast, 20 of the 62 texts in *Skolen* do not support a glossary function. Five of these are listening activities, but the remaining 15 display no apparent reason for not containing glosses. A closer reading of the texts could determine if the lack of glosses is because the texts contain only high frequency words, and as such, are considered to be simple texts.

Following this, is it possible to categorise the texts as hypermedia texts? Coiro (2020) writes that the integration of different media in hypertexts makes them hypermedia texts, and in her article both "hypertext and hypermedia refer to digitally networked texts found within a closed or bounded digital environment with one organizational structure (e.g., CD-ROM encyclopedias, library databases, digital storybooks)" (Coiro, 2020, p. 29). In this, Coiro suddenly does not distinguish between hypertext and hypermedia, but separates them from other digital texts that are not found in a bounded digital environment. However, if the goal is to differentiate between different digital text characteristics, the distinction between multimodal, hypermedia and hypertext is of relevance to the categorisation of texts in this study. It is possible to argue that the texts in the DLPs are hypertexts but not hypermedia. Firstly, because the multimodal content is embedded, which means that they are not hyperlinked, e.g., the audio recordings, or videos. Secondly, because they do not offer hypertextual content of another mode, e.g., the hyperlinked glosses displaying written descriptions. As such, they differ from other hypermediated texts such as internet text, and this distinction will be further discussed in the next section.

4.2.4 Augmented reality, internet texts and on-screen texts

Following the distinction of digital texts in Coiro's model of digital reading, augmented reality, internet, and on-screen texts have not yet been addressed. It possible to categorise the texts in the DLPs by ruling out what they are not. As table 3.1 exhibits, they are not augmented reality texts, which mix digital or virtual reality with unmediated reality. Though found online, they

also cannot simply be defined as internet texts. Internet texts are "an extension of hypertext" (Coiro, 2020, p. 29), distinguished from other digital texts because they are found in the open-ended web of the internet. Reading internet texts does not only entail mastering the complexities of internet navigation, but also the constantly changing interfaces and endless hypertext and hypermedia structure, not to mention social media. Coiro (2020, p. 20) underlines the difficulties in classifying internet texts in relation to digital reading, exactly because of the vast possibilities of text composition and affordances that exist. Opposite to internet texts, digital texts in closed environments are either found in an app, in another confined digital environment with one organisational structure, or downloaded to a device (Coiro, 2020, p. 29). As already established, navigation is a feature of the DLPs hypertextual structure. The texts in the DLPs are therefore bound by their digital environment, because the hypertextual navigational structure keeps the user inside the DLP. However, the DLP is dependent on an online web browser for its functioning, which makes it a part of the internet. But are the texts internet texts then? My claim is that the two texts in *Skolestudio* and the eight texts in *Skolen* that offer the user "external hyperlinks" are the only internet texts found in the DLPs. The rest, which include a majority of the texts in both *Skolen* and *Skolestudio*, as well as all texts in *Aunivers*, are not internet texts, because they do not contain any hypertextual structures linking to the web outside.

Because of the minimal use of hypertext features in a large majority of the texts in the DLPs, they resemble on-screen texts. On-screen texts refer to digital texts that are comparable to printed texts because they do not support hypertextual features (Coiro, 2020, p. 22). Though the texts in the DLPs have already been established as having hypertextual features, the nature of and lack of these traits in the main text body indicate that the texts can be categorised as on-screen texts. The lack of hyperlinks makes them resemble printed texts in their linearity, which means they have a definitive beginning and end. Though printed texts are often described as linear, this does not mean that they have to be read in a linear fashion; readers are free to skip between sections or to read the conclusion before the discussion. However, it is seldom difficult to define where a printed text begins and where it ends. The same can be said about digital texts that fit the category "on-screen texts". The lack of hypertextual pathways enabling the reader to construct their own reading path, makes them similar to printed texts in the way they signal their definitive beginning and end. The texts in *Skolen* and *Aunivers* that do not resemble on-screen texts have an organisational structure that does not promote linear reading. These

multimodal texts have a layout that allows the user to choose where to begin their reading, e.g., either with the written text or the video, and where to end it.

4.3 Conclusion from the quantitative account

In the previous sections I have discussed the categorisation and characteristics of the digital texts found on the digital learning platforms *Aunivers*, *Skolen*, and *Skolestudio*. In terms of genres, *Skolen* differs from the other two platforms, by offering a large majority of informational texts. All of the texts are multimodal hypertexts, but due to the nature of their hypertextual features, they are not hypermedia texts. Though found online, the greater part of the texts are not internet texts, which is, again, due to the nature of their hypertextual features. Lastly, the texts in the DLPs resemble on-screen texts, accounting to their linear structure and lack of hyperlinked content. Based on these findings, I assert that the general reading experience promoted by the DLPs does not reflect the diversity and variety of reading in digital environments.

5 Affordances

5.1 The theories of affordances

The concept of affordances is a useful term for investigating the ways people perceive and interact with their environment and the objects in that environment. It is relevant to this thesis, as it seeks to characterise the digital environment for reading in the English subject classroom. Affordance theory is applied across several different research areas, e.g., information science, Information Systems, and social psychology (D'Ambra et al., 2017), though employment of the term, and what is emphasised, differ between disciplines and studies within a field. In some educational research the term affordance is used as a positive effect of engaging with a source (for examples see Crompton et al., 2022), while several studies within embodied reading discuss affordances based on the foundation given by Gibson, supplemented by that of Norman (see for inst. Hillesund et al., 2022; Mangen & Pirhonen, 2022). The following section will outline the basics of the affordance theory proposed by Gibson, before moving on to present the affordance perspective put forward by Norman, as his concept of affordances is particularly relevant to reading in digital environments, because of his focus on how we understand affordances of objects due to their design. Lastly, the term virtual affordances will be presented as a way to identify characteristics of the affordances of the DLP *Skolestudio*.

5.1.1 Affordances according to Gibson

First coined by James Gibson, affordances are the possibilities for action offered to the animal by the environment (Gibson, 1979/2015, p. 127). Affordances describe how the physical properties of an object are constructed in relation to how we perceive them in possibilities for interaction (Berthelsen & Tannert, 2020, p. 6). Affordances are therefore not equal to the properties of an object, they are relationships between the object and the user, based on the properties of the object. As such, there are two aspects of affordances that are central to Gibson's definition: affordances are embodied within the material or physical properties of an object, and affordances are equal to the relationship between the object and the individual. This means that the affordances that are offered by an object exist in the object itself but are only emergent when they are perceived as such. The relationship, the affordance, is therefore not fixed, it is relative to the person recognising it. Related to the topic of this thesis, the following example looks at printed and digital texts.

Found in several different modes and platforms, e.g., as single papers, or a book, on a tablet or a laptop, these modes have different affordances; they offer different possible actions according to their properties (Hillesund et al., 2022, p. 4). Whether we read a text on paper or on screen, the object we are using is formed by our perception of it, and thus affects both the text and the possibilities for action in relation to the text. Books and digital reading devices afford possibilities for actions such as being moved, dropped, or thrown. These affordances exist within objects, as they are detached from the environment (Gibson, 1979/2015, p. 29). To materialise as affordances, however, they have to be perceived as such, and to perceive them as offering possibilities for reading, users have to be informed of this possibility. This means that "affordances are skill-relative, and have to be learnt" (Hillesund et al., 2022). Perceiving a printed book as a possibility for reading, involves knowing to open the book, understanding that the contents may include a story or information, and eventually learning to read. Knowing that a digital device provide affordances for reading, requires more than that of a book, because the digital text is hidden in layers of code. The fact that a digital device supports affordances for reading typed text is not possible to perceive by simply observing its physical properties. Users, therefore, require more guidance in order to perceive these invisible affordances. Gibson's theory of affordances "focuses upon the fundamental characteristics of the object in relation to the user, which is a question of utility." (Bower, 2007, p. 5). However, for readers of digital texts, the reading experience is also about how easy it is to utilise the affordances of the interface design, a question of usability. Norman's view on affordances provides a way to consider this, as he "places more emphasis on how an object is perceived, which relates to usability and not just utility." (Bower, 2007, p. 5).

5.1.2 Perceived affordances according to Norman

Building on Gibson's concept of affordances, Norman holds that affordances are relationships between objects and agents. However, for Norman, affordances do not exist if they are not perceived as such. He therefore argues that there is a difference between affordances and perceived affordances (Norman, 2013, p. 19). Affordances relate to the possible actions an object offers, but the possible actions are bound by how easy it is to perceive them as such. Because "some affordances are perceivable, [and] others are invisible" (Norman, 2013, p. 18) agents are reliant on clues for how to identify and utilise the affordances of objects that are not physically visible. The part of a perceived affordance that provides the clue for the right operation is called a signifier (Norman, 2013, p. 13). Signifiers are "characteristics in the

appearance of a device that give clues for its proper operation" (Hartson, 2003, p. 316). For digital devices that offer an array of different invisible affordances "the concept of affordance is weakened, so the signifier concept becomes dominant" (Norman, 2015, p. 236), because of how the affordances of a digital device is buried beneath the surface in layers of code. To utilise the perceived affordances of a digital device such as a laptop, there are signifiers guiding our actions. The keyboard is marked with letters and symbols that signals what the keys afford. The desktop of the laptop is covered with signifiers that help us understand where to click or type to perceive the affordances of the computer. The design of a DLP is thus covered with signifiers to make the platform usable to students and teachers. As stated above, affordances are skill-relative, and so the interpretation of signifiers, their usability, is dependent on how the user understands them. As such, whether we perceive a graphic object as "clickable" or not is dependent on conventions created by constraints (Norman, 1999, p. 40).

Norman (2013, p. 125) defines four types of constraints: physical, semantic, cultural, and logical. Physical constraints are the physical properties or characteristics of an object that limit possible actions. Semantic constraints rely on the interpretation of symbols, signs, and meanings to guide user behaviour. These meanings are culturally dependent, and as such, they are culturally constrained. Cultural constraints are based on societal norms and conventions that affect user expectations and behaviour. Lastly, logical constraints build on reasoning to determine possible actions. The scroll bar is an example of an object subject to all four kinds of constraints. The physical constraints of a scroll bar restrict movement along the vertical or horizontal axis, guiding users to navigate content. Through semantic constraints, users know that the grey rectangle in the right margin of the screen indicates scrolling. In turn, this is determined by cross-culturally accepted norms becoming cultural constraints, as users across different cultures associate the scroll bar with its specific possibilities for action. The scroll bar is logically constrained in "how the user knows to scroll down and see the rest of the page" (Norman, 1999, p. 40), and how they know they have reached the bottom of the page when the scroll bar is restricted from further downward movement.

5.1.3 Virtual affordances

In their study on utilising affordances of a DLP, Berthelsen and Tannert (2020) apply the concept of virtual affordances. Virtual affordances are described as the possibilities of action a software offers the user. Thus, the virtual affordances of a text in a DLP apply to navigational

features, such as the use of hyperlinks or scrolling, viewing static or dynamic virtual objects, such as pictures or video, and possibilities for resizing or altering text format, such as enlarging or refitting objects, or changing font size (Berthelsen & Tannert, 2020, p. 14). These features would not be affordances, according to Norman, but perceived affordances, visible through signifiers and controlled by constraints. Through interacting with the wide array of interface designs in today's digital environment, students enter a DLP with both logical and cultural constraints building on experiences from school and leisure activities. This means that it is timely to address not only which possibilities for action is provided by a software, i.e. virtual affordances, but also how these are signified in terms of Norman's concept of perceived affordances and signifiers. The discussion of affordances within the DLP *Skolestudio* will therefore make use of the term virtual affordances, as an aid in identifying the software's affordances, and perceived affordances and signifiers, to discuss how users may understand and interact with the virtual affordances.

5.1.4 Affordances and embodiment

To fully perceive a book as a possibility for reading, the necessary cognitive and sensorimotor skills must be developed (Hillesund et al., 2022). When learning to read, children develop cognitive skills through bodily actions. Fine-tuned coordination of eyes, hands, and head movements is established throughout this process. As such, the physical engagement of reading enhances sensorimotor skills alongside cognitive language skills. Neuroscientific research has showed that in this process, the brain recycles already existing neural networks from areas such as vision, motor, and language, to use for word recognition and understanding syntax (Hillesund et al., 2022, p. 3), underlining the close relationship between brain and body. Further, as we learn to adjust our bodies for reading, our brains develop new motor programs, called body schemas. These refer to how the whole body is active in the reading process; not only do we use our eyes and hands, but we also activate muscle systems throughout the body that help position ourselves in relation to the text being read (Hillesund et al., 2022). This means that the affordances of the mode in which we read, not only must be learnt to be perceived as affordances, but also that the affordances of a reading device affect how we learn, as our bodies develop motor programs according to the mode of reading. In other words, the body schemas we develop for reading is affected by the different affordances of the reading device. In addition, the motor capabilities, skills, and habits that influence the body schemas, are formed by the culture in which reading takes places, e.g. which writing system is learnt. This means that how

we perceive affordances, the relationship that is formed between the person and its surroundings, is culturally shaped.

When accessing a text through a book, the text itself appears as a physical object; it is tangible, ink on paper, with a specific weight and dimensions. For purpose of reading, it can be held, leafed through or pages slowly turned. The book provides direct access to the text being read, and indicates text characteristics with its weight, size, or aesthetics. When accessing a text on a computer, on the other hand, the navigation of the text relies on the physical affordances of the computer: typing, clicking, moving the mouse (Berthelsen & Tannert, 2020, p. 8). These affordances are the same whichever text you read on that same device; thus, the materiality of the different digital texts is one and the same. In this aspect, the weight, dimensions, and physicality of different printed books are found to support the reader, as the physical action of moving pages from one side of the book to the other aids in text orientation (Mangen & Schilhab, 2012; Mangen et al. 2019). This is explained through how the brain creates mental images of the text as a form of simulation (Mills et al., 2022, p. 27). Research in neuroscience has found that in the making of mental images, mirror-neurons activate the corresponding neurological motor systems for the mental image created. This means that the brain does not only recycle sensorimotor neural networks for reading, but that these are activated during reading as well. For instance, when reading about licking an ice cream, sensorimotor areas in the brain connected to smell, vision, sense of holding the cone, the cold and taste of the ice cream, are activated (Mills et al., 2022, p. 27), further demonstrating the connection between the body and brain in reading.

