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MASTER'S THESIS

A comparative case study of 8th graders' spelling and grammar using handwritten versus computer-written texts with autocorrect/ Grammar-checking-software.

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Anders Rynning-Tønnesen
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1. Introduction

During my various teaching practice periods, I have wondered to what extent autocorrect assists students' spelling abilities, and what would happen if they were asked to use pen and paper instead. Printed articles, websites, and Chromebooks have displaced physical books, pens and paper; computers and the internet have become cost-efficient and easily accessible for teachers and students alike. This technology allows homework to be handed out through Google Classroom and enables teachers to assess what is handed in quickly. However, there is a need to consider whether teachers should assign more tasks that involve handwriting; research conducted by Medwell and Wray (2008) suggests that handwriting is more than just a motor skill and may make a crucial contribution to text composition.

There has been extensive research by prestigious scholars in the field concerning the benefits and drawbacks of handwriting versus typewriting. Efforts have been made to investigate the correlation between orthographic motor skills and grammatical and orthographic accuracy. Moreover, previous studies indicate that the cognitive abilities concerning the orthographic motor integration may be strengthened with the use of handwriting, as seen in Christensen (2004) study. The lack of orthographic motor integration may lead to struggles in various aspects of text production, including ideation, text monitoring, and pragmatic awareness. However, the development of autocorrect and grammar-checking tools has become widely available, benefiting students who struggle with grammar and orthographic accuracy.

The availability of these tools for all students presents a challenge; it may be difficult to assess student's language competence based on their performance, as discussed by Chomsky (1957). This thesis aims to investigate the difference in grammatical and orthographic accuracy in students' texts based on the two modes of writing. Examining the differences found within the two modes of writing may assist teachers in evaluating student's language competence in the future. Students may perform significantly differently in their handwritten text compared to their typewritten text. As a result, teachers may face the challenge of evaluating student's competence differently based on the mode of writing. If the handwritten text contains a significant increase in errors compared to their typewritten text, how should teachers evaluate student competence?

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1.1 Research Questions

The primary objective of this thesis is to examine the distinction between handwritten and typewritten text generated by a single 8th-grade class, with the aim of investigating the potential significant difference in the texts produced in the two different modes of writing. For this case study, a categorization approach has been adopted to segregate grammatical and spelling errors in the handwritten and typewritten text, thus facilitating data comparison and analysis. This study seeks to contribute new insights to the existing knowledge on the subject. The analysis outcomes will be critically evaluated with relevant scholarly theories and prior research. The following research questions guide the thesis:

RQ(1): To what extent do handwritten and typewritten text differ in terms of grammatical accuracy?

RQ(2): To what extent do handwritten and typewritten text differ in terms of orthographical accuracy?

RQ(3): To what extent are differences in grammatical and orthographical accuracy contingent on the reported gender of the learners who produced the texts?

A total of 26 handwritten and 26 typewritten texts were collected from an eighth-grade class in a mid-sized Norwegian city. A quantitative content analysis was conducted on the data using a meticulously designed coding manual. The coding manual consisted of four grammatical and five spelling categories. The grammatical categories consisted of subject-verbal agreement, pronoun agreement, article usage, and irregular past tense. The spelling categories included misspellings, homophones, letter omissions, letter additions, and capitalization. A detailed description of each category is presented in section 2.3.5. Each error identified in the handwritten and typewritten texts was meticulously analyzed and classified into its corresponding category using an Excel sheet.

1.2 Outline of the thesis

The thesis is structured as follows: Chapter 2 provides a theoretical backdrop on the topic of grammatical and orthographical accuracy and digital competence; it includes opinions and previous research conducted by experts in the field and discusses the importance of competence as a concept, ability, and utilization. Chapter 3 of this thesis examines the various methods employed in this research, including the crucial decisions made concerning the chosen analysis methods, ethical considerations, as well as issues of validity and reliability. Chapter 4 provides an extensive analysis of the data material collected using the coding manual; the study uses the

Log-likelihood test in order to establish any significant results. Chapter 5 discusses the findings of this research in light of relevant theories and concepts discussed in Chapter 3. Chapter 6 concludes this thesis, discussing pedagogical implications, limitations of this thesis, and further research.

2. Theoretical considerations

This chapter provides an overview of previous empirical research and relevant theoretical frameworks concerning handwriting and typewriting, focusing on the common grammatical and spelling errors observed in primary education. Section 2.1 focuses on language- and writing competence and how the Norwegian Ministry of Education and Research defines competence. To contextualize this discussion, sections 2.2-2.2.3 will provide an overview of the development of the modern-day Norwegian classroom and the technological advancements that have shaped the current landscape of digital competence for both teachers and students. Moreover, Christensen (2005) emphasizes the importance of the orthographic motor as a crucial component of cognitive development in literacy, highlighting its relation to long-term memory and working memory capabilities in section 2.3 (Medwell & Ray, 2008; Baddeley, 2010; Gatherocole, Pickering, Knight & Stegmann, 2004). Section 2.4 and 2.5 investigate if there is a correlation between handwriting and typing proficiency, and how proficiency in either mode might positively or negatively impact their grammatical and orthographic accuracy (Karlsdottir & Stefansson,2002; Rosemary Sassoon, 2006). In section 2.6, autocorrect and grammar-checking software are discussed in order to get a better understanding of their capabilities and limitations. In the latter part of this chapter, I will present the different grammatical and spelling errors that this thesis seeks to investigate.

2.1 Writing Competence and Performance.

In the core curriculum The Norwegian Ministry of Education and Research lists five essential skills: reading, writing, numeracy, oral skills, and digital skills (pp.13-14). The Ministry emphasizes the importance of integrating these skills in all subjects taught in Norwegian schools (Norwegian Ministry of Education and Research, 2017a, p.14) The Ministry defines competence as:

"[…] the ability to acquire and apply knowledge and skills to master challenges and solve tasks in familiar and unfamiliar contexts and situations. Competence includes understanding and the ability to reflect and think critically". (Ministry of Education and Research, 2017a. p.12)

The document further explains that knowledge means "focusing on facts, concepts, theories, ideas, and relationships in various subjects" (p.13). The Ministry emphasizes the importance of developing reading and writing skills throughout the entire learning path, from when pupils first learn to read and write to when they go on to read more advanced subject texts (p.14). In Syntactic Structures (1957), Noma Chomsky discusses the difference between competence and performance. Where language competence is defined as; "the speakers-hearer's knowledge of his language" and performance as: "the actual use of language in concrete situations" (Chomsky, 1957, p.2). According to his argument, a distinction between performance and competence can only be made under ideal conditions, which are rarely present (p.2). Chomsky's (1957) position that performance is an inadequate measure for determining the competence of participants; emphasizes the challenges educators face in evaluating the writing proficiency of their students. The difficulty in assessing students' writing skills has long been a concern, as highlighted by Skar and Aasen (2018). Skar & Assen (2018) argue that one of the reasons why assessing students writing competence is difficult is to the complex cultural and cognitive phenomenon which cannot be measured through singular tasks (Skar & Assen, 2018). In addition to this, student performance might vary greatly based on the format and the task at hand, as well as other influences such as time available, stress, and other potential variables. When seeking to investigate the writing competence of pupils, the problem becomes: how do we measure writing competence? Is it based on the grammatical accuracy of the text produced? Pupils' ability to express, reflect and discuss their opinions? In order to determine what methods of measurements to use when evaluating student's writing competence, teachers are advised to look to the Ministry's definition of what writing competence entails.

The Norwegian Ministry of Education and Research lists four criteria defining a pupil's writing competence. They are (1) The ability to plan and revise their texts based on their own assessment and feedback, (2) Formulating, which involves being able to master and use spelling, grammar, sentence structure, and text cohesion on paper and screen, along with other means of expression such as images, figures, and symbols in an appropriate manner, (3) Communicating, which involves being able to express opinions, discuss issues, share knowledge and experiences by adapting one's own text to the receiver, content and purpose of the text, and lastly (4) reflecting and evaluating involve using writing as a tool to monitor and develop an awareness of one's own learning (Ministry of Education and Research, 2017b, p. 22).