The mental imagining, or visualising, correspond to what we read about as we progress through a text. In addition, a mental map of the text, its beginning, middle, and end, is created in relation to these visualisations, which aids recall as well as text orientation (Mills et al., 2022, p. 28). The tangible materiality of the printed text provides a fixity for creating mental images, that is different from a fluid, scrollable hypertext. The materiality of the printed book provides haptic feedback that engages senses of touch, smell, and vision, in addition to engaging the muscle systems for using hands and turning pages as we read, which correspondingly engages several different areas of the brain. The scrolling, clicking, and interacting with a digital text are in the same way constitutive for the meaning making process when reading on-screen, though the haptic feedback of engaging with the text is restricted to vision and touch. The sense of touch remains the same throughout the reading experience, as the surface of digital device remains

unchanged through the “turning of pages” in the text. However, when students engage with a text in a printed textbook for the English subject, they rarely read more than one text a time, e.g. a short story or an article. As such, the text encountered is not equal to the physical affordances of the whole textbook, and obtaining spatial clues for text orientation would require students to leaf through the pages to identify the boundaries of the text in question.

5.2 Characteristics of the perceived affordances in the DLP

This section aims to describe the perceived affordances found in the DLP *Skolestudio*. For the purpose of this study on English teaching materials, focus will be on the virtual affordances within the English subject in *Skolestudio* called *Enter Fagrom*. As previously mentioned, the characterisation of the DLP will be based on access through a laptop computer. The affordances offered by a laptop includes typing, clicking, moving the mouse, positioning the laptop and adjusting screen angle, and are the same whichever software is applied on the device. The focus in the following is therefore on how the virtual affordances emerge as perceived affordances, according to Norman’s concept of perceived affordances and signifiers. To account for these, the DLP must be accessed, which encompasses several steps compared to a traditional textbook. To access a given text in a textbook, the textbook must be found, and the relevant pages must be looked up. To get a sense of what is to be read, the reader must leaf through the pages to identify where the text begins and ends. To access a given text in the DLP *Skolestudio* the operations needed are opening the laptop, logging in, opening a web browser, locating, and logging on to the DLP, and selecting, first, the English subject, then the “textbook” called *Enter Fagrom*, followed by the chapter/topic, and lastly the text module.

One of the characteristics of the DLP is its navigational hypertext structure, simulating an enclosed environment. Though the DLP is not an app and is found on open web of the internet, once inside the DLP the user is no longer dependent on the navigational tools of the web browser but can navigate inside the DLP using its integrated tools for navigation. This means that how to find and navigate through texts and tasks is a property of the DLP itself, and these navigational features therefore apply to all texts. Subsequently, the following descriptions are based on findings that apply to all the texts in the DLP, and as such characterise its virtual affordances. The DLP *Skolestudio* does not afford any possibilities for resizing or formatting presented texts, and opportunities for doing this would therefore lie in the affordances of the web browser or another application.

As mentioned in the presentation of the material, the texts from the DLP applied in this thesis are accessed through a teacher user. The teacher and student users have different virtual affordances, as the teacher is the administrator of the subject. The differences between the two modes of access do not have any significant impact on the layout or navigation of the texts. Affordances differ related to the teacher's possibility to assign reading and tasks, as well giving feedback on student work. The feedback is accessible for students through a bubble icon (see figure 3.2), which displays an alert when feedback has been given. It is reasonable to assume that students read the text before executing tasks and receiving feedback, and the affordance provided by the bubble icon has therefore not been found to affect the reading experience, and is therefore not included in the following discussion.

5.2.1 Navigation

Considering navigation, there are a number of steps to follow to access a text in *Skolestudio*, as already identified above. Once logged in to the DLP, all navigation across pages is done by using hyperlinks. These are signified throughout the DLP by a changing cursor marker and by being highlighted when hovering above them. The usability of the hyperlinks builds on the convention that interactive elements are in fact identified by an alteration of either the hyperlinked item or the cursor marker. Though there are variations in icons from software to software, the visible change in either the hyperlinked item or the cursor marker, is what guides the user to understand the signification as meaning “clickable”.

Once inside *Enter Fagrom* students enter according to the chapter they worked on last. As can be seen in figure 5.1., there is a menu on the left-hand side of the page, displaying the different topics, or chapters, students can work with. The content of each chapter is displayed across the page as separate tiles and are referred to as text modules by the publisher (Gyldendal, n.d.b). When clicking on a text module, students are presented with the main text, and a navigational menu for the module appears on the right-hand side, as seen in figure 5.2. The main texts are navigated by scrolling, signified by a scroll bar on the right side of the page. As long as the sidebar menu is toggled, there are two scroll bars visible, one for the text and one for the menu (See figure 5.3. for an illustration of a closed sidebar).

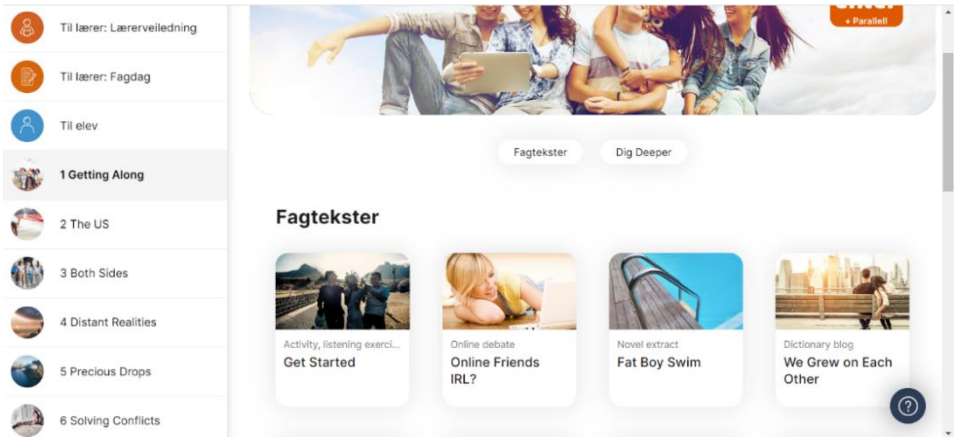


Figure 5.1. *The site users access when entering Skolestudio Enter Fagrom. The two options at the top menu to the left are only available for teacher users. The page has been scrolled down to display the text modules. (From Gyldendal Skolestudio, Enter Fagrom (2020). See "List of figures" for image copyrights.)*

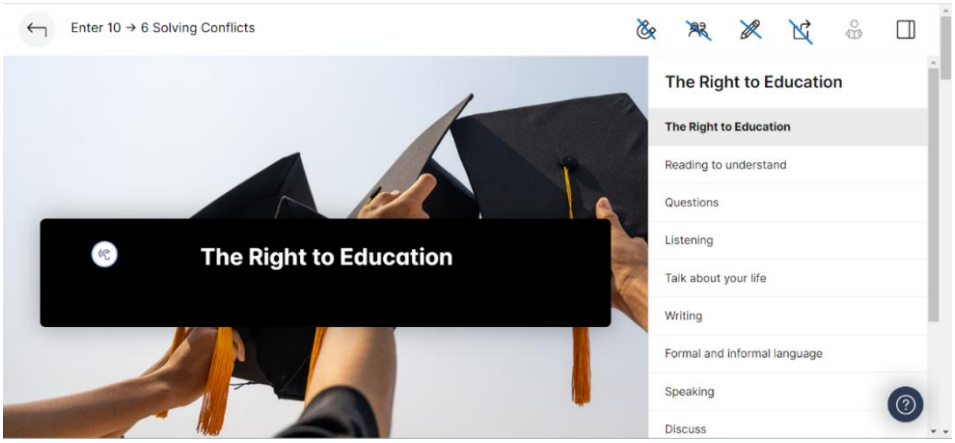


Figure 5. 2 *An example of the start page of a text module.The tools that are crossed out are only available for the teacher. (From "The Right to Education",* Gyldendal Skolestudio, Enter Fagrom (2020). *Background image copyright: Shutterstock)*

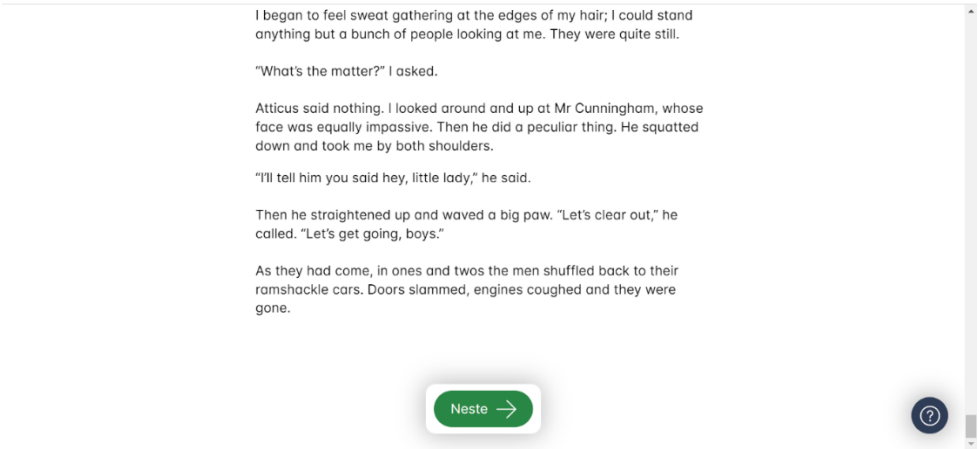


Figure 5. 3 *This illustration displays the navigational button that appears at the end of each main text. This also illustrates what a text looks like when the sidebar menu is closed. (From "To Kill a Mockingbird",* Gyldendal Skolestudio, Enter Fagrom *(2020)).*

The length of the scroll bar indicates the length of the text, and is a well-known signifier, as discussed above. On reaching the bottom, a green button displaying "Neste" (next), and an arrow pointing towards the right, appears (See figure 5.3.). These signifiers guide the user through both semiotic and cultural constraints. Semiotic because of the button being labelled "next", and due to the arrow, a cross-cultural sign for indicating direction. It is culturally

constrained following the arrow pointing to the right, indicating the direction of reading from left to right employed in the Latin alphabet. Continuing to venture deeper into the text module in the DLP, navigation is either done by using the task menu, or by clicking left- or right-pointing arrows on the bottom of the page. The task menu can be shown or hidden by clicking an icon in the top right corner of the page. This icon is a sidebar icon, a signifier perhaps not as familiar to students as arrows for navigation. This signifier is therefore culturally constrained by not being unambiguous and is additionally an example of how affordances express a relationship, in this case between the user of a DLP and its interface design.

5.2.2 Audio tool and tool for e-glosses

There are two virtual affordances that are clearly signified throughout the texts in the DLP, namely the tool for e-glosses and the audio tool. These are illustrated in figure 5.4 below. To activate the tool for e-glosses, users must tick a box titled “Vis ordliste” (show glossary) placed above the main text. This is signified by a grey box across the page, and the cursor changes from an arrow- to hand-icon when hovering above the box. Once activated, the text specific glosses are highlighted in the text in a soft yellow, and when hovering above these a Norwegian translation of the word is given in a pop-up box. However, for multimodal texts in which a virtual object is placed inside the text, this activation must be done anew each time a virtual object is scrolled past, as a new tool for e-glosses appears below the virtual object. Though clearly signified, it is uncertain why this affordance is split up like this, and why toggling the box on the top of the text does not display glosses for the whole text.

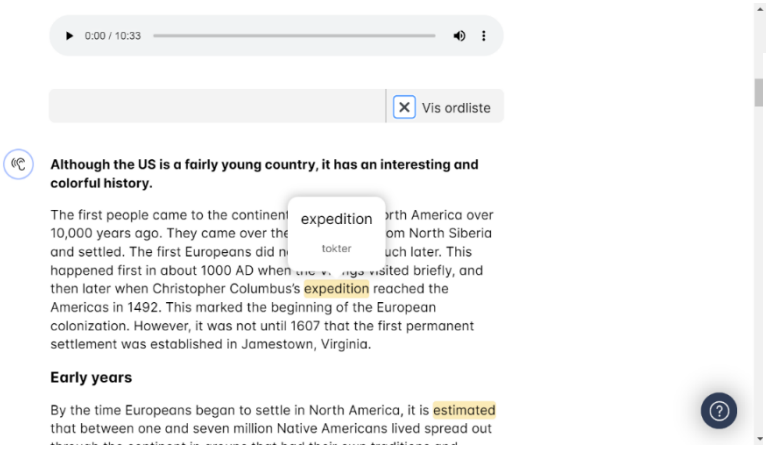


Figure 5. 4 *Illustration of the audio toolbar at the top of the image and the tool for e-glosses below it. The ear icon provides audio for a section of each text at a time. The pop-up window displaying the e-glosses is activated by hovering above the highlighted word. (From “The Road To Equality”,* Gyldendal Skolestudio, Enter Fagrom, *(2020)).*

As textual glosses are found to contribute to vocabulary acquisition (Zhang & Ma, 2021), which in turn supports reading comprehension, the repeated need to activate the tool for e-glosses might only affect reading in form of disturbance. It is also worth mentioning that five of the texts in the DLP have supplementary glossary placed above or below the main text, and that one additional text only makes use of this. In addition, two texts do not incorporate glosses or glossary at all. In one of these, called "We grew on each other", the purpose of the text is to learn about phrasal verbs through context, and consequently, glosses are excluded from the text.

The audio tool bar is identified as a virtual affordance because it is a possibility for action the software offers the user (Berthelsen and Tannert, 2020, p. 14). The possible action is to play an audio recording, and thus to access the text through audio. For users to perceive this affordance, the audio files are signified in two ways: a circular button with an icon displaying an ear and lines to indicate sound waves, or a horizontal toolbar, containing a play-button, progress bar and options for adjusting audio speed.

The audio file accessed through the toolbar includes a recording of the text as a whole. The audio files available through the ear icons are linked to the text passages in proximity, and these icons are therefore placed next to shorter passages of text that are not part of the main text, e.g. next to warm-up activities or informational text boxes distinct from the main text. However, the use and placement of the audio tools differ between the texts, as with the glossary tool. For a large majority of the texts, both literary and informational, the audio toolbar is placed between the warm-up activity and the main text. Once activated, the students may follow the written text and the audio file simultaneously, without any obstructions. Five of the texts, however, have the tool bar placed above the warm-up activity, which leads to a discrepancy between the text on display and the audio file. This is no major obstacle, as students can start the audio file and scroll down to the main text, but it adds complexity to the process. Further, the placement of the toolbar on the top of the text inhibits possibilities for interacting with it while reading. Students will have to scroll to the top of the page to pause the audio file, and then start it and scroll back down to resume reading. As even the texts that are less than 300 words require scrolling to move between the text and the audio toolbar, this creates an unnecessary number of actions. Three of the texts in the DLP have affordances that provides a solution. They are signified with "the ear icon" as readers move through the text, and this affords the possibility to play the audio file for each separate part of the text at a time, and does not require the reader to scroll back to stop and start the recording. However, users still have the possibility of using

the audio tool bar, and this audio file does not correspond with the ones played back from the ear icons. This means that for these texts, students have the option of playing two different audio files at the same time. This is obviously not recommended for increased reading comprehension and might distract readers by offering too many possibilities for action.

5.2.3 Virtual objects

In addition to incorporating audio files and written text, the DLP's texts are identified as multimodal due to the use of additional modes of communication. Berthelsen and Tannert (2020) identify these in terms of affordances as the possibility of watching virtual objects, either static or dynamic. A typical static virtual object is a picture, while a dynamic virtual object could be a video. Because digital texts can be characterised by the level of interactivity, the category *interactive virtual objects* will be added to discuss the virtual objects in the DLP.

All texts in the DLP offer the virtual affordance of watching a static virtual object, namely pictures. One of the texts is distinct in the sense that it offers a series of three pictures in a reel for the warm-up activity. Further, three of the texts afford watching dynamic virtual objects in form of videos. In two of these the video is the main text source, and tasks are executed in line with the videos. In the third text offering videos as dynamic virtual objects, these are located on a separate page after the main text in the text module. The accompanying tasks in the module are not related to the videos, only to the main text. Concerning possibilities for interacting with virtual objects, there are two texts that afford this. One, called "Capital Punishment", includes two bar charts where pop-up information is displayed when hovering above a bar in the chart. The information given in the pop-up box is the same as can be read from the axes of the charts. The other interactive virtual object is found in a text module called "Spontaneous Storytelling" which contains a game with a digital dice.

5.3 Affordances in research on reading comprehension

Research on digital reading has been centred on the difference between reading in print and reading on screen (Coiro, 2020). Still, a growing number of studies concern specific elements of the digital reading experience. Though few of these incorporate an affordance perspective, the textual features they address do align with what Berthelsen and Tannert (2020) describe as virtual affordances. If virtual affordances are what the software offers the user in possibilities

for action, then it is possible to state that reading research on scrolling, concentration, or the use of hypertextual features, do in fact concern virtual affordances in relation to reading comprehension. This section will therefore discuss research in relation to the identified virtual affordances of the DLP *Skolestudio*; hypertext, scrolling, virtual objects, and glossary and audio tools.

5.3.1 Hypertext, attention and working memory

A printed book and a digital device both offer affordances for reading. Though it is possible to interact with the book in other ways, e.g., by different forms of annotation, the books main affordance is reading. A laptop, however, does not necessarily impart reading as its main affordance. It affords tools for an array of different actions, e.g., writing, gaming, picture editing, etc. Though obvious, it is nevertheless timely to acknowledge this aspect of the device now taking the place of the printed book as a source for reading throughout classrooms. This multi-functionality, or display of affordances, impact the reading experience on digital devices because of how our brains respond it. In their state-of-art review "The 'Online Brain': How the Internet might be changing our cognition", Firth et al. (2019) explores findings from psychological, psychiatric and neuroimaging research to explore how internet usage might affect attention, memory, and social cognition. Relevant to this thesis are especially their findings on how media multi-tasking affect attention.

Media multi-tasking refers to the behavioural pattern of interacting with several different sources of input at the same time (Firth et al., 2019). A stereotypical description of modern technology use, media multi-tasking is encouraged by the wide array of media content accessible through hyperlinks, notifications and other prompts found online. This conduct is characterised by interaction on a shallow level. One study found that the media switches "occurred as frequently as every 19 seconds, with 75% of all on-screen content being viewed for less than one minute" (Firth et al., 2019, p. 121). Further, research point to evidence for this "checking" behaviour to spike dopamine levels in the brain, contributing to what is called "information rewards" (Firth et al., 2019, p. 120).

Though the DLP in this study is characterised by its confined navigational environment, it is still accessed through a common web browser, and is thus prone to succumb to information rewarded behaviour; alternating windows or tabs, clicking hyperlinks and searching. Research

has found that hypertext structures and internet texts increase the cognitive load on readers by offering an array of possibilities in how to access and read texts (DeStefano & LeFevre, 2007). This increased cognitive load puts pressure on the readers' working memory. Working memory refers to the short-term memory storage and manipulation of information that takes place when performing cognitive tasks, such as reading (DeStefano & LeFevre, 2007, p. 1618). When navigating hypertext, readers with a strong working memory will have advantages in being better able to remember the hypertext structure and where information was found (Baron, 2021a, p. 112). However, the lack of communication tools, and the limited hypertextual and interactive affordances in the texts in the DLP might at least provide fewer distractions for readers' sustained attention and less stress on working memory in the digital environment of the DLP.

5.3.2 Scrolling

As the main texts in the DLP are navigated by scrolling, it is part of what characterises the texts in terms of affordances. It is therefore relevant to this thesis to look at what research reveals about the effects of scrolling on the reading experience. Though more research is needed, there are indications for scrolling to be detrimental to reading comprehension (Brady et al., 2018; Sanchez & Wiley, 2009; Støle et al., 2020) due to increased cognitive demands and strain on working memory (Sanchez & Whiley, 2009), and how scrolling affects memory retrieval (Brady et al., 2018). As with hypertext reading, scrolling is believed to increase the cognitive load on readers, as they must "maintain a surface representation of a text and engage in comprehension processes" (Sanchez & Wiley, 2009, p. 737). Studies based on eye-tracking display how eye movement differs between short and long digital texts, where scrolling navigation breaks up routine saccadic eye-movements, i.e., the short, rapid movements of the eyes during reading, which enhance the cognitive load and affects working memory (Singer & Alexander, 2017; van der Weel & Mangen, 2022). For readers with a low working memory capacity, scrolling might be particularly challenging, as the increase in cognitive load affects their ability to orientate themselves in the text, and consequently lowers attention span and reading comprehension (Baron, 2021b; Sanchez & Wiley, 2009). Further, this aspect is connected to memory retrieval because the affordance of scrolling restricts the possibility of constructing mental text maps (Baron, 2021b), which supports the ability to remember and locate information in a text. Within an embodied view on reading, this relates to how the brain uses mental images for spatial orientation in a text (Mangen & Schilhab, 2012; Mangen et al.

2019; Mills et al., 2022), and as such, longer texts which necessitate scrolling might negatively affect reading comprehension. Thus, text length is a property of a text that influences scrolling as an affordance. In addition, text length and scrolling affect navigation for reading activities, such as skimming a text as a pre-reading activity, or scanning for answers as a post-reading activity. Because of the lack of spatial markers, such as pagination, the longer texts in the DLP might be challenging for readers. However, the incorporation of virtual objects in the texts in the DLP might help readers by becoming spatial markers for text orientation.

5.3.3 Tools for audio and e-glosses

Digital reading environments have the possibility of offering affordances to support readers with cognitive or physical disabilities in a more profound way than printed texts. Reading-aids, such as speech synthesis and text enhancement, are common features in the digital reading environment, and are found to accommodate struggling readers (Baron, 2021a, p. 88). For the DLP, these are found in the audio tool and tool for e-glosses.

The tool for e-glosses in the DLP contributes to vocabulary acquisition, a central element in L2 language learning. In their meta-analyses on textual glosses, Zhang and Ma (2021) emphasise how research on the matter might seem inconclusive, but still found decisive evidence for the benefit of textual glosses on L2 vocabulary acquisition in general. In addition, research points to a positive effect of in-text, margin, and pop-up glosses on vocabulary acquisition, in contrast to glossary placed on the bottom of a text (Zhang & Ma, 2021, p. 14). As the tool for e-glosses in the DLP provides pop-up glosses, this can be seen as beneficial to students. Further, there were found no significant differences between the effects of glosses in paper and hypertexted reading environments across the studies included in the meta-analysis. When comparing the glosses in the DLP *Skolestudio* with those in the textbook *Enter 10*, the difference is that the DLP provides pop-up glossary for which words are directly highlighted within the text, while the textbook provides glosses in the margin, with no highlighted words within the text. Findings from research on eye-tracking in hypertext reading show how readers emphasise hyperlinked words, by displaying longer fixations on these (Fitzsimmons et al., 2019). Though the e-glosses in the DLP are highlighted in yellow and not as typical, blue-coloured hyperlinks, it is possible to hypothesise a similar effect for the textual glosses in the DLP.

The audio tool characteristic of the affordances in the DLP provides students with an opportunity to benefit from reading-while-listening, which has proved to be a substantial support to L2 readers (Conclin et al., 2020). Research has shown that reading-while-listening promotes reading comprehension, vocabulary acquisition and fluency, especially for struggling readers, as the combination of auditory and visual input aids in identification of corresponding spoken and written forms, and establishing letter-sound connections (Conclin et al., 2020). Based on the meta-analysis by Conclin et al. (2020) and the literature review by Singh and Alexander (2022), it is relevant to the topic of this thesis to underline how research considering reading-while-listening does not at this point address the difference between listening while reading static text and listening while scrolling. As all the texts in the DLP provide this affordance, it timely to acknowledge that scrolling might impact reading-while-listening, especially considering how the audio tool is placed on the top of the text in a majority of the texts in the DLP, hindering easy access to the audio tool bar. In relation to this, research on reading speed and patterns identified reading comprehension to coincide with the length of pauses in scrolling (Dyson & Haselgrove, 2000), pointing to how proficient readers kept their text stationary for a longer period of time before scrolling. Though an interesting point in terms of digital reading strategies, it is also an aspect relevant for how reading-while-listening and scrolling might mutually influence one another, and thus the digital reading experience of the DLP.

6 Remediation

6.1 Remediation, immediacy and hypermediacy

The concept of remediation comes in useful to understand what happens and what has happened in the transition from printed textbooks to digital learning portals. Bolter and Grusin (2000) coined remediation as the representation of one medium in another. Remediation addresses how new media and technology define themselves in relation to the old, but also how "older media refashion themselves to answer the challenges of the new media" (Bolter & Grusin, 2000, p. 15). For media and technology in schools, remediation sheds light on how both new and old media, e.g., learning apps or textbooks, challenge and influence each other, and how this can be seen in the layout and content of the materials. For this thesis, this implies analysing how digital teaching materials remediate traditional teaching materials, or more specifically, how the digital learning platform *Skolestudio* refashions Gyldendal's printed textbook for the English subject, called *Enter 10*. When focusing on *Skolestudio*, it is also possible to identify if and how it remediates other digital media, such as podcasts or blog entries. In this chapter I will apply Bolter and Grusin's (2000) theory of remediation and its driving logics of immediacy and hypermediacy to the digital learning platform provided by Gyldendal for 10th grade English. This first section will provide an overview of the theoretical concept of remediation, followed by a discussion on how remediation of the printed textbook and other digital media can be seen in the DLP *Skolestudio*.

6.1.1 The theory of remediation

Bolter and Grusin's concept of remediation explores the ways in which new media constantly borrow and refashion elements from older media forms. (Bolter & Grusin, 2000, p. 15). Remediation can be driven by different strategies. It can be the result of simply offering another mode of access to original material. An example is the digitisation of paintings or literary texts that in the early days of the internet was seen to open up possibilities for access to the original works, without irony or critique of the older media, thus opting to erase the difference between them. However, digital media are often created with the aim of improving or enhancing the experience of the existing media, emphasising the difference between the two. In digital encyclopaedia, for instance, it is possible to recognise characteristics of traditional encyclopaedia in its content and structure, yet it offers an improved experience through the ease

of navigation in search bars and hyperlinks. Another example is how photography can be seen as a remediation of paintings. Since the renaissance, the goal of Western visual representation was to perfect the linear perspective and erase brush strokes to offer a realistic experience, as if the medium could disappear and become transparent (Bolter & Grusin, 2000, p. 24). Photography can thus be viewed as a perfection of the visual representation of the real, remediating painting into photography by emphasising the difference and offering an improved experience.

More recent examples show how remediation can be increasingly aggressive in trying to refashion or even absorb the older medium. Bolter and Grusin (2000, p. 46) exemplify the refashioning of media through a discontinued space in the windowed style of a graphical user interface, affording the possibility of activating and controlling several different media at the same time. The older medium is still possible to identify, e.g., the typewriter in form of a word processing document, or the radio in form of a podcast being played, but they are completely refashioned in terms of how the user navigates between the different media.

"Finally, the new medium can remediate by trying to absorb the older medium entirely, so that the discontinuities between the two are minimised" (Bolter & Grusin, 2000, p. 47). This form of remediation is currently identifiable through how streaming networks, such as Netflix and Amazone Prime Video, have challenged the position of traditional TV. Many viewers now favour on-demand streaming, moving away from scheduled programming and linear channels. As a result, traditional TV channels are pushed towards remediating themselves: they must now offer possibilities for streaming content to keep up with their diminishing audience. This exemplifies two aspects of remediation: Firstly, it describes not only how new media represent older media, but also how older media adapt to answer to the new. Secondly, it shows remediation prevents erasure of older media in how new media are dependent on the old. When technological innovations are being promoted for use in schools, there has to be some connection to existing pedagogical practices for the benefits of the new technology to be recognised. In other words, the new technology must incorporate, or more accurately, remediate, elements of older media, for instance as seen in how the first digital textbooks were simply that, a digital version of the printed textbook. To keep up with the continuous evolvement of digital media the first digital textbooks are now being further developed to remediate newer digital media, to try stay relevant in the digital age.