2.2 Digital competence.

Over the past few decades, a significant shift has occurred in how school children learn and complete their assignments. In the past, students would typically rely on pen and paper to take notes, complete assignments, and complete exams. However, with the widespread adoption of computers and technology in education, many schools have transitioned to using computers as a primary tool for learning. This means that students now have access to a wide range of educational resources, tools, and applications on their computers, which they can use to complete assignments, research topics, and communicate with their classmates and teachers. The Norwegian Directorate of education (2019) has published guidelines outlining the responsibilities of schools when providing pupils with computers or other digital devices. These guidelines aim to ensure that children are able to use these tools effectively and safely for educational purposes, such as completing homework and assignments. The directorate states, "Kindergartens and schools have a responsibility to protect children's safety and personal data when using digital units, and they are to be given the necessary competence when using digital units" (Norwegian Directorate of Education, 2019, p.2)

2.2.1 Digital Competence for Teachers and Students.

The concept of digital competence has evolved since its initial introduction in the National Curriculum of knowledge Promotion 2006 (LK06). The most recent definition, as articulated by The Norwegian Ministry of Education and Research (2017b), encompasses five key competencies: the ability to acquire and process information, the ability to find and evaluate information, the ability to produce and process digital material, the ability to communicate, and the ability to demonstrate digital judgment (Ministry of Education and Research, 2017b, pp.3-4). Specifically, the third competence, communication, entails the utilization of digital tools, resources, and media to collaborate and communicate in the learning process and present one's work and competence to diverse audiences (Ministry of Education and Research, 2017b, p.4). This is exemplified in the curriculum for 7th grade in the English subject, and it is stated that students are required to employ digital resources and various dictionaries in language learning, text creation, and interaction (Ministry of education and research, 2019, ENG01-04). The International Computer and Information literacy Study (2013) proposes a definition of digital competence similar to the one that the Norwegian Ministry of Education and Research uses:

> "Computer and Information Literacy refers to an individual's ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society" (Fraillon et al., 2013, p. 17)

Combined with the competence aims provided by the Norwegian educational association and the definition provided by ICILS, this entails that the induvial can use the device accurately in terms of text production and knowledge about its capabilities and limitations. The Impact of having digital competence and how it may affect students' grammar and orthographic accuracy is further discussed in the following section.

2.3 Orthographic motor in hand- and typewriting.

2.3.1 Orthographic-motor, definition, and research

Orthographic-motor integration is referred to as what Christensen (2005) describes as; "[…] the way in which orthographic knowledge is integrated with the motor demands of handwriting in order to produce letters and words" (p.441). The lack of Orthographic-motor integration is explained by Christensen (2005) as that the writers do not have sufficient cognitive resources for the more challenging aspects concerning text production, this includes ideation, the ability to monitor and revise one's own text and lack pragmatic awareness (p.441). Individuals need to master two skills to create and construct a text; they need to be able to automate the basic subcomponents of the task and manage and understand how to create a draft of a text, monitor it, and revise it for syntactic, semantic and pragmatic adequacy (Christensen, 2005, p. 442) Furthermore, Christensen argues that "These processes of ideation and translation require a complex array of cognitive and metacognitive strategies" (p.442). Self-monitoring, revising, and editing skills are necessary for students to detect errors; this is not necessarily a skill that comes without practice; being able to recognize one's own mistakes is a crucial feature in the construction of a well-functioning text (Christensen, 2005, p. 442).

2.3.2 Orthographic-motor integration study

In a study conducted by Christensen (2004), the impact of Orthographic-motor integration on typewritten and handwritten texts was examined. A total of 276 participants from 8th and 9th-grade classes were included in the first study. The second study included 35 students in Grade 8 and 9 who exhibited very low levels of proficiency in typing (p.551).

The first and second studies were separate but contained the same format. The research project consisted of two studies, and five criteria were used to evaluate the quality of the student-produced text. These criteria included creativity and originality of ideas, logical organization and structuring of ideas, technical accuracy of spelling and grammar, comprehensiveness and elaboration of ideas concerning the topic, and pragmatic awareness and sensitivity to an audience (Christensen, 2004, p. 555). To evaluate the participants orthographic-motor integration related to handwriting, they were asked to write as many letters in correct alphabetic

order as possible (p.555). The inter-rater reliability was calculated using Pearson's product moment correlation and was found to be r=.99 (p.555). Before the intervention, the participants were pre-tested by writing a text with the prompt "Three wishes." They were given 3 minutes to think about what they wanted to write, followed by 20 minutes to complete the task. In order to evaluate the participants orthographic-motor integration related to typing, a similar task was administered to that used in the handwritten text, with the only difference being that it was done through a specific data-program. The typewritten text used the same criteria as the handwritten text, with the prompt "The best day ever" (p.556). The results from the analysis showed that there was a significant positive correlation between orthographic-motor integration related to handwriting and both the quality and length of handwritten text, the same findings were true for the typewritten texts (p.556).Additionally, the study found a significant difference in the length of the typewritten and handwritten texts, with the average typewritten text comprising 599.16 words and the average handwritten text comprising 169.43 words (Christensen, 2004, p. 556).

The second study, Christensen (2004) conducted, aimed to examine the impact of developing typing skills on older students' ability to generate computer-based written text. A total of 35 participants were recruited for the study and underwent pre-testing, which consisted of two tasks: one involving handwritten texts with the prompt "My greatest challenge" and the other involving typewritten texts with the prompt "My best friend." The samples of written work were then administered and scored using the same procedures as in Study 1 (pp. 557-560)

After pre-testing, the participants were randomly divided into a control and an experimental group. The control group completed a written journal using a desktop computer using the Microsoft Word processing program. They were encouraged to write whatever was significant to them each day. At the end of each session, the designated tutor read and further encouraged the participants without focusing on the technical aspects of their writing. The example group worked on a typing skill program. The program was specifically developed for the project. The program provided feedback and progressed the participants to the next level once they reached a certain "level" of 40 WPM (p.558).

The post-testing results revealed that both groups had significantly improved typing proficiency compared to pre-testing. Furthermore, the students who underwent the typing condition performed significantly better at post-testing in typing than the journal group did. This suggests that facilitating students' ability to produce written text through typing instruction improves

their technical accuracy and logical sequencing and enhances their creativity and sensitivity to the audience (Christensen, 2004, p. 561).

2.4 Handwriting.
2.4.1 Previous Studies on Handwriting

The topic of handwriting proficiency in children has been extensively researched. A longitudinal study of 407 primary school students in Norway by Karlsdóttir and Stefansson (2002, p. 626) revealed that 27% of the sample were classified as having dysfunctional handwriting at the end of grade 1 (age 7). However, this percentage decreased to 13% at the end of grade 5 (age 11) (p.623). Karlsdóttir and Stefansson (2002) define dysfunctional handwriting as a series of incapacities that one "difficulty" leads to another; "Dysfunction of handwriting speed can usually be traced to dysfunction of its quality" (p.624). The quality is based on the participants' ability to write at a certain speed and the quality of the letters produced concerning readability (p.641). Rosenblum, Weiss, L., & Parush (2004) found that 10-30% of elementary school-aged children exhibited handwriting difficulties, with significant disparities in prevalence between male and female students (p.434). This observation is consistent with prior research indicating that girls generally demonstrate greater handwriting proficiency than boys (Graham & Miller, 1980, p. 2). The observed discrepancy in handwriting proficiency between the sexes highlights may highlight the potential need for increased emphasis on handwriting instruction, particularly for boys. The long-term ramifications of this disparity in proficiency may be what Stanovich (1986) has dubbed the "Matthew effect": in the context of orthographic-motor integration, it has been observed that more proficient individuals, particularly females, demonstrate greater success in their compositional processes, which may be attributed to the availability of heightened cognitive resources (Medwell & Wray, 2008, p. 41). These compositional processes include text revision, in which grammatical and orthographic accuracy play a vital role (Medwell & Wray, 2008 p. 42).

On the topic of factors that may influence ones writing ability, memory is a potential one. An enormous amount of study has been done over the last ten years to comprehend the function of working memory in writing (Medwell & Wray, 2008. p. 38). Medwell & Wray (2008) explains the difference between working memory and long-term memory as "Long-term memory can store unlimited amounts of material for many years, working memory holds a limited amount of memory and is often used when performing necessary tasks (p.38)" Baddeley (2010) adds that "Working memory is assumed to be necessary to keep things in mind when performing

complex tasks" (p.136). The complex tasks referred to are tasks that include reasoning, learning, and comprehension (Baddeley, 2010, p.136). Gathercole et al. (2004) suggest that working memory is particularly associated with the literacy scores of young children (pp.12-13). If young students have devoted enormous amounts of working memory to control lower-level processes, such as handwriting, they may have little left for higher-level processes (Medwell & Wray, 2008, p.38). According to Medwell and Wray (2008), excessive use of working memory capacity for handwriting can restrict a student's capacity to produce ideas, choose appropriate vocabulary, monitor progress, and revise written content (p.38). However, modern technology can mitigate many of these difficulties for individuals with poor sequencing skills. Typing on a computer keyboard can assist in finding appropriate words, determining their meanings, and correcting spelling errors as Ott (2007, p.28) noted. The benefits of using a computer for writing will be explored in greater detail in section 2.4.