6.1.2 The double logic of remediation

The theory of remediation is built on the concepts of immediacy and hypermediacy, which together are the logics behind remediation (Bolter & Grusin, 2000, p. 5). Put simply, immediacy describes the desire to minimise the user's awareness of the medium, in contrast to hypermediacy which foregrounds the medium itself. Though supposedly opposites, immediacy and hypermediacy are co-dependent, and new media are developed in an oscillation between the two. A new medium seeks to improve the old by offering a true, more realistic experience, hence improved immediacy. However, through this process the user is reminded of the new medium being, in fact, a medium, as what it offers is new, unfamiliar, and different, and as such, immediacy results in hypermediacy. In the following section I will explain the concept of immediacy and hypermediacy in more detail.

Immediacy refers to the effect of making the user of a medium forget its presence. The desire for immediacy seeks to make the experience seem transparent, seamless, and unmediated for the user. Going back to the example of the remediation of painting in photography, immediacy can be described as the driving logic: the more realistic the painting, the less mediated (and more immediate) it appears; enter photography, the visual representation is so similar to our experience of reality that the medium is experienced as transparent. Thus, immediacy is experienced through transparency (Bolter & Grusin, 2000, p. 70). For interface designers of digital media, transparent immediacy is pursued by assimilating everyday objects. This is visible, for instance, in how the computer desktop was first designed to look like that of a physical desktop (Bolter & Grusin, 2000, p. 23). Thus, transparency in interface design is about mimicking "the natural", foregrounding the content and the analogy on behalf of the interface, or medium, itself. However, "the computer always intervenes and makes its presence felt in some way" (Bolter & Grusin, 2000, p. 45 - 46), as the interface of a computer invites interaction, sometimes even demanding it. As such, the interactive interface gets in the way of transparent immediacy, leading to hypermediacy instead.

Hypermediacy contrasts immediacy in acknowledging and foregrounding the medium. The logic of hypermediacy relies on multiplicity, on the combination of images, sound, text, animation, or video to provides layers of different media within one and the same space or interface. Hypermediacy thus draws attention to the fact that the experience is indeed mediated, as the user is directed to, as well as interacts with, the different layers of representation. The

windowed interface of a computer illustrates this point. “The heterogeneity of their [the windows’] contents mean that the user is repeatedly brought back into contact with the interface” (Bolter & Grusin, 2000, p. 33), underlining the hypermediacy of the experience. The user of a computer oscillates between recognising and interacting with the medium, looking *at* it, and connecting with the content of the medium, looking *through* it.

This difference between looking at and looking through, or between immediacy and hypermediacy, and the constant shift between them, is the essence of the experience of new media, according to Bolter and Grusin (2000). They write that the psychological sense of hypermediacy forces the viewer to process the hypermediated experience as real, as something authentic (Bolter & Grusin, 2000, p. 71). What we characterise as real or authentic relies on individual differences, and as continuous and expanding digitisation influences our lives, what is categorised as authentic is changing. In that sense, hypermediacy is not contradictory to immediacy as digital technology is becoming second nature. In fact, it might be contributing to actually experiencing something as real. This is, perhaps, a stretch, but the constant presence of digital devices in our everyday lives point towards a hypermediated reality. So, when Bolter and Grusin, in 1999, wrote that “the appeal to authenticity of experience is what brings the logics of immediacy and hypermediacy together” (Bolter & Grusin, 2000, p. 71), they might not have known to which extent this would be true today.

6.2 Remediation in the DLP *Skolestudio*

This section contributes to the characterisation of the DLP *Skolestudio* by describing how the DLP refashions the printed textbook and other digital media, through observing how it tries to convince the users of its transparency, and thus immediacy, or confront the user with a diverse media experience, and thus hypermediacy. When looking at how the DLP has remediated the printed textbook, remediation is seen as digitisation. Digital media often remediate older media “as if the content of the older media could simply be poured into the new medium” (Bolter & Grusin, 2000, p. 45). The printed book that has been remediated to that of the e-book, illustrates this aspect. The content of the e-book is the same as that of a printed book, and it is defined by the older medium: imitating it, merely providing a new way of access to the old material. Just as e-books, the first digital textbooks for use in schools were directly imitating printed textbooks, simply offering another mode of access. By offering a new medium for access, the remediation was driven by the logic of hypermediacy, as the medium itself enhanced the

mediated experience. But this remediation was also driven by immediacy, in exactly how the first digital textbooks resembled printed textbooks, seeking transparency in the reading experience by not offering any additional media content compared to the printed textbook.

Looking at the DLP *Skolestudio*, it is possible identify the same patterns. Though the DLP has a different design than the printed textbook, the textual content is almost identical. Gyldendal emphasises this in how they promote the printed textbook and the DLP. On their web page, they advertise suggestions on how to combine the different teaching materials, and state that the purchaser may choose between the printed textbook and the DLP as their core element for teaching (see figure 3.1). The educational content of the DLP is described as "being based on the same script as the printed books but is transformed and adapted to the digital format" (Gyldendal, 2021, my translation). As such, the content of the printed textbook has indeed been poured into the DLP. However, the fact that the DLP is not just a digitised version of the textbook implies that it has something else to offer. The next sections will try to identify how the DLP *Skolestudio* remediates both the printed textbook *Enter 10*, its audio companion, and possible other digital media.

6.2.1 Respectful remediation in the DLP *Skolestudio*

By cross referencing the text modules in the DLP with the texts in the textbook *Enter 10*, it is possible to identify the similarities in content. The only texts that differ, are the ones in the DLP that incorporates a video as the main text source. The DLP mimics the structure of the textbook; it has the same topical chapters, containing all but two of the same texts. The DLP's hyperlinked features for navigating through this structure is a refashioning of the older medium. It is thus still possible to identify the printed textbook in the DLP as the latter relies on the former's composition; the DLP is validated through its relationship to the former medium and stays true to the character of the textbook. In addition, the DLP's incorporation of audio files makes it a remediation of not only the printed textbook, but of the audiobook that traditionally has accompanied the printed textbook as well. Thus, the DLP seeks to improve both older media by uniting them in the same media experience, and by placing the user of the DLP in control of both. The subtle way this is done points to a strategy of respectful remediation, which "highlight other media without any apparent critique" (Bolter & Grusin, 2000, p. 200). Respectful remediation implicates that the new medium does not seek to eradicate or make the older medium irrelevant. Thus, to view the remediation of the printed textbook and audio files in the

DLP as respectful remediation, is to see how the DLP acknowledges its predecessors, but nevertheless offers an improvement.

The two texts that are only included in the DLP and not in the printed textbook are the ones that utilise videos as their main textual content. As such, they take advantage of the digital medium, providing an experience that is not possible for the printed textbook to offer. The DLP does therefore not remediate the printed textbook in these texts, but rather television, as the videos present a documentary type of text, resembling a travel report or news montage most typical of traditional, linear TV. As with the printed textbook and audiobook, this is performed as a respectful remediation, seen through how the DLP utilises the videos to highlight its hypermediacy, and as a contrast to the written texts, the improvement here lies in the incorporation of the different medium. These two texts additionally differ from the others in how the source of information is placed within the context of a task. Students are prompted to work with vocabulary and pre-reading tasks before reading and are given specific questions to answer while watching. As such, the video content is clearly contextualised in an educational setting, which can be interpreted in two ways in light of remediation: It can be understood as a contrast to watching videos at leisure and thus provides as an improved setting for interacting with the medium. However, it can also be regarded as if the DLP acknowledges the learning potential found in the older medium of television, and in this can be said to pay a form of tribute.

The main improvement on the printed textbook found in the DLP can be identified as its hypertextual features and its implementation of several media in one mediated experience. As the DLP leaves behind the paginated, linear structure of the textbook, its form of mediation points to remediation of other digital media. The main identifiable source is that of other text-based digital media, such as online newspapers and digital encyclopaedias. These rely on navigational structures similar to those of the DLP, e.g., hypertext and scrolling. This remediation appears without critique, and though the digital environment is highly hypermediated, this familiarity in format promotes a sense of transparency in the DLP. Transparency leads to immediacy and promotes the sense of "realness". "If the (...) software is 'intuitive' it is because (..) [it] is a culturally familiar object" (Penny, 1995, in Bolter & Grusin, 2000, p. 32). The cultural familiar object would here be recognised as a scrollable text. Though promoting immediacy in its familiarity, it still claims hypermediacy through the aspect of replacement, a defining character of hypermediacy. The next section will therefore discuss how replacement contributes to the user experience of the DLP.

6.2.2 Replacement as the essence of hypertext

The DLP *Skolestudio* provides a hypermediated experience through its use of replacement. According to Bolter and Grusin (2000, p. 44), hypertexts continuously execute acts of remediation by offering possibilities for replacement. The function of hypertext is to be a connection between two sources of information found in separate locations, and is thus a non-linear system, promoting interaction (Nyre, 2024, p. 475 - 476). Clicking on hyperlinks display new material on top of the existing, relocating the user's attention. This facet of hypermediacy and hypertext is relevant for digital reading because it sheds light on an aspect of the digital experience that affects our attention. Though the DLP does not afford a broad variety of hypertextual features, as established in the previous chapters, it does contain affordances that leads to replacement.

The hyperlinked navigation in the DLP carries out acts of replacement when clicked, because the activated link leads to a display of new information. When using the navigational menus, either the main chapter menu or the menu in each text module, these are not replaced themselves, but the current visual space juxtaposing them is replaced. The new information replaces the previous, and thus wins the user's attention. When clicking on a text module, however, the whole site is replaced with a new, which contains new information, new media formats, and a new navigational tool. This form of replacement thus elevates the hypermediacy of the experience. Furthermore, the hyperlinked tool for e-glosses displays new information when the cursor hovers above a highlighted word. Hovering promotes a sense of temporary replacement, as the new information quickly vanishes when the cursor is moved. The box that displays the glosses effectively grabs and redirects the user's attention by appearing above the text being read. As such, the tool for e-glosses utilises replacement as a strategy for hypermediacy in support of reading, because the temporary replacement caused by hovering does not direct the reader away from the text in the same way as a more "permanent" click.

A characteristic of the text modules in the DLP is the affordance of scrolling for navigating the main texts. The scroll bar is a device for replacement, as it aids in "replacing the current visual space with another" (Bolter & Grusin, 2000, p. 44). To explore how this replacement forms the reading experience of the DLP, I have selected a typical text from the DLP to provide as an example. Based on the analyses from chapter 3 and 4 in this thesis, a typical text in the DLP can be described as multimodal, applies e-glosses as the only in-text hyperlinks, and relies on

scrolling for in-text navigation and hyperlinks for site navigation. As there are slightly more literary than informational texts, the literary text called “Aurora Rising” from the chapter “Distant Realities” in the DLP *Skolestudio* has been chosen as the example text.

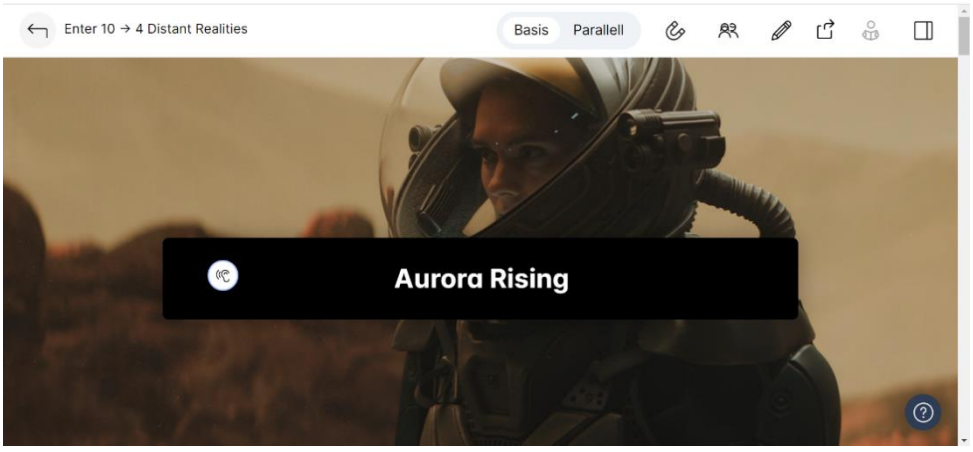


Figure 6. 1 *This Image shows the page displayed when clicking on the text module "Aurora Rising". (From “Aurora Rising”,* Gyldendal Skolestudio, Enter Fagrom *(2020). Background photo copyright: Shutterstock/Supamotion)*

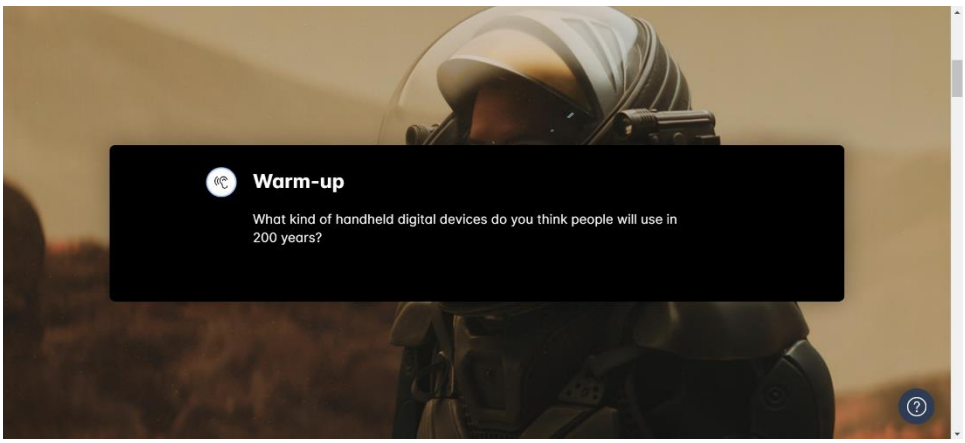


Figure 6. 2 *This image shows how the warm-up activity is displayed in the text module "Aurora Rising". (From “Aurora Rising”,* Gyldendal Skolestudio, Enter Fagrom *(2020). Background photo copyright: Shutterstock/Supamotion)*

When clicking on the text module “Aurora Rising”, the current page is replaced with a new page displaying the title of the text above an imaged background (figure 6.1). Scrolling down replaces this visual space with a similar one, now showing the warm-up activity connected to the text (figure 6.2). This way, replacement forces the user to focus attention on specific elements of the text at a time. In the printed textbook, the warm-up activity is placed in a blue textbox in the top left corner of the first page (see figure 6.4) and is not particularly conspicuous compared to the other brightly coloured images across the two pages. Further scrolling replaces the warm-up activity with the audio toolbar, followed by the tool for e-glosses, and the main text body. Bolter and Grusin (2000, p. 44) write that “replacement is at its most radical when the new space is of a different medium”. The replacement act of scrolling which reveals the audio tool bar could thus be interpreted as a radical replacement. However, in continuing scrolling down the page, the user quickly replaces the audio toolbar with text. This creates a

temporality in the hypermediated experience, as the access to control the temporal audio recording is replaced, and the user no longer presides over their own reading pace.

Additional scrolling takes the user into the main text, and as the images in the text are placed in the text itself, it becomes split up and provide the user with an opportunity for replacing the written text entirely with an illustration. This is seen in figure 6.3 which displays three different images.

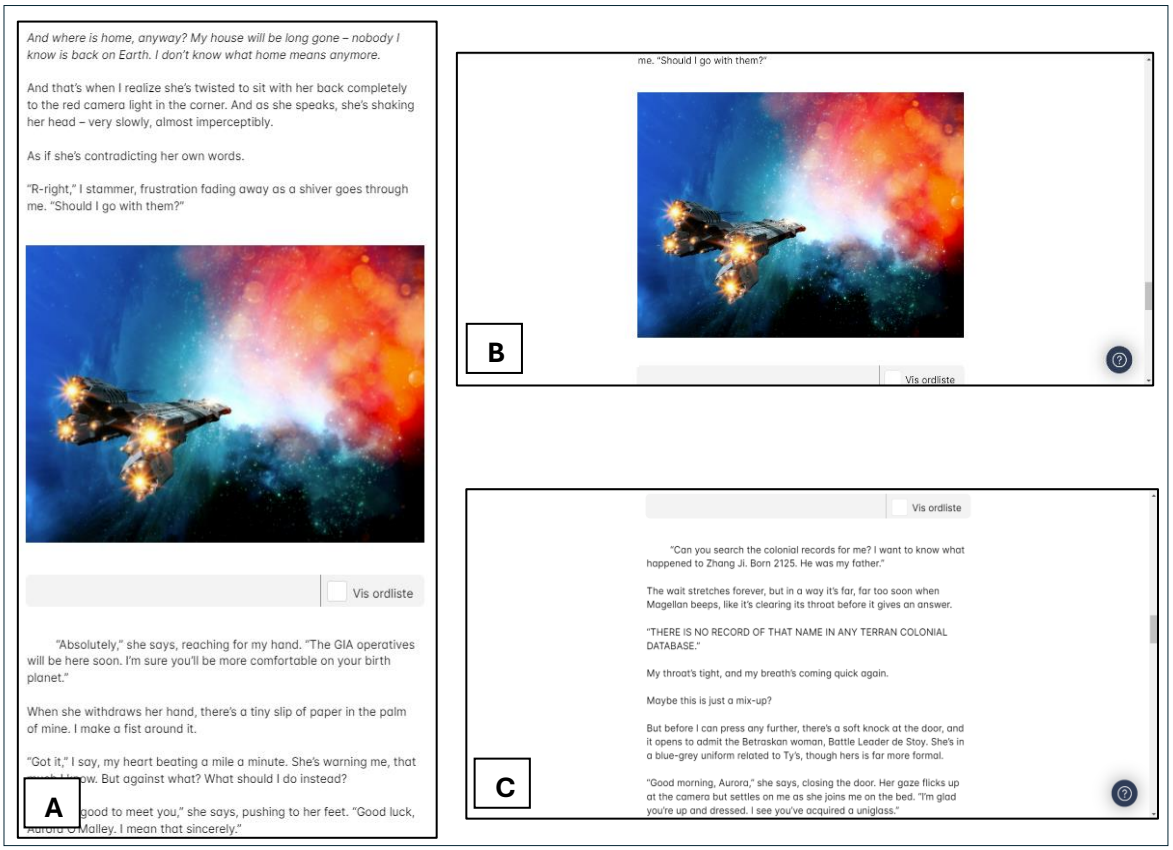


Figure 6. 3 *The three images show how text and images are combined in the DLP, here from the text module "Aurora Rising". Image A examples how the images are placed within the text, while image B and C shows what the text looks like while scrolling. (From "Aurora Rising",* Gyldendal Skolestudio, Enter Fagrom *(2020). Image copyright: Victor Habbick Visions / Science Photo Library / Getty Images).*

Image A displays how the illustrations are placed inside the text, separating it. To create image A, a web browser was used to zoom out to view a larger part of the text. Therefore, it does not present the DLP as it is experienced on a computer and is only meant to illustrate how the multimodal texts in the DLP are composed. Image B and C depict what is actually seen on a computer while scrolling and reflects how scrolling leads to replacement by showing either text or picture. With the text laid out this way, replacement steers the reader's focus in a similar manner as with the warm-up activity. By replacing, at one time, all written text with an image, replacement forefronts the images in a different way than the printed textbook, which displays

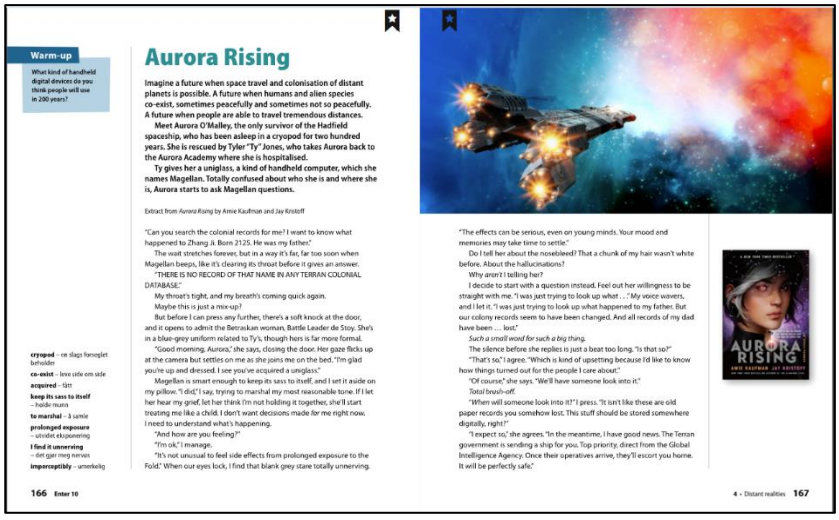
text and picture at the same time; by replacing the written text with an image, the DLP forces the user to view the image at a specific time during reading.

As this section has pointed to how the DLP connects to strategies of replacement, which according to Bolter and Grusin is the essence of hypertext, it is no question that the DLP is hypermediated. However, as the DLP can be seen to employ a respectful remediation, it is possible to observe how it strives to convince the user of its transparency. The next section will therefore discuss the oscillation between hypermediacy and immediacy in the DLP *Skolestudio*.

6.2.3 Oscillation - there and back again

In this section I will address the oscillation between hypermediacy and immediacy in the DLP. I will first discuss remediation in the DLP in general, related to characteristics of a majority of the texts, before going on to look at two particular texts in which the oscillation between hypermediacy and immediacy is affected by specific text characteristics.

The DLP is a hypermediated experience through how it confronts the user with a variety of different media, and through its use of replacement for navigation. However, compared to other digital textual formats, such as digital encyclopaedias or blogs which encompass a variety of different modalities and hypertext in presenting their content, the DLP does not foreground its hypermediacy. On the contrary, it seems as if the DLP is restricted from some of the possibilities found in a digital environment, such as interactive text or videos. In this sense, the DLP can be seen as trying to provide transparency for its written textual components. For instance, the DLP provides a simpler layout of the main text in the text modules compared to its printed equivalent,


Warm-up

What kind of handheld digital devices do you think people will use in 200 years?

Aurora Rising

Imagine a future when space travel and colonisation of distant planets is possible. A future when humans and alien species co-exist, sometimes peacefully and sometimes not so peacefully. A future when people are able to travel tremendous distances.

Meet Aurora O'Malley, the only survivor of the Hadfield spaceship, who has been asleep in a cryopod for two hundred years. She is rescued by Tyler "Ty" Jones, who takes Aurora back to the Aurora Academy where she is hospitalised.

Ty gives her a uniglass, a kind of handheld computer, which she names Magellan. Totally confused about who she is and where she is, Aurora starts to ask Magellan questions.

Extract from *Aurora Rising* by Amie Kaufman and Jay Kristoff

"Can you search the colonial records for me? I want to know what happened to Zhang Ji. Born 2125. He was my father."

The wait stretches forever, but in a way it's fat, far too soon when Magellan beeps, like it's clearing its throat before it gives an answer.

"THERE IS NO RECORD OF THAT NAME IN ANY TERRAN COLONIAL DATABASE."

My throat's tight, and my breath's coming quick again.

Maybe this is just a mix-up?

But before I can press any further, there's a soft knock at the door, and it opens to admit the Betraskan woman, Battle Leader de Stoy. She's in a blue-grey uniform related to Ty's, though hers is far more formal.

"Good morning, Aurora," she says, closing the door. Her gaze flicks up at the camera but settles on me as she joins me on the bed. "I'm glad you're up and dressed. I see you've acquired a uniglass."

Magellan is smart enough to keep its sass to itself, and I set it aside on my pillow. "I did," I say, trying to marshal my most reasonable tone. If I let her hear my grief, let her think I'm not holding it together, she'll start treating me like a child. I don't want decisions made for me right now. I need to understand what's happening.

"And how are you feeling?"

"I'm ok," I manage.

"It's not unusual to feel side effects from prolonged exposure to the Fold." When our eyes lock, I find that blank grey stare totally unnerving.

"The effects can be serious, even on young minds. Your mood and memories may take time to settle."

Do I tell her about the nosebleed? That a chunk of my hair wasn't white before. About the hallucinations?

Why aren't I telling her?

I decide to start with a question instead. Feel out her willingness to be straight with me. "I was just trying to look up what . . ." My voice wavers, and I let it. "I was just trying to look up what happened to my father. But our colony records seem to have been changed. And all records of my dad have been . . . lost."

Such a small word for such a big thing.

The silence before she replies is just a beat too long. "Is that so?"

"That's so," I agree. "Which is kind of upsetting because I'd like to know how things turned out for the people I care about."

"Of course," she says. "We'll have someone look into it."

Total brush-off.

"When will someone look into it?" I press. "It isn't like these are old paper records you somehow lost. This stuff should be stored somewhere digitally, right?"

"I expect so," she agrees. "In the meantime, I have good news. The Terran government is sending a ship for you. Top priority, direct from the Global Intelligence Agency. Once their operatives arrive, they'll escort you home. It will be perfectly safe."

cryoped – en slags fønsoglet beholder
co-exist – leve side om side
acquired – fått
keep its sass to itself – holde munn
to marshal – å samle
prolonged exposure – utvidet eksponering
I find it unnerving – det gjør meg nervøs
imperceptibly – umerkelig

166 Enter 10

4 • Distant realities 167

Figure 6. 4 *This image shows the layout of the first two pages of text "Aurora Rising" in the printed textbook Enter 10. (Diskin & Winsvold, 2021, pp. 166 - 167).*

as can be seen in figures 6.4 and 6.5. This could be said to promote transparency, letting the user focus on the written material, and not the hypermediated space of which the reading takes place. However, scrolling disrupts immediacy in prompting the reader to interact with the interface. In addition, the DLP can be seen to promote immediacy through the way it affords e-glosses. As mentioned, the replacement that occurs while hovering above the e-glosses in the text comes across as temporal and can thus be interpreted as a way for the DLP to keep the reader close to the text in desire for transparent immediacy.

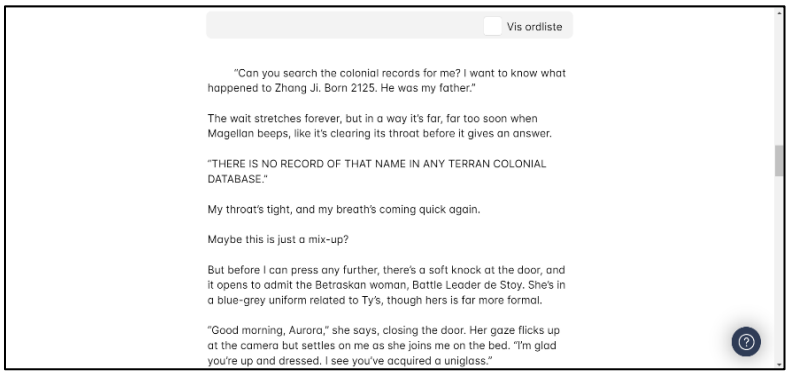


Figure 6. 5 *This image shows the first part of the text "Aurora Rising" from the DLP Skolestudio. The illustrations that can be seen in Figure 6.4. are placed in between sections of written text. (From "Aurora Rising",* Gyldendal Skolestudio, Enter Fagrom *(2020)).*

Through its remediation of audio, and in some cases video and interactive charts, the DLP makes claim to both immediacy and hypermediacy. Hypermediacy, as discussed, because the incorporation of several mediums in one media experience highlights the new medium, in this case, the DLP. Immediacy, because the remediation of audio or video "promise a new transparency (..) that cannot appear in a printed version" (Bolter & Grusin, 2000, p. 202). New media "can bring her [the reader] closer to the event by offering such transparent media instead of mere prose" (Bolter & Grusin, 2000, p. 202). This way to transparency could be further exploited through hypermediacy, had the DLP utilised the possibilities of its digital format. To elaborate on this statement, an example from the DLP is necessary.