Rosemary Sassoon has done a lot of research and development on children's struggles with handwriting. In her book *Handwriting Problems in secondary school* (2006), she sheds light on the topic of handwriting difficulties and its effects on students' motivation and self-esteem. She argues that handwriting problems are more complex when pupils reach secondary school.

Early elementary school is the first setting for assessing and developing handwriting skills. The formation of letters, their point of entrance, and the direction of the stroke are all examples of writing movements (Sassoon, 2006, p.12). When pupils first learn to write, proper letter placement is essential, and it gets more challenging for the writer to break a bad practice if a bad habit becomes automatic (Sassoon, 2006, p. 12). According to Sassoon, children should start learning a clear, straightforward, and effective handwriting script from the beginning of writing instruction (Medwell & Wray, 2008, p.36). Sassoon also covers additional areas that may influence student's writing abilities; school furniture, posture, and how a pupil handles a pen can all contribute to joint and finger discomfort as well as affect their legibility. Feder & Majnemer (2007) emphasizes the importance of how spelling may affect students' motivation and self-esteem (p.312). The topic of self-esteem and writing confidence will be discussed in section 3.5.3.

2.5 Typewriting

The global presence of computers in contemporary life is undeniable. The proliferation of personal computers since the 1970s has resulted in their integration into all spheres of human activity, including education and professional work. In this context, students employ computers for personal and academic pursuits, leading to a marked increase in computer-mediated text production and note-taking compared to traditional pen-and-paper methods (Bouriga & Olive, 2021, p. 2228). This shift toward digital technology represents a significant challenge to traditional pedagogical practices based on print-based technologies (Skaftun et al., 2018,p.44). Despite the magnitude of this transformation, its full implications remain difficult to discern, making it challenging to anticipate future developments. As such, researchers have begun to investigate how students and educators utilize computers in the classroom, identifying factors that may influence student proficiency and exploring the relationship between typing technique and typing ability (Skaftun et al., 2018, pp. 44–45). In the following section, I will examine the field of typewriting and its implication for teaching and learning.

2.5.1 Previous studies on typewriting

In 2010, Johansson, Wegelin, Johansson, and Holmqvist conducted a study examining the correlation between students typing performance and their tendency to look at the screen or the keyboard. The study found that individuals who look at the screen, or "monitor gazers," were faster and more productive than those who look at the keyboard, or "keyboard gazers" (Johannson et al., 2010, p.849). The monitor gazers were found to have better touch-typing skills, which involves typing without looking at the keys. Conversely, keyboard gazers had to spend more time searching for the correct keys, negatively impacting their words per minute (wpm) rate (Johannson et al., 2010 p.843). Apart from affecting their wpm, monitor gazers could detect spelling errors and typos as they occurred, and immediately correct them as they had their eyes on the screen. In contrast, keyboard gazers tended to write their entire text first and then revise it later (p. 849).

This research suggests that students should strive to develop touch-typing skills through various touch methods, for instance the QWERTY method. The QWERTY method can be achieved by utilizing all fingers from both hands to press appropriate keys without looking at the keyboard (Johannson et al., 2010, p.836). Typing skills are acquired through three types of associations: between words and letters, between letters and keys, and between keys and fingers (Bourgia & Olive, 2021, p.2231). Christensen (2004) argued in her research that using personal computers,

especially for older students who have previously struggled with the demanding aspects of developing their automaticity in handwriting, is better for constructing their text with the help of a typewriter (p.561).

Most modern-day keyboards use the QWERTY keyboard. The QWERTY keyboard is the standard layout used in almost all modern computing devices, including laptops, desktops, and tablets. Therefore, mastering this layout ensures that students can effectively navigate and utilize a broad range of digital devices (Christensen, 2004, p.561). According to Christensen's study in 2004, becoming skilled in coordinating orthography and motor skills for typing can enable writers to use their cognitive abilities more adaptably while using a computer. As a result, they can focus on more advanced tasks such as generating ideas, monitoring sentence structure and meaning, and being aware of pragmatic elements. (Christensen, 2004, p.552). Further studies argue for the use of ICT in the classroom (Christensen, 2005; Skaftun et al., 2018; William & Beam, 2019).

2.6 Grammatical and Common spelling-mistakes
2.6.1 Microsoft autocorrect and spelling- and grammar-checking software.

Autocorrect and spelling-aids programs have two different functions. Autocorrect is corrections made automatically without interference and often done without the user noticing it. The idea behind the autocorrect function is to assist writers in writing grammatically and correctly without interrupting the writing process. It is among many seen as a safety net for correcting sloppy and unnoticed spelling mistakes made along the way. An example of the autocorrect function is if one writes "teh" instead of "the," the autocorrect will automatically change the word for you to the indefinite article "the" without notifying the user. It uses its inbuilt context algorithm to detect and analyze where the error occurred and automatically changes it. However, the autocorrect function can never correct the word into the word that the writer is trying to write with a hundred percent accuracy. This could potentially lead to incorrect changes made to the author's text without them noticing.

2.6.2 Previous studies on spelling- and grammar-checking software.

A study was conducted by Kaushik et al. (2020). They invited fifteen participants who were all students at Oslo Metropolitan University. In their project, they wanted to see if the grammar-checking tool could improve the text readability in order to determine if the text had improved or not with the help of a grammar-checking tool. Eleven participants reported having English as their second language (L2), three participants reported having English as their third language (L3), and one participant reported having English as their fourth language (L4) (p.277). Most participants (10) had heard about Grammarly and grammar-checking tools, while five reported that they had not heard about such tools. The participants were asked to bring a recently written text document on a USB stick. These texts were used as a pre-experimental sample. The participants were then asked to use the grammar-checking tool (Grammarly) to "improve" their writing and respond to the suggestion made by the program to improve their text. They could either accept or reject the suggestions made by the software.

The number of errors found in the individual documents was reported by Grammarly, and the researchers also verified this by reviewing the screen recordings. In order to assess the ratio of errors found in the individual texts, the ratio of errors per word per text was assessed by dividing the number of errors reported by the number of words in the text (p.278). This method was employed to compare scores across writings with varying lengths. They used an online tool to calculate the Gunning FOG index. Furthermore, Kaushik et al. (2020, p.279) the software program provided the Grammarly readability scores. The texts were also manually assessed based on a scoring rubric of five criteria: style, vocabulary, grammar, mechanics, and clarity. The results showed that the participants accepted one-third of the advice provided by the grammar tool (M=31.8, SD=18.3) but rejected the remaining advice (p.280). They noted that it was worth mentioning that the rate of errors per word prior to grammar checking correlated strongly with the participants' language levels (L2, L3, and L4), confirming that less experienced learners made more mistakes than more experienced learners (p.280). No significant effect of the grammar checker could be observed for the Grammarly readability score (W =15.0,p=.93); the scores before checking (M=38.7, SD =10.7) were marginally larger than the score after checking (M=37.2, DS= 12.4). The final results showed that the grammar checker significantly improved the effects of vocabulary and language. Substantial improvements could also be observed in clarity and style, although these improvements are not statistically significant, as Kaushik et al.. (2020) mention. The results were interesting because they showed that the scores for mechanics in the post-grammar check were slightly lower than the pre-check scores. These findings suggest that the grammar-checking software is very good

at improving vocabulary, language, clarity, and style by providing rephrases and word choices but lacks the ability to improve grammatical features.

Vernon (2000) reported in his book "Computerized Grammar Checkers 2000: Capabilities, limitations and Pedagogical Possibilities" the same limitations concerning grammar as seen in Kaushik et al. (2020) studies. He compared two grammar-checking programs, Microsoft Word and WordPerfect, against The Allyn & Bacon Handbook's list of 26 sample items (single or multiple sentence constructions) containing 36 errors representing over 90% of grammar problems (Vernon, 2000, p. 340). The results from this test showed that WordPerfect correctly identified 17 errors, offered incorrect solutions for two of these, and mistakenly identified two errors. Microsoft Word correctly identified 12 errors, offered no suggestions for three, and made no mistaken identifications (p.340). Even though this exercise was a small test, Vernon argues that the findings still held some interesting general observations. Most significantly, the checkers are restricted to the sentence level (p.340). Vernon explains, based on his observations of the analysis, that "The software can not identify inconsistent verb tenses or vague pronoun references across terminal punctuation (p.340)". Patricia Bizzell (1992) argued back in 1992 that the idea of a software program being able to effectively assist students might never be fully developed due to technological limitations, and she argues that:

> "As attempts to program language using computers have shown, such structures reveal their lack of explanatory power when applied to an actual situation in which discourse conventions come into play. Programming a computer to use language comes up against a problem of infinite regress of context (Bizzell, 1992, p.96)"

Based on the findings of Kaushik et al. (2020) and Vernon (2000) it seems like Bizzell´s comment on the idea of creating software capable of accurately detecting grammatical errors still holds value almost 30 years later. Even creating software capable of assisting grammatical features is exceptionally challenging as seen in Cai et al. (2009). They wanted to create a software program that could detect subject-verbal agreement errors. In order for the program to effectively work, the sentences in question had to go through a "sentence simplification," meaning that they had to delete some adjectives, adverbs, modified nouns, and some prepositional phrases so that the sentence became more simple, in order for the software to detect them (Cai et al., 2009, p. 66). In developing their software, they had to do much manual work in each sentence, as the software could not "simplify" all the sentences without removing some crucial elements. They conclude that grammar-checking software could possibly assist students who wrote simple sentences without much need for sentence simplifications. The task

becomes increasingly worse when a sentence is written to "advanced" or too long with too many modifiers (Cai et al., 2009, p.71).