One of the text modules in the DLP is called "Inspiring Speeches" and contains excerpts from the speeches "I Have a Dream" by Martin Luther King Jr. and "The 50th Anniversary of the Selma to Montgomery Marches" by Barack Obama. This text module contains the same affordances as the majority of the other texts in the DLP. The audio tool provides a reading of the main text in the module, and though this text module contains two different texts, there is still only one audio recording containing sound for both texts, which is placed at the top of the page. If the transparent medium of an audio recording promise new transparency, then the audio tool for the "Inspiring Speeches" would provide this. However, transparency is interrupted by

there only being one audio recording for the two different texts. Additionally, it is the same voice actor who reads both texts, which for an oral text genre as speech, breaks transparency in the experience of the real. To exploit the possibilities of the digital medium, the DLP could, firstly, provide two separate audio tools, making the user take control of interaction, and thus remediating further the radio format. Secondly, the DLP could have provided different voice actors for the two speeches, and lastly, they could have made use of the original audio recordings from the speeches to bring the user of the DLP even closer to the event.

There is yet another text in the DLP that deserves special attention in light of remediation and the oscillation between hypermediacy and immediacy. The text module "Everybody Believes They Are the Good Guy" contains a main text labelled by the publisher as a podcast. The original source for this text, the podcast, has gone through several remediations. The podcast itself is a remediation of radio, which can be seen as a radical remediation in pursuit of immediacy through how the podcast offers on-demand access across the globe. For the DLP, the podcast has been remediated to a written text. Taking into account that the DLP in fact supports audio, it is reasonable to believe that the podcast was primarily remediated for the printed textbook *Enter 10*. This points to how traditional media remediates new media, but instead of promoting transparency, the printed textbook's remediation of the podcast claims hypermediacy, by referring to a newer medium that already provides a more transparent experience. However, there are indications pointing to this podcast text being written specifically for the printed textbook, and as such has never existed as a real podcast in the first place: There are no references to an existing podcast, and an online search finds no traces of there ever being such a podcast. Nevertheless, it is a textualization of media content that is primarily aural. Furthermore, the written podcast text is remediated by the DLP, which then provides a digital version of the text in addition to an audio recording. The audio recording is read by a single female voice actor, contradicting the actual content of the podcast which refers to two participants, at least one of them male. In this particular example, the audio recording hinders transparency to a greater extent than the written text does, in that it contradicts the reality of what is being presented in the podcast, and thus appears fake. Immediacy is to some extent dependant on authenticity, and as encounters with authentic texts are specifically mentioned in the English subject curriculum (Ministry of Education and Research, 2019a), the DLP presents a peculiar case with the podcast text.

To sum up, the oscillation between immediacy and hypermediacy in the DLP can be seen through how the medium promotes transparency in its attempt to mimic both the printed textbook and other digital text materials at the same time, and how the user is constantly reminded of its hypermediacy through replacement and interaction with the interface. The strive for transparency is obstructed by the DLP's seeming reluctance to appear hypermediated, leading to a, perceptively, poorly mediated digital text, because of the limited use of digital enhancement that has become a common advantage in today's digital society.

> "Technology is gradually becoming second nature, a territory both external and internalized, and an object of desire. There is no need to make it transparent any longer, simply because it is not felt to be in contradiction to the 'authenticity' of the experience." (Huhtamo, 1995, in Bolter & Grusin, 2000, p. 42)

Thus, a poorly mediated digital experience will lead to hypermediacy instead of transparent immediacy, as the user is made aware of the lack of digital enhancement. It is therefore possible to interpret the DLP as not exploiting the possibilities of the digital medium, which leads to question what it really does offer in terms of enhancing the reading experience.

6.3 Remediation as reform

To understand why the DLP remediates previous and existing media the way it does, we can look at how the culture or context for digitisation as remediation have influenced the process. "Remediation always operates under the current cultural assumptions about immediacy and hypermediacy" (Bolter & Grusin 2000, p. 21). The cultural assumptions about immediacy and hypermediacy that are characteristic of the last decades are influenced by a technological, or perhaps even digital, optimism. Remediation is thus prompted by what Bolter and Grusin (2000, p. 59) terms remediation as reform. The belief in remediation as reform is strong among those who aim to digitise existing media, and the new digital medium is thus justified through simply being digital. It is the characteristic that makes it an improved version of its predecessor. This could describe how the DLP remediates the printed textbook: improvement by digitisation, remediation as reform.

In an article on why Norwegian authorities are digitising education, Klausen (2023) analysed the political arguments for implementing digital skills in the Norwegian curriculum. Through

critical discourse analysis, she identified a strong technological optimism in the discourse concerning white papers for educational development. In addition, the white papers described existing school practises, traditional textbooks, methods, and activities as old-fashioned and outdated (Klausen, 2023, p. 261). The answer became to modernise through digitising and digitalising the school system, its materials and curriculum content. In this sense, remediation as reform is driven by political initiative. The DLP can be seen to be developed in line with this discourse, because it claims to offer the same foundation for learning as the printed textbook. The improvement thus lies in its digital format, a modern format, and as such it can be an expression of a technological optimism. This optimism is evident in how some Norwegian schools has emphasised digital teaching materials, almost to the extent of making the digital formats absorbing the printed textbook entirely. Thus, remediation as reform implies not only reforming media, in this case teaching materials, but how the whole school system follows and is reformed as well.

If today's cultural assumptions about immediacy and hypermediacy are based on the optimistic belief in technology, and thus how hypermediacy will provide a new transparent immediacy for new media, it is curious how the DLP utilises so few of the possibilities found in the digital medium. If the goal is to outdo printed textbooks, then it is even more peculiar how it still imitates so many of the characteristics of the former medium. There are, however, critical voices now being raised, questioning the digitisation of schools, teaching, and teaching materials. In applying the theory of remediation on a small part of that digitisation, this thesis seeks to contribute to describing what this change entails.

7 Digital reading on digital learning platforms - conclusions

7.1 Characteristics the DLP *Skolestudio*

In the previous chapters I have aimed at characterising the DLP *Skolestudio* through discussing digital text characteristics, affordances, and remediation. This has been done to provide a better understanding of what it is that the digital learning platforms offer their readers, and to discuss how it may affect the reading experience on digital platforms.

Together, the three analyses provide a basis for claiming that the DLP *Skolestudio* does not represent the multifaceted experience of digital reading. The analysis of the digital text characteristics in the DLP *Skolestudio* identify the texts in the DLP as multimodal, on-screen texts. When compared to the two DLPs included in the quantitative overview, *Skolestudio* was not found to differ significantly from the others in digital text characteristics, and as such, a majority of multimodal, on-screen texts defines all three DLPs. The characteristics of the affordances in the DLP were found to entail mainly hypertextual features for navigation, e-glosses and scrolling, signified by common signifiers that are culturally, semantically, or logically constrained. The characteristics of remediation in the DLP point toward a respectful remediation, defined by a respect for the existing medium.

Due to the small amount of digital text characteristics, the slight utilisation of digital affordances and respectful remediation, a general characteristic of the DLP *Skolestudio* is conventionality. This conventionality comes to light in how a large majority of the texts in the DLP are multimodal texts. In the following section I aim to argue for the claim that the texts in the DLP *Skolestudio* are characterised by conventionality and multimodality.

7.1.1 Characteristic 1: Conventionality

Based on the three analyses in the previous chapter, I claim that the DLP *Skolestudio* is characterised by a certain conventionality. In this section I discuss reasons for this statement. Conventionality has in some discourses a negative ring to it, as pointing to a phenomenon that is outdated, or holds outdated beliefs. I would like to make clear that the use of conventionality

is not meant in a negative sense, but in line with the meaning of conventional as "based on or in accordance with what is generally done or believed" (Oxford Thesaurus of English, www.ordnett.no, n.d).

The DLP follows the textbook tradition of the English subject. The organisation of content in the DLP, by topical chapters containing chapter texts accompanied by tasks and activities, resembles the conventional textbook presentation that has been typical of English subject textbooks for decades (Lund, 2020). This finding is in line with those of Rodriguez-Regueira and Rodriguez-Rodriguez (2022) who found that digital textbooks in Spain follow the traditional structure of printed textbooks. In addition, it supports the findings by Ørevik (2018) who found digital materials to imitate printed textbooks (Ørevik, 2018, p. 44). She describes how a strong, conventional, text culture is prominent in the English subject. This is seen through how textbooks in the subject are carriers of a traditional text paradigm, which has not been challenged by authors, publishers, teachers, or students.

Though the analysis of genre in the DLPs in this study applies broad categories, there was found an even distribution of informational and literary texts in *Skolestudio*'s main chapter structure. This contrasts the findings from *Skolen*, the DLP published by Cappelen Damm. *Skolen* has a large overweight of informational texts in the main content, as literary texts were found in the additional content. This might point to how *Skolestudio* is more conventional in its structure and content than *Skolen*, in how the latter makes the teacher responsible for including literary texts in the classroom.

The DLP *Skolestudio* is characterised by conventionality because of its affordances. Firstly, it utilises few of the affordances available for a digital medium, which corresponds with the findings of Berthelsen and Tannert (2020). As seen in chapter 5, the virtual affordances are identified as the hypertextual features that enables navigation and e-glosses, the multimediated experience offered by the audio tool, and an overweight of static virtual affordances. The DLP does not enable the reader to engage with the texts through annotation or resizing elements, and manipulating interactive elements is only found in one of the texts. I contend that this is evidence for its conventionality, as its affordances appears bound by traditional print structures. Secondly, the affordances' usability is built on conventionally constrained signifiers. This seems perhaps unnecessary to underline, because most constraints build on conventions (Norman, 1999). As such, the only signifiers not built on conventions would be ones that are

unique to a product. The signifiers in the DLP that points to affordances for navigating the main structure, builds on the conventional text culture of the English subject. This could also be said about the affordances of audio files and e-glosses, as these are common in texts for second language acquisition. In addition, signifiers such as the scroll bar and arrow icons for navigation increase usability exactly because of their semantic and cultural conventionality.

The indications of respectful remediation outlined in the previous chapter implies a conventionality in the DLP *Skolestudio*. Respectful mediation is seen through how the DLP remediates the printed textbook, its supporting audio files, and on-screen texts found in online newspapers and digital encyclopaedias. Additionally, respectful remediation of television is evident in the two texts that incorporates videos. I assert that respectful remediation is promoting conventionality, because in this form of remediation the new medium does not challenge the existing conventions of earlier media characteristics, and as such is based on prevailing practices or common beliefs. Though I have argued that the DLP's conventionality can be traced to text culture in the English subject, this conventionality is not specific to the English subject. Similar conventional textbook structures are found in other subjects in DLPs as well. It is therefore relevant to consider if it is the drivers of the uncritical digitisation of schools, or the optimistic belief in technology, that is the reason behind the conventionality found in the DLP. Because the technological optimism found characteristic of the discourse in educational development holds a strong belief in digitisation as progress (Klausen, 2023), it could be a plausible explanation for the conventionality found in the DLP, and a reason why it has not further been developed to utilise the possibilities of the digital medium.

An aspect relevant to the discussion of conventionality, is how this might work in favour of reading comprehension. In incorporating well-known structures of text composition and signifiers in the screen interface, students might benefit from engaging in a familiar environment. As such, conventionality seen through how the multimodal texts of the DLP exclude, or do not make use of, several digital text characteristics, might support reading comprehension. Multimodal texts are the second main characteristic of the DLP *Skolestudio* and will be discussed in the following section.

7.1.2 Characteristic 2: Multimodality

Multimodality is found to characterise the texts in the DLP *Skolestudio* through all three analyses in this study. Related to digital text characteristics discussed in chapter 4, it is important to take notice of how multimodality, or multimodal texts, is a defining character of the texts in the DLP *Skolestudio* in contrast to hypermedia texts. As discussed, this is due to how the multimodal elements are embedded and not hyperlinked, as well as how the hypertextual content is presented in the same mode as the source text, as seen in the e-glosses that are hyperlinked, but of the same textual modality as the source word.

Because a large majority of texts in DLP does not contain affordances that enables the reader to access content of the open web of the internet, its multimodal content is shaped by the internal text presentation of the DLP. The multimodal content is therefore characterised by scrolling as an affordance, which seen through remediation theory leads to replacement. As identified in the previous chapter, replacement in the DLP is seen through how scrolling enables replacement between written text, images, and audio files, due to how these are placed on the page. As such, it can be seen as a radical replacement, i.e., when the new space is of a different medium (Bolter & Grusin, 2000, p. 44). Replacement in the DLP forefronts the images in a different way than the printed texts, by steering the reader to focus on the images at a specific time and place during reading. It could be hypothesised that this guided view can impact the readers spatial orientation, by offering pictures as visual, spatial markers in the text, i.e., if an event in the text happened above or below the picture, and as such increase comprehension. However, research on the matter does not provide clear evidence in support of this.

In their study on the effect of reading mode on the comprehension of multimodal texts, Singer Trakman et al. (2023) found significant evidence for the advantage of print. This advantage was greater when post-reading questions focused on visuals only. In discussing several reasonable explanations for their results, Singer Trakman et al. (2023, p. 615) draw attention to how scrolling allows for students to see only one part of a text at a time, in contrast to the printed material in which students can view an entire page. This resonates with replacement in remediation theory, and the findings in the DLP *Skolestudio*. When scrolling leads to replacement, the web page displays either picture or written text at a time which disconnects the visual and textual material. Research has showed that reading comprehension is supported by images displayed in proximity to related textual content (Mayer, 2002; Singer Trakman et

al., 2023). As students reading in the DLP *Skolestudio* will have to scroll between the two to modes to understand their connection, replacement leads to increased cognitive load (Singer Trakman et al., 2023, p. 615). However, the presence of a third mode, audio, might influence the processing of the multimedia content. When reading-while-listening readers were found to spend more time viewing visual content compared to when reading-only (Conklin et al., 2020). Though it is not possible to combine the results from the previously mentioned studies on multimodal reading to propose a conclusion on behalf of the reading experience in the DLP, it does address the complexity of multimodal reading and points to areas eligible for further research.

7.2 *Skolestudio* in relation to LK20, L2-readers, and teaching

In this section, I will first discuss the found characteristics of the DLP *Skolestudio*, multimodality and conventionality, in relation to the description of texts, reading and digital skills in the English subject curriculum for LK20. Further, I will address the characteristics considering affordances in relation to L2-readers, and lastly, outline considerations for applying the DLP as material for reading in the English subject classroom.