2.6.3 Spelling development

In the following segment, I will discuss spelling ability and focus on the different types of spelling mistakes commonly seen in children's text production done by hand and typewriting. Treiman & Bourassa (2000, p.3) presents research findings related to spelling development theories. They present scholars' most widely accepted approach (e.g., Ehri, 1986; Gentry, 1982; Henderson, 1985) "stages theories." Theories concerning spelling development argue that children begin using their knowledge of letter names and their knowledge of phonology to spell words (Treimann & Bourassa, 2000, p.3). The "stages theory" established the several relevant stages in which children enhance their spelling skills, such as understanding orthographic patterns and morphological linkages between words (Treimann & Bourassa, 2000, pp.3-4). The stages theories give a rough overall picture of spelling development.

Ott (2007) emphasizes that children employ different strategies when learning to spell (p.22) and "that spelling skills develop over time, mainly through practice and experience" (p.24). Scholars have investigated potential reasons for poor spelling abilities, and Ott (2007) presents some of the potential factors that may influence pupils spelling abilities as; Poor phonemic skills, including segmentation difficulties, visualization weakness, including poor orthographic knowledge of letter and letter patterns, to mention a few (p.78).

 Spelling errors detected in text material may provide a window into the underlying processes employed by spellers, and may be utilized to detect issues as well as give additional information on the present state of competence and knowledge of their students (Ott, 2007, p.77)

The Norwegian Ministry of Education and Research lists the ability to write as one of the five core elements. They introduce four categories of elements needed to become a sufficient writer, i.e., the ability to plan, monitor, design, communicate, and reflect (Ministry of Education and Research, 2017b p.22). Within these four categories, they introduce five stages of development from grade one to ten (Ministry of Education and Research, 2017b, pp. 24-27). The stages the Ministry introduced follow the principles of the stage's theory and as the children progress and develop their cognitive abilities.

2.6.4 Grammatical Categories.

The grammatical categories included in this project will be presented in this section. The grammatical errors were categorized into four distinct categories based on their prevalence in the sample material to facilitate a more in-depth understanding and analysis. Furthermore, the examination will also encompass five subcategories of spelling errors. This section aims to uncover patterns and trends in the types of errors present in handwritten and typewritten texts and to conduct an in-depth analysis of the specific errors observed in the sample texts.

2.6.4.1 Subject-verb agreement error.

Subject-verb agreement is a grammatical principle that requires the verb to be in agreement with its corresponding subject in terms of number and person. As Nelson and Greenbaum (2016, p. 147) states, this agreement applies whenever the verb displays distinctions in person and number. This rule stipulates that a singular subject must be paired with a singular verb, and a plural subject must be paired with a plural verb. For instance, in the sentence "The dog barks," the subject "dog" is singular, and the verb "barks" is also singular, resulting in a grammatically correct sentence. However, in the sentence "The dog bark," the subject "dog" is singular, but the verb "bark" is in its base form, making the sentence incorrect. With regards to verbs other than "be," the distinctions of the subject-verb agreement are typically observed only in the present tense. The third person singular takes on the -s form while the third person plural, as well as the first and second persons, take on the base form (Nelson & Greenbaum, 2016, p.147). Examples of this are:

(1) The noise distracts them.

(2) The noises distract them.

In the first sentence, the subject "noise" is singular, and the verb "distracts" is also singular. In the second sentence, the subject "noises" is plural, and the verb "distract" is also plural. Examples extracted from *An Introduction to English Grammar* (Nelson & Greenbaum, 2016, p. 147

2.6.4.2 Irregular past tense error

Regular main verbs have four forms that are constructed as follows: The base form is the one that is find in dictionary entries: *laugh, mentioned & play*. The third person singular form of the verb adds an -s ending to the base form: *laughs*, *mentions & plays*. The present participle form of the verb adds an -ing ending to the base form: *laughing, mentioning, & playing*. The past tense from of the verb is created by adding an -ed suffix (or ending) to the base form of the

verb: *laughed*, *mentioned*, *played*. Irregular verbs, on the other hand, are not at straight forwards as the regular main verbs. As the name suggests, irregular verbs do not follow regular or predictable inflectional patterns, and this the different forms must be memorized for each verb (Nelson & Greenbaum, 2016, p. 43). Irregular verbs are verbs that "follow their own rules". Since there is no formula, English speakers have no choice but to memorize each one, along with their "special" verb forms.

Regular verbs

Base form	Third person singular	Past tense	Past participle	present participle
Talk	Talks	Talked	Talked	Talking
Climb	Climbs	Climbed	Climbed	Climbing
Add	Adds	Added	Added	Adding

Irregular verbs

Base form	Third person singular	Past tense	Past participle	present participle
Brake	Breaks	Broke	Broken	Breaking
Go	Goes	Went	Gone	Going
Put	Puts	Put	Put	Putting

Table 1 Examples of regular and irregular verbs.

2.6.4.3 Pronoun agreement error

Pronouns should agree in number with their antecedents. They can be classified into several categories, such as personal, possessive, reflexive, demonstrative, reciprocal, interrogative, relative indefinite, and pronoun one (Nelson & Greenbaum, 2016, pp. 51-52). A pronoun must be singular when its antecedent is singular and plural when its antecedent is plural. It is important to ensure pronoun agreement to maintain grammatical accuracy and clarity in writing. Examples of this:

(3) James wanted to ride his bike.

(4) Hannah and James went for a walk, they wanted to get some fresh air.

(5) The participants asked if you could bring them some food.

Example (3) the pronoun "his" agrees with the noun "James," which is singular and masculine. Example (4) the pronoun "they" refers to "Hannah and James," which is plural. Therefore, the Example (5), the pronoun "them" agrees with the plural noun "participants."

2.6.4.4 Article usage error

There are three distinct types of articles, namely indefinite, definite, and zero articles. The indefinite article (a/an) is used to refer to a non-specific or unidentified object, person, or idea, whereas the definite article (the) is employed to specify or particularize the object, person, or idea under discussion. In contrast, the zero article (Ø) refers to the absence of an article altogether and is frequently used to express a general reference or to indicate the plurality of the noun (Dypedahl & Hasselgård, 2018, p. 44).

In determining whether to use a or an, it is crucial to consider the pronunciation of the following word rather than the spelling. For instance, *a* is used before a consonant sound, while *an* precedes a vowel sound. The indefinite article is generally utilized to introduce new information and is only used with countable nouns in singular form (Hasselgård & Lysvåg, 2017, p. 120). Its purpose is to restrict the reference of the noun phrase to a single member of a class. In contrast, the definite article can combine with all types of common nouns, including uncountable and plural nouns, to specify the referent based on situational or textual clues. Anaphoric reference, also known as backward reference, is used to refer back to a noun previously mentioned in the text using the definite article (Hasselgård & Lysvåg, 2017, p. p.122).

Dypedahl & Hasselgård (2018) and Hasselgård & Lysvåg (2017), provide further insights and examples of the usage and functions of articles in English and Norwegian languages. For instance, in the example borrowed from (Dypedahl & Hasselgård, 2018, p. 45), the indefinite article "a" is utilized to add new information about the object under discussion, while the definite article "the" is used to refer back to a previously mentioned noun. The example effectively demonstrates the proper use of both indefinite and definite articles in English language.

> "I bought a book last week. The book is a disaster. The author does not know what he is talking about, even though the story is completely trivial" (Dypedahl & Hasselgård, 2018, p.45)

Zero articles are commonly used with abstract uncountable nouns such as love, hate, life, death, and nature, indicating a general reference to these concepts, in contrast, Norwegian language employs the definite form of the noun to express this meaning (Dypedahl & Hasselgård, 2018, p. 47). When comparing differences in the usage of articles between Norwegian and English,

the use of indefinite articles is more widespread in English than in Norwegian, particularly in expressions such as "Buy a house" (Kjøpe hus) or "Have a key" ("Ha nøkkel"). This disparity can be attributed to the consistent requirement of indefinite articles with countable nouns in English.

2.6.4.5 Spelling error

According to Nelson and Greenbaum (2016), the difficulty of English spelling stems from the fact that the pronunciation of words is not always an accurate indicator of their spelling (p.275). This discrepancy can be attributed to two main reasons. Firstly, the English spelling system is a combination of different historical systems and loanwords from various languages, including French, Latin, and Greek (p.275). Secondly, spellings have remained unchanged over time while pronunciations have evolved, leading to a difference between the two (p.276). During the Middle Ages, people who could write might spell the same word in multiple ways, as they did not consider one spelling to be the correct one. In the following centuries, printers worked towards establishing a uniform spelling system, which was eventually standardized by major dictionaries in the 18th century. These dictionaries and printers have played a conserving role, preserving orthographic forms, even when the sounds themselves have changed. This is why we still have spellings such as "gh" in "night" and "k" in "know" that represent sounds that are no longer produced in modern English. (Nelson & Greenbaum, 2016, pp. 275-276)

This paper aims to identify, count and categorize spelling errors made by students, and by doing this, discover patterns in their mistakes. I have sorted errors into five categories: capitalization errors, homophones, letter omissions, letter addition, and misspelled words. By accurately identifying the various types of spelling errors, I am able to calculate their relative frequency by errors per 100 words. How I analyze the data material will be further discussed in Chapter 3. My goal is to present a clear and organized understanding of students' spelling errors and ultimately aid in their improvement in this aspect of writing.

2.6.4.6 Capitalization

The conventions of capitalization differ among languages. This thesis employs the capitalization rules proposed by the Oxford University Press in their style guide. In English language writing, capital letters serve multiple functions, such as indicating the beginning of a sentence, distinguishing proper nouns from common nouns, emphasizing specific words, and titling headings and works (Waddingham & Ritter, 2014, p. 94). However, given the variability of a word's syntactic function within a sentence and the writer's stylistic preferences, it is

difficult to establish universal capitalization rules that apply to all contexts (Waddingham & Ritter, 2014, p.94). Nonetheless, certain principles can be considered universal, as demonstrated in the following section:

The initial letter of the first word of a sentence or a group of words functioning as a sentence should be capitalized. Proper nouns, including the names of people, places, and organizations, should be capitalized. Titles should be capitalized when they appear before a person's name. The first letter of each significant word in a title, such as books, articles, and songs, should be capitalized. The pronoun "I" should also be capitalized (Waddingham & Ritter, 2014, pp. 94–104).

2.6.4.7 Homophones, letter omissions, and letter additions.

Homophones are words that are pronounced the same manner but have different meanings and spellings, e.g., *rose,* which is both a flower and the past tense of the verb *to rise.* Because they sound very alike, writers frequently fail to distinguish between their different spellings (Nelson & Greenbaum, 2016, p. 289). Letter omission/ letter addition is in the project seen as either adding another letter or omitting it. Letter omissions are grammatical errors that occur when a necessary letter is left out of a word, which can make the sentence difficult to understand or completely alter its meaning. For example, leaving out a letter in a verb tense can create an incomplete sentence, or changing the spelling of a word can change its meaning entirely. Letter omissions often occur when a word contains a silent letter, e.g.:

    (6) Which – wich.

Letter additions are grammatical errors that occur when an extra letter is added to a word, which can cause confusion or alter the intended meaning of a sentence. Adding a letter to a word can change the tense or the context of the sentence and make it harder to understand the writer's intended meaning. E.g.:

    (7) Knot – not "I was knot feeling well."

2.6.5 Previous research on the topic of spelling and grammar

The study of grammatical errors in English as a Foreign Language (EFL) classrooms has been a topic of interest among researchers in recent years. This research has focused on orthographic accuracy and the choice and combination of words perceived as more grammatically correct. One theory that helps to explain this phenomenon is phraseology, which refers to the tendency for certain words to be used more frequently than others (Mahan & Breivik, 2015). In her

master's thesis, Karina Rose Mahan (2013) studied the common grammatical mistakes made by secondary school students aged 15-16 and higher education students aged 19-21. The participants were asked to write a text on a computer, and the results were analyzed and categorized into five categories based on Hasselgren's (1993) categorizations. The examples presented in this segment are derived from Mahan's (2013) study findings:

Semantic error: (Misunderstanding of the word meaning/definition)

Meaning using English words that one thinks have the same meaning in Norwegian. For instance: using the Norwegian word *Land* and adding that to a sentence: "I have been to many lands" instead of "I have been to many countries".

 Collocation error: (Misunderstanding of how words are combined in a sentence)

The over usage of general verbs in English. These are verbs that one can use in Norwegian but requires different verbs in English. Example of this; "Å ta en opperasjon "is grammatically accepted in Norwegian but not in English *to take surgery* instead of *have surgery*. Jeg må ta ett valg, directly translates to; "I have to take a choice". Instead of "I have to make a choice".

 Stylistic/connotation error: (Misunderstanding of the style or the association with the chosen word)

The over usage of informal and/or general verbs. Where Norwegian students tend to use verbs like *get*, *think*, *like*, *make*. The over usage of general adjectives, especially; *nice*, *good*, *bad*, *sad*, *little* and *big* which should be avoided when writing an academic text. Words and phrases accepted in academically writing in Norwegian, but not in English: *Actually*, (faktisk/egentlig), *pretty* (Ganske) and *totally* (helt).

 Syntactical error: (Misunderstanding by mixing of the word classes (e.g Adjective/adverb)

Using an adjective instead of an adverb: "To describe very good" (adjective) instead of "well" (adverb)

Non-existing words: (Creating words that do not exist)

Non-existing words means that the writer is not able to find the equivalent Norwegian to the English word, therefore composing a mixture of both resulting in a non-existing word.

(Mahan & Brevik, 2015)

2.7 Summary of Theoretical Chapter:

This chapter provides an in-depth review of previous empirical research and relevant findings from scholars investigating the difference in grammatical and spelling errors as they occur in the two means of writing. The chapter is divided into six sections, each focusing on different aspects that are relevant towards broadening the view of the topic of how the two means of writing may influence students' grammatical and orthographical accuracy. Section 2.1 discusses language- and writing competence and how it is defined by the Ministry of Education and Research and Chomsky's (1957) definition of language competence and performance. Sections 2.2-2.2.3 provide an overview of the development of the modern-day Norwegian classroom and the technological advancements that have shaped the current landscape of digital competence for both teachers and students. Section 2.3 highlights the importance of orthographic motor skills in cognitive development and its relation to long-term and working memory capabilities. In addition, Christensen's (2005) research highlights how typing conditioning may positively affect students' grammatical and orthographic- accuracy. Sections 2.4 and 2.5 investigate the correlation between handwriting and typing proficiency and the errors found in the text, while section 2.6 discusses the capabilities and limitations of autocorrect and grammar-checking software. The latter part of the chapter presents the different grammatical and spelling errors that the thesis seeks to investigate.

3.Methodogical considerations

3.1 Introduction

The present study adopts a quantitative research design with the aim of investigating the grammatical and orthographical accuracy of student-written texts. To this end, 30 participants were recruited, and 26 handwritten and 26 typewritten texts were collected. The present chapter will provide a detailed description of the methodology employed in this study, including the methods of data collection, analysis, and ethical considerations. Specifically, the method of data analysis will be outlined, which involves the utilization of an Excel sheet for the recording and subsequent analysis of the collected data. In order to determine if there is a statistically significant difference between errors found between the two modes of writing, a Log-likelihood test was employed. In addition to this, in order to normalize the relative frequency of errors occurring, the relative frequency is displayed per 100 words. Furthermore, the writing assignment given to the participants will be presented and discussed in relation to the research objectives in section 3.6.4.

3.2 A Small Case Study

In my master's thesis, I am conducting a case study of a single unit (one 8th-grade class). Furthermore, my research is focused on exploring a specific phenomenon: the difference in grammatical and orthographic accuracy between the two modes of writing in this class. I lean on the definition provided by Gerring (2004) on what he defines as a case study which is "An intensive study of a single unit for the purpose of understanding a larger class of (similar) units" (p. 342).