7.2.1 *Skolestudio*'s characteristics and LK20

The LK20 employs a broad view of texts in the English subject curriculum and emphasises reading of multimodal texts (Ministry of Education and Research, 2019a). This is reflected in the digital learning platforms in how they offer multimodal texts in different genres for perception, for instance, short stories, poems, online debates, news features, or paintings. However, as this thesis points to, the DLP lacks incorporation of texts with specific digital characteristics. Based on this, it is possible to claim that this inhibits the digital learning platform from sufficiently covering the variety of different texts and genres to present a broad understanding of texts.

In addition, the description of digital skills in the English subject curriculum emphasises the encounter with authentic English language (The Ministry of Education and Research, 2019a). Though texts in teaching materials are for the most part not categorised as authentic texts, due to how they are written specifically for a target audience of language learners, a digital platform harbours possibilities to incorporate authentic texts and language in a different way than printed

textbooks. As discussed in chapter 6, what is understood as authentic is changing, because of the digitisation and digitalisation of society. This does not imply a change in the definition of authentic language or sources, but it affects what students might actually experience as authentic, an aspect that the digital teaching materials have possibilities to exploit. An example is the podcast text from *Skolestudio* previously discussed in light of remediation. By mimicking an authentic podcast environment, including audio as the mode of communication and a layout resembling a podcast player, students could be provided with a context that promotes immediacy through hypermediacy, as the former is to some extent dependent on authenticity. Thus, efforts should be made to have the DLP utilise the possibilities of its digital platform, to provide a useful tool for both students and teachers in learning to navigate the multifaceted reading experience of digital environments. This is important, because there is no research evidence in support of the technologically superior digital natives, a term describing generations growing up with digital technology, and who were believed to respond differently to digitisation than the rest of the population (Støle, 2018). Instead, research points to the benefit of reading in print (Baron, 2021a; Clinton, 2019; Delgado et al, 2018; Kong et al., 2019), how media multitasking has a detrimental effect on concentration (Firth et al., 2019), and how students are seen to overestimate their reading comprehension in digital environments (Baron, 2021a; Singer Trakman et al., 2023). This does not mean that students should only read in print but reveals a discrepancy between printed and digital reading that needs to be given proper attention in the classroom. This is relevant to discuss further in relation to LK20.

LK20 describes how the English subject shall contribute to developing students' reading strategies and raising their metacognitive awareness. This is specifically mentioned in the curricula's description of reading as a basic skill, in addition to being incorporated in a competence aim related to reading (The Ministry of Education and Research, 2019a). Research points to reasons why this should be emphasised in classrooms, as it continues to provide evidence for the discrepancy between students' beliefs about their digital reading and their actual results (Baron, 2021a; Singer Trakman et al., 2023). Students tend to think that their comprehension is better when reading digital texts. However, reading comprehension tests reveal that this is very often not the case, and one possible explanation is that they read at a higher speed when reading digitally (Singer Trakman et al., 2023). This calls for increased attention on reading strategies, self-monitoring, and increased metacognitive awareness for digital reading. It further implicates that to meet the broad view on texts in the curriculum, a broader view on reading is needed, one that specifically employs an understanding of what

digital reading entails. Though reading and digital skills as basic skills have overlapping competence aims (see chapter 2), this aspect of reading is missing from the description of digital skills. It is therefore necessary that future curricula address the aspect of digital reading specifically, either as a part of reading or as a part of digital skills. I will put forth that a clear definition of digital reading could benefit printed reading, in confronting recent developments in high-stakes testing that might lead to a change of the definition of what reading is at the cost of long-form reading. Because reading is changing, the definition of reading is and should change. Not in a way that emphasises digital reading on behalf of printed reading, but to properly enhance what is characteristic of digital reading, and as such, address how it affects reading comprehension, and ultimately, how it must change our reading strategies.

7.2.2 *Skolestudio*'s characteristics and L2 readers

The characteristics of the DLP *Skolestudio*, identified as conventionality and multimodality in the previous section, could be advantageous for readers in the digital environment. As the texts are found to be multimodal, they might not increase the cognitive load in the same way as hypermedia texts are found to do (DeStefano & LeFevre, 2007). This favours students with lower working memory capacity, and might be beneficial to L2 readers, as reading in an L2 is found to impose a greater strain on working memory more than L1 reading (Li and Clariana, 2019). However, as scrolling are believed to negatively affect reading of on-screen texts (Brady et al., 2018; Sanchez & Wiley, 2009; Støle et al., 2020), it is not possible to conclude on the effects of the on-screen texts in the DLP without including students in the study.

Reading-while-listening is beneficial for L2 readers in general (Conklin et al., 2020), and for struggling readers in particular, as students with general learning difficulties, dyslexia or vision impairment are either dependent on or benefit greatly from audio-tools. However, the placement of the audio tool in the DLP above the written text might inhibit effective use and increase the cognitive load, as readers must scroll through the text to control the audio file. In addition, affordances for resizing elements, such as altering text size, should be incorporated in materials such as a DLP, due to principles of universal design and increased accessibility. Furthermore, L2 readers are found to benefit from e-glosses in their language learning (Zhang & Ma, 2021). The e-glosses in the DLP are enabled by hovering which provides a temporality that might aid the reader in keeping their focus and concentration on the main textual content, in contrast to

e-glosses that appear in a more fixed pop-up window. However, research is needed to identify the effect of this temporality of e-glosses on reading.

7.2.3 *Skolestudio*'s characteristic affordances and implications for teaching

Affordances are skill-relative and have to be learnt. This means that students need to learn how to engage with an object's affordances, and that the affordances are realised through the students' abilities. As the affordances of the reading material has changed, so does how we interact with and read them change. Therefore, we need to be aware of how reading strategies can be specific for digital materials. In order to utilise the affordances of a digital learning platform, learners must learn how to recognise their useability, and how to effectively utilise the affordances in support of reading comprehension. When reading in *Skolestudio*, students ought to be taught effective strategies for engaging with scrollable textual content, multimodal texts, and how to utilise the e-glosses and audio tool. These affordances found in the DLP *Skolestudio* are guided by constrained signifiers, and the conventionality of the DLP might support student's understanding of these signifiers. If they appear familiar, it is because of cultural conventions. In light of remediation, this might lead to immediacy, because transparency is dependent on a sense of realness that is promoted through culturally familiar objects (Bolter & Grusin, 2000, p. 32). As teachers, we need to be aware of how familiar students are with the affordances of the digital material, what their relationship is, to identify how best to scaffold their learning.

As affordances are relationships, they are reliant on the person who perceives. Affordances of a computer are therefore shaped by reader dispositions and beliefs, and their experiences with digital devices shapes how they interpret their affordances. As such, the variety of affordances a computer offers impact readers differently than the affordances of a book. Reluctant readers might be more motivated by digital texts because of how they perceive the affordances of a laptop as something that enables them to engage with a text more successfully, due to tools for reading support. Students' prior experiences with digital material, either the lack of or the immersion in, affect their dispositions as well as their skills. As the DLP is found to not represent the variety of digital texts, and not exploiting or utilising the affordances of the digital medium, this might be demotivating for tech-savvy students.

There is always a possibility of media multitasking when reading on a computer. As, such, this is an affordance of the computer and is affected by the user's relationship and experiences with media multitasking, which might interfere with the perception of the computer as an opportunity for learning. Media multitasking is found to be detrimental on concentration (Firth et al., 2019), and there is no evidence for this being any different for L2 readers. In fact, much of the content students access through social media is actually in English, which is an important aspect for teachers and researchers to consider, as the changing role of English in Norway is in large part due to digitisation.

The identified characteristic of texts in the DLP *Skolestudio* as multimodal and not hypermedia texts, might be an advantage for the readers, due to how the DLP does not offer any possibilities for media multitasking inside its own environment, and therefore it does not provide any additional distractions that might steer the reader off course. However, as the DLP is accessed through a web browser, the vast possibilities of the internet are readily waiting at the students' fingertips. This underlines the importance of context for reading. By being on the web, the DLP is contextualised in the same digital environment and by the same physical affordances that lead to media multi-tasking.

7.3 Suggestions for further research

In this thesis, I have analysed digital learning platforms for the English subject and done a quantitative account of the digital text characteristics as well as a close reading in light of affordance theory and remediation of the DLP *Skolestudio*. In addition to suggestions for further research posed in the previous sections, students writing master's or bachelor's theses could follow up on this study by employing close readings of other DLPs for the English subject, as well as DLPs for other subjects, to compare how and if they differ. In addition, surveys and research on actual use, which DLPs are most widely applied and how they are applied, would be relevant to the field. This type of research could result in descriptions of how teachers and schools make use of digital materials, which DLPs are most widely used, and how and if teachers and schools prioritise the combination of printed and digital materials.

I recommend future studies to consider all the aspects of reading as proposed in Coiro's model. As this thesis focuses on the element *text* and context of *mode* in the model, aspects that are not addressed relate to *activity* and *reader*. In relation to digital learning platforms, it would be

relevant to look into questions and activities, and further research how these impact reading comprehension in a digital environment, as the type of questions asked have an influence on reading comprehension in relation to mode (Baron, 2021a). It would be beneficial to include research designs on students' actual use and utilisation of the texts in the DLP, how they experience their affordances or how they utilise reading strategies for digital reading in a DLP, and as such address the aspect of *reader* in Coiro's model. Inclusion of students could further lead to investigations of how reader dispositions and beliefs, such as their experience with technology or socio-cultural background, affect their experience with digital reading and reading comprehension. This would provide a fuller understanding of what digital reading encompasses, to identify and evaluate influential factors.

I would also like to emphasise the role of embodied reading research and urge future research to take this aspect into account. Embodied cognition provides a more complete picture of how we learn and develop skills and would contribute to a better understanding of how we interact with technology, and its possible consequences.

7.4 Reading in the digital school - concluding remarks

In this thesis, I have examined defining features of digital reading materials for the English subject and contributed to the description and understanding of the digital materials now commonly applied throughout classrooms. Through identifying how the DLP is characterised by conventionality and multimodality, and how it does not utilise the wide array of affordances supported in a digital environment, the findings in this thesis underlines the aspect of technological optimism that has been prominent in schools: improvement by digitisation. Though digital teaching materials are modified to better fit the digital interface, it is clear that neither curriculum authors nor publishers of teaching materials have taken into consideration what it means to read on screen. Teaching materials, both printed and digital, have a strong influence on what happens in classrooms, as they guide and support teachers and are the primary source for engaging with texts. The overview of digital learning platforms provided in this thesis shows that the presiding logic behind the development of digital teaching materials is still the optimistic belief in technology. It is time to move ahead. If schools are to educate students to become critical problem solvers for our common future, they must also learn be critical and aware of technology's grip on modern lives and its influence on us. By raising students' metacognitive awareness in reading on screen, and scaffolding specific digital reading

strategies, they might become better equipped to tackle the found inferiority of reading on screen.

The implications from research on screen use and embodiment need to be considered in the digitisation of schools. As screen use is shown to have a detrimental effect on attention span and concentration (Baron, 2021a; Firth et al., 2019), it is timely to question the position of screen technology in today's classrooms. When digital learning platforms and other digital teaching resources are placed within the array of digital content found online, it is too optimistic to believe that the constant possibility of media multi-tasking does not influence readers and learners. If reading on screen supports shallow, rapid reading, as suggested in the shallowing hypothesis (Anisette and Lafreniere, 2017), we cannot sit back and readily believe that the digitisation of teaching materials will not affect students' reading comprehension and learning outcomes. In addition, screen technology is disembodied technology (Mangen & Pirhonen, 2022). This means that in heavy dependence on screens for reading and learning, the body is restricted from engaging with the physical material of the objects for learning. As seen through a screen, all content and objects have the same materiality: that of the digital device. Research in neuropsychology and cognitive science underline the role of embodiment in learning basic skills (Mangen & Pirhonen, 2022), such as reading, and it is critical to acknowledge this in the application of digital technologies in school. I urge teachers, publishers, and school owners alike to emphasise findings from research on reading on screen, as well as the findings from this thesis, in their application, promotion and development of digital learning materials.

The use and implementation of digital technologies in school should be justified through the unique affordances that are found in a digital environment. If what is being offered as digitally mediated learning opportunities differs considerably from those found in traditional materials, it could enhance both the significance of printed reading, and the specificity of digital reading. The findings in this study suggest that the DLPs do not offer possibilities of this kind. Therefore, they do not offer the specific affordances that students meet when reading other digital sources. I claim that digital teaching materials should strive to offer such affordances, because without them students have to dive into the sea of possibilities of the internet for their authentic digital reading experiences. Because the texts written for English subject teaching materials are carefully accommodated or adapted for specific levels of English learners, many texts encountered online are too advanced linguistically or thematically to support reading comprehension. Thus, instead of teaching students to handle hypermedia reading in the open

web, a DLP in the English subject could simulate authentic hypermediated reading environments. As such, it could provide students and teachers with digital texts that does not only represent the multifaceted experience of digital reading, but also present texts that are accustomed for English language learners, to promote and develop specific strategies and skills for reading on screen.

By truly acknowledging that digital devices are here to stay, we can move beyond the technological optimism characteristic of digital school development and begin to focus on educational benefits and motives. This entails not jumping onboard and embracing every new gadget and gizmo with the promise of a better digital school for the future, but to pause and think, evaluate, and further develop solid digital practices. As already emphasised, it is therefore pertinent to utilise the possibilities for different reading experiences that exist in the digital medium. It means to take control of the changing nature of reading and promote reader's enjoyment through born-digital literature that have long been developed through exploiting the affordances of the digital platform. It means to truly consider what digital devices actually afford, and evidently, acknowledging what it is they do not afford. As such, it means to promote printed reading where digital reading comes in short. In the end, it is not a question about choosing between print and screen. It is about knowing when to choose what and which implications it might have for readers. Perhaps most importantly, we need to know how to best support students in their encounter and engagement with the wide array of texts found in a digital environment.

Learning materials referred to in the thesis

Printed material

Diskin, E., & Winsvold, K. G. (2021). *Enter 10*. (2nd edition). Gyldendal.

Digital materials[*]

Enter Fagrom (2020) in *Skolestudio.* Gyldendal. Retrieved from https://www.skolestudio.no/

Engelsk 10 (n.d.) in *Skolen fra Cappelen Damm.* Cappelen Damm AS. Retrieved from https://skolenmin.cdu.no/

Røkaas, F., & Pettersen, S. (2020) *Stages 8 – 10* (2nd edition) Aschehoug undervisning. Accessed as Aschehoug's digital learning platform Aunivers. Retrieved from https://aunivers.no/fag/eng

References

Anker, T. (2020). *Analyse i praksis: En håndbok for masterstudenter*. Cappelen Damm Akademisk.