There is an ongoing debate about how one could define a case study. John Gerring (2004) discusses various definitions proposed by scholars and acknowledges that each holds some value; however, researchers still have no consensus on a single definition (p.342). Gerring argues that a "case study" is a definitional mess (p.342). He further discusses that the definition proposed by various scholars is missing some crucial elements and aspects of what a case study is. He argues that one can not substitute a case study for qualitative, ethnographic, or process tracing without feeling that important parts of a case study if left out (p.342). In order to enter the debate of what a case study could be defined as, Gerring adds his definition into the pool, and he defines a case study as; "an intensive study of a single unit for the purpose of understanding a larger class of (similar) units" (p.342). In order to understand the definition proposed by Gerring, it is important to understand the concept of what a unit might be. In a case study, the focus may be directed toward individuals, several individuals, a group, or a whole

country. They are all eligible to be defined as a unit as long as it fits the scope of the researcher seeks to investigate (Postholm & Jacobsen, 2018. p.64)

This research project focuses on a single unit of analysis, which comprises individual participants in a single 8th-grade class. Gerring (2004) argues that one of the strengths of single-unit studies is that they are likely to be comparable (p.348). However, single-case studies might not provide a sufficient amount of representativeness, which again may lead to researchers making assumptions that the findings were evident in that singular unit to be true for a larger set of unstudied units (p.348). The researcher needs to acknowledge that the findings of this case study may not be representative of other cases or classes similar to the one used in this project. The findings obtained from one particular 8th-grade class may not be generalizable to other 8th-grade classes. Conducting a case study requires the researcher to make certain trade-offs between comparability and representativeness. It is, therefore, essential to acknowledge the strengths and weaknesses of the study and to assess the trades being made to determine their potential benefits or drawbacks.

This project can be considered a case study because it involves an intensive examination of a single unit (8th-grade class). This study meets the definition of a case study proposed by Gerring (2004). In addition, this project shares some key characteristics of case studies, such as a focus on a specific phenomenon, a holistic perspective that considers multiple factors, and an emphasis on context and complexity. By examining the errors made in handwritten and typewritten texts, we are exploring a specific phenomenon related to writing. By considering multiple types of errors, we are taking a holistic approach. Furthermore, by collecting data from handwritten and typewritten texts, we are considering the context in which the errors occur and accounting for potential differences in the writing process between the two modalities. The limitations of this study will be further discussed in section 3.5.

3.3 Quantitative Analysis

The method of analysis employed in this study is based on the principles of quantitative content analysis (QCA). There are different variations of QCA, in which researchers add different modifications and changes to the method. I have used the QCA method which Rourke & Anderson (2004) argues "as it was originally conceded" by systematically identifying, categorizing, and counting objective elements (p.15). In order to identify and categorize the

objective elements, a coding manual was created. It was developed based on the criteria Rourke & Anderson (2004) presented for developing a theoretically valid protocol (p.8). The coding manual is presented and discussed in section 3.3.1. Quantitative content analysis allows for a systematic and objective analysis of the texts and provides a clear and accurate picture of the objectives found to the audience (p.15). It is important to note that the material analyzed in this study is limited to "visual performance," meaning that we can only draw conclusions based on the material presented. In light of this, it is important to emphasize that the purpose of this study is focused solely on the four categories of grammatical errors and the one category focused on spelling errors with its five sub-categories that were established in section 2.6.4. As this is a small-scale case study, it is important to exercise caution when drawing general conclusions about the grammar skills of this particular 8th-grade class based on the findings of this study. The limitations and considerations of validity and reliability of the study will be further discussed in section 3.4.

According to Rourke and Anderson (2004), the validation process of Qualitative Content Analysis (QCA) comprises two distinct procedures for the development of a valid coding protocol. The first pertains to the theoretical validity of the protocol, while the second concerns its empirical validity (Rourke & Anderson, 2004, p. 5). In the following section, I will discuss the implications of being a solo coder and further discuss the importance of a well-constructed coding manual to maintain the validity of this project.

As a solo coder, there are various challenges that one may face. To address and mitigate the potential risks of bias and inaccurate reporting, specific measures have been implemented. Mackey and Gass (2015) underline the significance of recognizing that several issues might arise if a researcher codes the entire dataset. One of them is issues concerning that the coder at some point realizes that the coding system is unreliable or faulty, which again forces the coder to revise previous text(s) and materials, leading to an unnecessary amount of time and effort to revise and re-code the data set (Mackey & Gass, 2015, p.142). Accordingly, the authors advise that researchers use a subset of the data to familiarize themselves with the coding process and to test their coding scheme early on (Mackey & Gass, 2015, p. 142). In line with this training method, the present study utilized ten texts as an initial training set, which were later analyzed in the same manner as the remaining texts.

In addition to training on a subset of the data, solo coders face several potential challenges that include, but are not limited to, risks of personal bias, reduced reliability due to limited ability to maintain consistency and accuracy, and potential fatigue caused by mentally demanding

coding tasks, which may result in errors and inconsistencies (Mackey & Gass, 2015, p.193). To overcome these challenges, a thoughtfully organized coding schedule was implemented.

To increase the validity of the research in a project with only one coder, the following steps have been taken: (1) A clear coding manual has been established, outlining definitions, categories, and rules for coding the data to ensure consistency and minimize bias and errors. (2) A pilot coding process was conducted using a small sample of the data to identify and resolve any potential issues. (3) The coding process, including any decisions made and their reasoning, was documented to provide a comprehensive record. The coding categories listed in the coding manual have been limited to a number that ensures that the analysis is manageable, i.e., five main categories and five sub-categories. In cases where the researcher became uncertain in which category the errors should be placed, the error was written down and further discussed with his mentor. In order to stay consistent and accurate, a maximum of ten texts were analyzed each session to ensure the researcher was comfortable and confident when working with a large amount of data.

While conducting an analysis of the handwritten texts, the researcher encountered instances where certain words were not legible. To address these occurrences, attempts were made to contextualize the word in question in order to determine its meaning. However, when such efforts proved unsuccessful, the word was excluded from the final analysis and recorded as unreadable and unidentifiable. This decision was made to maintain the research's validity, as it was deemed unethical and inconsistent with the objective of collecting authentic material and generating accurate results to categorize unreadable words arbitrarily. However, not being able to identify specific letters and words might argue in favor of the need for more focus on practice on text production by hand.

3.3.1 Coding manual.

This manual outlines the coding procedures and guidelines for my research project focused on comparing grammatical and spelling errors in student-written texts. The project involves 26 participants who wrote two texts, one handwritten and one typewritten, which will be analyzed for similarities and differences in grammatical and spelling errors. The errors will be categorized into five main categories: Subject-verb agreement error, pronoun agreement error, article usage error, irregular past tense error and spelling error. The spelling error category will have five sub-categories: Homophones, letter omissions, letter addition, capitalization, and misspelled words.

Coding Procedures:

1. Read each text thoroughly and identify the grammatical errors established in the introduction of the coding manual.
2. Categorize each error into one of the five main categories: Subject-verb agreement error, pronoun agreement error, article error usage, and irregular past tense error.
3. Analyze each text thoroughly and identify any spelling errors.
4. When the spelling error is detected, further categorize it into one of the five sub-categories: Homophones, letter omissions, letter addition, capitalization, or misspelled words.
5. Record the error in a coding sheet, including the category and sub-category (if applicable), and the line number or page number of the error in the text.
6. Repeat the coding process for all 52 texts (26 handwritten and 26 typewritten).

Coding Guidelines:
1. Follow the definitions provided for each category and sub-category to ensure consistency in coding.
2. If there is any uncertainty about how to categorize an error, consult the coding manual or the project supervisor.
3. Make a note of any errors that cannot be categorized and the reasons why.
4. Ensure that the coding sheet is filled out accurately and thoroughly.

Coding Categories and Sub-categories:
1. Subject-verb agreement error: An error in which the subject and verb do not match in number or person.
2. Pronoun agreement error: An error in which the pronoun does not match the antecedent in number, gender, or person.
3. Article usage error: The incorrect or inappropriate use of articles (such as a, an, or the).
4. Irregular past tense error: refers to the incorrect or inappropriate use of irregular past tense forms of verbs.
5. Spelling error: An error in the spelling of a word.
- Homophones: An error in which a word is spelled correctly but is the wrong word because it sounds like another word (e.g., their vs. there).
- Letter omissions: An error in which a letter is omitted in a word (e.g., necesary vs. necessary).
- Letter addition: An error in which a letter is added in a word (e.g., gett vs. get)
- Capitalization: An error in which a word is not capitalized correctly (e.g., president vs. President).
- Misspelled words: An error in which a word is spelled incorrectly (e.g., recieve vs. receive).

Conclusion: This coding manual provides the procedures and guidelines for coding grammatical errors in student-written texts in this research project. Following the procedures and guidelines outlined in this manual will ensure consistency and accuracy in coding, leading to internally valid and reliable results.

3.4 Mechanics of Coding

The analysis of the texts involved a systematic approach whereby each text was examined individually with a specific error category in mind. For instance, subject-verb agreement errors were targeted in both the handwritten and typewritten text produced by G1 (HWG1), followed by other categories, such as misspelled words, with each category requiring a new read-through of the exact text. As the data material was solely available in hard copy, without access to a word processor, the researcher manually recorded each identified error, color-coded them, classified them into respective subcategories on paper, and subsequently transferred the data onto an Excel sheet for further analysis. A concise summary was produced for each text, and the spelling mistakes were transcribed into a separate Word document according to their respective categories.

3.4.1 Loglikelihood-test

In my study, I have used the Log-likelihood test (henceforth LLT) in order to assess if whether there is a statistically significant difference between the observed number of errors occurring in the texts produced by means of the two modes of writing. To ensure consistency with previous research, I set the probability at 5% (0.05), a widely used approach in psychology journals and among scholars, as suggested by Dancey and Reidy (2020, p.144). According to Mack and Gass (2015) "The generally accepted p-value for research in second language studies is .05 (p.308)". Dancey and Reidy´s (2020) recommendations is in line with this, as they suggest using 5% level of α as a guide to determine the acceptable probability of findings resulting from sampling error (p.144).

This is the value that I will be using for my statistical analysis of this thesis. Table 2 is based on Rayson & Garside (2000) description of calculating LLT score. Rayson & Garside (2000) explain the contents of the table in the following way: "The value "c" corresponds to the number of words in corpus one and "d" corresponds to the number of words in corpus two (N values). The values "a" and "b" are called the observed values (O) (Rayson & Garside, 2000, p.3)"

When applied to this project, "a" corresponds to the number of errors found within the different grammatical and spelling categories for the handwritten texts and "b" corresponds to the number of errors found within the different grammatical and spelling categories for the typewritten texts. "c" corresponds to the total number of words of the handwritten category, and "d" corresponds to the total number of words in the typewritten category. The frequency of errors within the different categories was put into the Log-Likelihood calculator at

https://ucrel.lancs.ac.uk/llwizard.html and compared based on corpus size. If the LLT score is less than the critical value of 3.84 the results are not statistically significant, and if the LLT score was more than 3.84 the results were statistically significant at the 0.05 level.

	Corpus 1	Corpus 2	Total
Frequency of word	a	b	a+b
Frequency of other words	c-a	d-b	c+d-a-b
Total	c	d	c+d

Table 2 contingency table for word frequencies.

3.4.2 Relative frequency.

The way that I have normalized the data is by reporting the number of errors found per 100 words of text produced by the learners. This is admittedly rather unusual: quantitative research which reports frequencies normalized by the number of words in a corpus usually do so by reporting tokes per 1000 or 1 million words of text. However, since the learner texts from which the present study draws its empirical material are extremely short, ranging from 71 to 450 words, normalizing by 100 words enables me to standardize the frequency measure and make it comparable.

3.5 Validity and Reliability Measures

This section will focus on the factors that can potentially affect the validity and reliability of the study's findings. Validity refers to the extent to which the study accurately measures what it is intended to measure, and it is a measure of the soundness and appropriateness of the research design, methodology, and conclusion drawn from the study (Mackey & Gass, 2015, pp. 158–159). There are various types of validity, such as content, face, construct, criterion-related and predictive validity (Mackey & Gass, 2015, p. 158). The variables that will be discussed in this section include sample size, time constraints, task difficulty, privacy, and anonymity, which may impact the validity and reliability of the study's findings. The section will also present and address any limitations identified as potential confounding variables.

The following section will discuss the criteria for participation in the research study. The data sample utilized in this study consisted of student-generated written material, including handwritten and typewritten texts. The primary criteria for participation were as follows: (1) Participants were required to be in 8th grade at the time of the study, (2) participants were required to possess proficiency in the use of computers/Chromebooks, as well as the ability to write by hand, (3) participants were required to have the availability to participate in two

consecutive writing lessons, and (4) participants were required to produce one handwritten and one typewritten text, in order to facilitate comparison and analysis. Of the 30 students in the class, 29 were eligible to participate in the study, ultimately resulting in a total of 26 participants, yielding a total of 52 texts. Of these texts, 26 were produced by boys, and 26 were produced by girls. During the data collection process, the study encountered several issues with some participants. One participant, identified as G15, was not present during the data collection. Another participant, J10, declined to participate due to a lack of motivation and interest in the English subject. The data from another participant, G14, was deemed unusable for analysis as they provided only ten words on the handwritten paper, thus making a comparison of the texts unfeasible. Additionally, participant J7 was excluded from the study because she only submitted a copy of the task instructions without independent writing.

3.5.1 Participants

The sample population for this study consisted of thirty 8th-grade students aged 13 to 14 who had recently completed primary education and transitioned to secondary school. The aim was to ensure that the class was representative of a typical Norwegian classroom; while challenging to define, it typically includes students from diverse backgrounds, including those with reading and writing disabilities and other diagnoses.

The students had been enrolled in the secondary school for approximately six months during the study. The school comprised students from various primary schools, leading to varying skill levels in computer usage for text construction. During the two classroom sessions, informal conversations were held during breaks where the students did not disclose personal information. However, they did indicate when they were first introduced to using computers in a classroom setting and in what grade. This informal conversation revealed that some students had been using computers for text construction since 4th grade, while others had not begun until 8th grade. This information was not collected or utilized in the final analysis as it was not part of the research objectives, and it was not possible to determine who had previous computer knowledge based on the texts collected, as candidate numbers were randomly assigned beforehand.

Nevertheless, this information could have been relevant when analyzing the text produced, as this could have been one of the factors contributing to the quality of the typewritten text. The limitations of this study will be further discussed in the following segment.

3.5.2 Time Constraints

The time constraints posed a significant challenge during the implementation of the project. Data collection took place at a mid-sized Norwegian school meeting the minimum class participation criteria. However, an additional challenge arose concerning the designated data collection window, which was limited to the first two lessons on Monday morning or the last two lessons on Friday. Both options presented obstacles, as Monday morning was susceptible to student fatigue and lack of motivation following the weekend. At the same time, Friday afternoons were prone to fatigue and preoccupation with the upcoming weekend. After careful consideration, the Monday morning window was chosen, with the possibility of revisiting the school on a Friday if necessary. As a result, the sample may be considered a convenience sample, as the time constraints did not allow for the selection of a class with a more convenient schedule.

Before my visit, I communicated via mail with the teacher of the class to gather relevant information. I was informed that a lesson was 45 minutes long and that students typically took 5-10 minutes to enter the classroom, with the teacher also using an additional 5-10 minutes to conclude the lessons. This posed the potential for losing 20 minutes in the first lesson, leaving only 25 minutes for data collection. To mitigate this, I emphasized to the teacher the importance of maximizing the available time for data collection and the project's time constraints. In response, the teacher informed the students and their parents of my visit and emphasized the importance of prompt arrival to the classroom. Additionally, I provided the teacher with an informational leaflet, which was subsequently distributed to the student's parents before my arrival. To ensure the teachers anonymity, the teachers name, email address and phone number is replaced with ⁎ (see Appendix 1).

3.5.3 Factors influencing the task construction.

In the preparation stage of this project, the researcher communicated with the class's teacher to gather information about the class's previous work experiences and obtain a brief characterization of the class without compromising their anonymity. The class had recently completed midterm exams in the subjects of Norwegian and English, marking their first midterm exam experience, which had a noticeable impact on the students. During the midterm, it became evident that many students struggled to focus, sit still, and refrain from communicating with their peers. The teacher attributed this behavior to the effects of the COVID-19 pandemic, as many of the students had engaged in extensive home-schooling since

the end of 5th grade, leading to a decline in social behavior, focus, and a general lack of knowledge in several subjects. The teacher's concern was echoed by several other 8th-grade teachers who were facing similar challenges in their classes.

Based on the feedback from the class teacher and several other teachers regarding the students' challenges, it became apparent that the task design had to cater to the participants' needs. Specifically, the task required a design that would maintain the participants' engagement with the material while reducing the time required to complete the task to prevent restlessness. Additionally, the task had to be structured in a way that did not necessitate student collaboration or communication to complete the task. To maintain participant focus and motivation, the task included visual prompts to inspire creativity and appropriate audio/sounds to introduce new and unfamiliar concepts. Furthermore, addressing the challenge of maintaining focus and stillness while allowing sufficient time for data sampling was a primary challenge. The task design aimed to avoid creating an environment that could potentially lead to restlessness, disturbance, and boredom, which could affect other participants negatively. In the following section, the task and additional information is presented.