Annisette, L. E., & Lafreniere, K. D. (2017). Social media, texting, and personality: A test of the shallowing hypothesis. *Personality and Individual Differences*, *115*, 154–158. https://doi.org/10.1016/j.paid.2016.02.043

Baron, N. S. (2021a). *How we read now: Strategic choices for print, screen, & audio*. Oxford University Press.

Baron, N. S. (2021b). Know what? How digital technologies undermine learning and remembering. *Journal of Pragmatics*, *175*, 27–37. https://doi.org/10.1016/j.pragma.2021.01.011

Bergene, A. C., Vika, C. S., Denisova, E., Steine, F. S., & Vennerød-Diesen, F. F. (2021). *Spørsmål til Skole-Norge: Analyser og resultater fra Utdanningsdirektoratets spørreundersøkelse til skoler og skoleeiere høsten 2021*. (NIFU Rapport 2021:25) Nordisk institutt for studier av innovasjon, forskning og utdanning. https://hdl.handle.net/11250/2837634

[*] No author information is given on the websites from Cappelen Damm and Gyldendal.

Berthelsen, U. D., & Tannert, M. (2020). Utilizing the affordances of digital learning materials. *L1-Educational Studies in Language and Literature*, 1–23. https://doi.org/10.17239/L1ESLL-2020.20.02.03

Bolter, J. D., & Grusin, R. A. (2000). *Remediation: Understanding new media*. MIT Press.

Bower, M. (2008). Affordance analysis – matching learning tasks with learning technologies. *Educational Media International, 45(1), 3-15* https://doi.org/10.1080/09523980701847115

Brady, K., Cho, S. J., Narasimham, G., Fisher, D., & Goodwin, A. (2018). Is Scrolling Disrupting While Reading? In Kay, J. and Luckin, R. (Eds.) *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences* (ICLS), 152-159

Brevik, L. M. (2019). Gamers, Surfers, Social Media Users: Unpacking the role of interest in English. *Journal of Computer Assisted Learning*, *35*(5), 595–606. https://doi.org/10.1111/jcal.12362

Carlsen, C. (2020). Reading literature. In C. Carlsen, M Dypedahl & S. H. Iversen (Eds.) *Teaching and learning English.* (pp. 209-227). Cappelen Damm Akademisk.

Clinton, V. (2019). Reading from paper compared to screens: A systematic review and meta-analysis. *Journal of Research in Reading*, *42*(2), 288–325. https://doi.org/10.1111/1467-9817.12269

Coiro, J. (2020). Toward a Multifaceted Heuristic of Digital Reading to Inform Assessment, Research, Practice, and Policy. *Reading Research Quarterly*, *56*(1), 9–31. https://doi.org/10.1002/rrq.302

Conklin, K., Alotaibi, S., Pellicer-Sánchez, A., & Vilkaitė-Lozdienė, L. (2020). What eye-tracking tells us about reading-only and reading-while-listening in a first and second language. *Second Language Research*, *36*(3), 257–276. https://doi.org/10.1177/0267658320921496

Crompton, H., Jones, M. V., & Burke, D. (2022). Affordances and challenges of artificial intelligence in K-12 education: A systematic review. *Journal of Research on Technology in Education*, 1–21. https://doi.org/10.1080/15391523.2022.2121344

D'Ambra, J., Wilson, C. S., & Akter, S. (2019). Affordance theory and e-books: Evaluating the e-reading experience using netnography. *Personal and Ubiquitous Computing*, *23*(5–6), 873–892. https://doi.org/10.1007/s00779-017-1086-1

Delgado, P., Vargas, C., Ackerman, R., & Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. *Educational Research Review*, *25*, 23–38. https://doi.org/10.1016/j.edurev.2018.09.003

DeStefano, D., & LeFevre, J.-A. (2007). Cognitive load in hypertext reading: A review. *Computers in Human Behavior*, *23*(3), 1616–1641. https://doi.org/10.1016/j.chb.2005.08.012

Dyson, M., & Haselgrove, M. (2000). The effects of reading speed and reading patterns on the understanding of text read from screen. *Journal of Research in Reading*, *23*(2), 210–223. https://doi.org/10.1111/1467-9817.00115

Engen, L., & Helgevold, L. (2006). Fagbok i bruk: Å lese en fagtekst. In *Fagbok i bruk* (pp. 6–15). Lesesenteret.

Ensslin, A. (2014) Hypertextuality. In M.-L. Ryan, L. Emerson, & B. J. Robertson (Eds) *The Johns Hopkins guide to digital media*. (pp. 258-265). Johns Hopkins university press.

Firth, J., Torous, J., Stubbs, B., Firth, J. A., Steiner, G. Z., Smith, L., Alvarez-Jimenez, M., Gleeson, J., Vancampfort, D., Armitage, C. J., & Sarris, J. (2019). The "online brain": How the Internet may be changing our cognition. *World Psychiatry*, *18*(2), 119–129. https://doi.org/10.1002/wps.20617

Fitzsimmons, G., Weal, M. J., & Drieghe, D. (2019). The impact of hyperlinks on reading text. *PLOS ONE*, *14*(2) https://doi.org/10.1371/journal.pone.0210900

Gibson, J. J. (2015). *The Ecological Approach to Visual Perception: Classic Edition*. Taylor & Francis Group. (Original work published in 1979).

Gyldendal. (n.d.a). *Enter Fagrom. Instruksjonsvideo: Slik bruker du* Enter Fagrom *Skolestudio.* Retrived April 18, 2024, from https://www.skolestudio.no/fagtid/uvi-enter-fagrom

Gyldendal. (n.d.b). *Produktsammensetninger for ungdomstrinnet*. Retrieved April 18, 2024, from https://www.gyldendal.no/grs/enter/c-183609/

Gyldendal. (2021, March 15). *Inkluderende og fleksibel engelsklæring.* Gyldendal. https://www.gyldendal.no/artikler/inkluderende-og-fleksibel-engelsklaering-med-enter/

Hartson, R. (2003). Cognitive, physical, sensory, and functional affordances in interaction design. *Behaviour & Information Technology*, *22*(5), 315–338. https://doi.org/10.1080/01449290310001592587

Hillesund, T., Schilhab, T., & Mangen, A. (2022). Text Materialities, Affordances, and the Embodied Turn in the Study of Reading. *Frontiers in Psychology*, *13*, 827058. https://doi.org/10.3389/fpsyg.2022.827058

Klausen, S. W. (2023). Why Are Norwegian Education Authorities Digitising Education? *Nordic Journal of Digital Literacy*, *18*(4), 246–264. https://doi.org/10.18261/njdl.18.4.4

Koda, K. (2007). Reading and Language Learning: Crosslinguistic Constraints on Second Language Reading Development. *Language Learning*, *57*, 1–44. https://doi.org/10.1111/0023-8333.101997010-i1

Kong, Y., Seo, Y. S., & Zhai, L. (2018). Comparison of reading performance on screen and on paper: A meta-analysis. *Computers & Education*, *123*, 138–149. https://doi.org/10.1016/j.compedu.2018.05.005

Krashen, S. (1982). *Principles and Practice in Second Language Acquisition*. Alemany Pr.

Li, P., & Clariana, R. B. (2019). Reading comprehension in L1 and L2: An integrative approach. *Journal of Neurolinguistics*, *50*, 94–105. https://doi.org/10.1016/j.jneuroling.2018.03.005

Lund, R. E. (2020). Teaching and learning materials. In C. Carlsen, M Dypedahl & S. H. Iversen (Eds.) *Teaching and learning English.* (pp. 343-362). Cappelen Damm Akademisk.

Mangen, A., Olivier, G., & Velay, J.-L. (2019). Comparing Comprehension of a Long Text Read in Print Book and on Kindle: Where in the Text and When in the Story? *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00038

Mangen, A., & Pirhonen, A. (2022). Reading, Writing, Technology, and Embodiment. In S. L. Macrine & J. M. B. Fugate (Eds.), *Movement Matters* (pp. 103–118). The MIT Press. https://doi.org/10.7551/mitpress/13593.003.0013

Mangen, A., & Schilhab, T. (2012). *An embodied view of reading: Theoretical considerations, empirical findings, and educational implications* In Matre, S. & Skaftun, A. (Eds.), *Skriv! Les!* (pp. 285–300). Akademika forlag.

Mayer, R. E. (2002). Multimedia learning. *Psychology of Learning and Motivation*, 41, 85–139. Academic Press. https://doi.org/10.1016/S0079-7421(02)80005-6

Mills, K. A., Unsworth, L., & Scholes, L. (2022). *Literacy for Digital Futures: Mind, Body, Text*. Routledge. https://doi.org/10.4324/9781003137368

Ministry for Education and Research (2019a). *Curriculum in English* (ENG01-04). Established as a regulation. Læreplanverket for Kunnskapsløftet 2020. https://www.udir.no/lk20/eng01-04?lang=eng

Ministry for Education and Research (2019b). *Curriculum in Norwegian* (NOR01-06). Established as a regulation. Læreplanverket for Kunnskapsløftet 2020. https://www.udir.no/lk20/nor01-06

Norman, D. (2013). *The Design of Everyday Things—The Revised and Expanded Edition*. Basic Books.

Norman, D. A. (1999). Affordance, conventions, and design. *Interactions*, *6*(3), 38–43. https://doi.org/10.1145/301153.301168

Norman, D. A. (2015). Affordances: Commentary on the Special Issue of AI EDAM. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, *29*, 235–238. https://doi.org/10.1017/S0890060415000232

Norwegian Directorate for Education and Training. (2024, January 09). *Læremidler og læringsteknologi i skole og opplæring*. https://www.udir.no/om-udir/tilskudd-og-prosjektmidler/tilskudd-til-laremidler/begrepsavklaring-skole/

Norwegian Publishers Association. (2023). *Bokmarkedet 2022. Forleggerforeningens bransjestatistikk*. Den norske forleggerforening. https://forleggerforeningen.no/wp-content/uploads/2023/06/Bransjestatitikk-2022-endelig.pdf

Nyre, L. (2024). *Teknologi: En teoretisk innføring*. Universitetsforlaget.

Osloskolen. (2021, November 16). *Økosystem for digitale læremidler med bruksbasert betaling*. https://aktuelt.osloskolen.no/larerik-bruk-av-laringsteknologi/digital-skolehverdag/okosystem-for-digitale-laremidler-med-bruksbasert-betaling/

Oxford Thesaurus of English (n.d.). *Conventionality*. In *www.ordnett.no*. Gyldendal.

RAND. (2002). *Reading for understanding. Toward an R&D program in reading comprehension.* RAND Reading Study Group. Rand Education. *http://www.rand.org/content/dam/rand/pubs/monograph_reports/2005/MR1465.pdf*

Rimmereide, H. E. (2020). Multimodal texts in the English classroom. In C. Carlsen, M Dypedahl & S. H. Iversen (Eds.) *Teaching and learning English.* (pp. 191-208). Cappelen Damm Akademisk.

Rindal, U., & Brevik, L. M. (2019). *English Didactics in Norway: – 30 years of doctoral research*. Universitetsforlaget. https://doi.org/10.18261/978-82-15-03074-6-2019

Rodríguez-Regueira, N., & Rodríguez-Rodríguez, J. (2022). Analysis of digital textbooks. *Educational Media International*, *59*(2), 172–187. https://doi.org/10.1080/09523987.2022.2101207

Sanchez, C. A., & Wiley, J. (2009). To Scroll or Not to Scroll: Scrolling, Working Memory Capacity, and Comprehending Complex Texts. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *51*(5), 730–738. https://doi.org/10.1177/0018720809352788

Singer, L. M., & Alexander, P. A. (2017). Reading on Paper and Digitally: What the Past Decades of Empirical Research Reveal. *Review of Educational Research*, *87*(6), 1007–1041. https://doi.org/10.3102/0034654317722961

Singer Trakhman, L. M., Alexander, P. A., & Sun, Y. (2023). The Effects of Processing Multimodal Texts in Print and Digitally on Comprehension and Calibration. *The Journal of Experimental Education*, *91*(4), 599–620. https://doi.org/10.1080/00220973.2022.2092831

Singh, A., & Alexander, P. A. (2022). Audiobooks, Print, and Comprehension: What We Know and What We Need to Know. *Educational Psychology Review*, *34*(2), 677–715. https://doi.org/10.1007/s10648-021-09653-2

Skjermbrukutvalget. (2023). *Konsekvenser av skjerm i skolen—Et kunnskapsgrunnlag fra Skjermbrukutvalget*. https://files.nettsteder.regjeringen.no/wpuploads01/sites/546/2023/12/Konsekvenser-av-skjerm-i-skole-endelig.pdf

Støle, H. (2018). Why digital natives need books: The myth of the digital native. *First Monday*, *23(*10*)*. https://doi.org/10.5210/fm.v23i10.9422

Støle, H., Mangen, A., & Schwippert, K. (2020). Assessing children's reading comprehension on paper and screen: A mode-effect study. *Computers & Education*, *151*, 103861. https://doi.org/10.1016/j.compedu.2020.103861

Tishakov, T. (2020). Reading skills and strategies. In C. Carlsen, M Dypedahl & S. H. Iversen (Eds.) *Teaching and learning English.* (pp. 177-190). Cappelen Damm Akademisk.

van der Weel, A., & Mangen, A. (2022). Textual reading in digitised classrooms: Reflections on reading beyond the internet. *International Journal of Educational Research*, *115*, 102036. https://doi.org/10.1016/j.ijer.2022.102036

Zhang, C., & Ma, R. (2021). The effect of textual glosses on L2 vocabulary acquisition: A meta-analysis. *Language Teaching Research*, 136216882110115. https://doi.org/10.1177/13621688211011511

Ørevik, S. (2018). *Mapping the text culture of the subject of English -Genres and text types in national exams and published learning materials* [Doctoral thesis, University of Bergen]. Bergen Open Research Archive. https://hdl.handle.net/1956/19266