3.5.4 The task "The abandoned house & the hospital"

The following criteria guided the task design: (1) clarity in the task instructions provided to the students, (2) presentation of the task in a manner that stimulated creative thinking, and (3) feasibility within the given time frame. A copy of the task was distributed to each participant. The task was presented to the participants through a PowerPoint presentation, during which the instructions were thoroughly explained, and any queries were addressed. The participants were informed that they would be creating one text by hand and another using a computer.

The first task was presented during the first lesson, while the second task was presented during the second lesson. The researchers made this deliberate arrangement to prevent the students from being concerned about the next task. The task assigned was a continuation of a story. The students were provided with information regarding the two primary characters, James and Hannah, and their current situation (as outlined in Appendix 2). The only information about the main characters that was presented was their age, 14, thereby allowing the participants to form their own interpretations and assign traits as they saw fit. The introduction of female and male characters aged 14 was no coincidence; they are introduced based on the similarity hypothesis. The hypothesis suggests that we tend to identify with characters and individuals similar to ourselves. That is, the readers or viewers are likely to identify more strongly with characters of

the same age, sex, and ethnicity or that are otherwise similar to them in some meaningful way (Cohen, Weimann & Tregerman, 2018, p. 508).

To initiate their creative writing process, various inspiration prompts were given to the students. Some of these prompts included descriptions of James and Hannah's attire, while others focused on the setting of where the story took place, such as the interior of the house, any scents present, and questions such as who screamed and if they managed to escape. The task was introduced as follows:

"The abandoned house & The Hospital"

1. "James and Hannah had just finished watching a movie at the cinema. On their way home, they took a shortcut through the dark forest. James was a bit scared, but Hannah convinced him to join her, so he did. When they were halfway through the woods, they saw this abandoned house. They decided to enter the house, and when they reached the second floor, they heard a scream from the first floor…. "

2. "It was a gloomy night; the date was the 28th of November. Hannah had just eaten dinner with her family; on the menu was a turkey roast, her favorite. Suddenly the phone rang, it was from the local hospital. They said that they had found James in the middle of a road. They wanted Hannah to come to the hospital to see if she could ask James what had happened to him. He would not speak with anyone else but Hannah, so she went. When she arrived at the hospital, she saw James lying there, he could barely speak, but after a while, he started talking, he told Hannah what had happened… "

Additionally, to further enhance the imaginative elements of the task, two "scary" images, and accompanying audio were introduced to the participants. Using pictures as prompts can be very useful aid in stimulating students' ideas, creativity, interest, and ability in narrative essay writing (Listyani, 2019, p. 193). The images utilized in both exercises were obtained from Pexels.com, a source of royalty-free images, while the audio was sourced from YouTube and included in the reference list. During informal conversations between the two sessions, the participants reported frequently utilizing the images. The response to the ominous sounds was mixed, with some participants enjoying the addition while others found it to be disruptive. The feedback regarding the musical component was not documented or used as a metric in subsequent analysis.

3.5.5 Research Ethics

In this research project's preliminary stages, ethical considerations were of great importance. The researcher was required to make informed decisions to ensure the protection of the information obtained from the participating children. Tangen (2010) has explored ethical dilemmas in research involving vulnerable populations such as children and adolescents. As per the National Committee for Research Ethics in Social Sciences and the Humanities (NESH), the researcher must possess adequate knowledge of the needs and capabilities of children in order to design an age-appropriate methodology and material (Tangen, 2010, p. 323). The importance of obtaining parental consent and ensuring that the children understand the nature of the research and their rights to participate or withdraw at any time was also emphasized by NESH (2016, pkt. 12).

To address these ethical considerations, an informational letter was sent to the parents and participants via email. This letter provided details about the researcher and the project and informed the participants of their right to opt out at any time. It was also clearly stated that all measures were in place to protect the anonymity of the participants. By following ethical guidelines, this research project aimed to maintain the integrity of the data collected and respect the rights of the participating children. It was also informed that the parents could contact me via telephone or via email about any inquiries or questions concerning my project. The head teacher of the class could also be contacted if they wished to do so; however, no questions came to either the researcher or the teacher of the class.

According to the Belmont Report (1979) as cited in Mackey & Gass (2015): "informed consent requires that subjects, to the degree that they are capable, be provided with the opportunity to choose what shall or shall not happen to them" (p.32). This can happen only when at least the following three conditions are fulfilled (Mackey & Gass, 2015, p. 32):

1. Suppliance of sufficient information (i.e., full disclosure about the experiment by the researcher).
2. Comprehension on the part of the participants.
3. Voluntary participation, where the participant is free from undue pressure or coercion.

Thus, consent implies voluntary agreement to participate in the study where the participant has enough information and understanding to make an informed decision (see Appendix 1).

To ensure the participants' anonymity, several ethical considerations must be made. Mackey & Gass (2015) advise researchers to clearly communicate that all information will be kept confidential and anonymous and explain the measures taken to protect anonymity. These measures include using numbers instead of names to refer to participants, avoiding revealing identifying information and discussing the location of records and who will have access to them (pp.34-35). In my study, all of these steps were taken, with the only identifier linked to the number being the participants' gender, differentiated as male (G) or female (J), e.g. G1 or J1. To minimize contact with the participants, the class teacher assigned the candidate numbers before my arrival. A third category was created for participants who did not identify as male or female, but none of the participants did so; hence, the category was not used.

One of the initial ethical concerns in my project was determining the extent to which I could disclose my research. While researchers are usually advised to be transparent with participants, there are instances in second-language research where it may be necessary to withhold information to avoid compromising the study's goals or outcomes (Mackey & Gass, 2015, p. 35) . According to Rounds (1996), "research design sometimes requires the researcher to conceal their true intent and use limited deceits to overcome the "observer's paradox" (p.53). In my case, I informed the participants and their parents through an informational letter and verbal communication that I was comparing handwritten and typewritten texts produced by the students for similarities and differences, but I did not mention my intention to look for grammatical and spelling errors as it could have affected the participants to focus grammar and spelling, thereby not making the marital authentic.

To further protect the participants' anonymity, I reached out to the Norwegian Centre for Research Ethics (NSD). The NSD is an institution that ensures data is collected in a legal and secure manner. As stated on their website, "if you only process anonymous information, you do not need to notify the project" (NSD, n.d). In my case, the only concern was whether handwriting could be considered personal information. I reached the same conclusion as Tjølsen (2021) in a similar study, i.e., that the measures taken to maintain participant anonymity were sufficient in terms of minimizing the possibility of handwriting identification. After consultation with NSD, it was determined that the project did not collect identifiable information; thus, no application was necessary.

3.6 Summary of Methodology Chapter

The present chapter has outlined the methodology used in the research project, which is primarily centered on the application of quantitative content analysis (QCA) to the collected data. A comprehensive overview of the coding manual used for data analysis was presented, along with a discussion of the challenges encountered during data collection, with a specific focus on issues of validity and reliability measures, participant selection, time constraints, and task construction factors. Moreover, ethical considerations related to the research project were also addressed. This chapter aims to provide transparency and clarity regarding all the decisions made by the researcher in the conduct of the study.

4. Analysis

This section of the master's thesis investigates the impact of handwriting versus typing on language production among 8th-grade students. Specifically, the study seeks to address research questions on performance differences between handwritten and typewritten texts in terms of grammatical and spelling accuracy and potential gender differences.

To achieve these objectives, the study utilizes a quantitative dataset of all participants and explores whether one mode of writing produces more/less types of grammatical and spelling errors than the other. The analysis of the dataset is presented in different categories, each with a description of the analysis, as well as a graph or a table displaying occurrences between the handwritten and typewritten texts. Furthermore, the study examines the types of errors made by the participants, including spelling and grammatical correctness, and focuses on the categories that displayed the most errors in the handwritten and typewritten texts. The examples are displayed in the way they appear in the data material.

In this project, a total of 52 texts were produced by the participants, half of which were produced by male participants and the other half by female participants. Each participant was given a candidate identity, with females identified as J (Jente) followed by a number 1-13 and the type of text produced, and males identified as G (gutt) followed by a number 1-13 and the type of text produced. To differentiate between the two modes of writing, handwritten text was noted as HW, and typewritten text was noted as TW. For each text produced, the candidate number and type of text were combined with the mode of writing notation to create a unique identifier, for example, (HWG2) or (TWJ12). This coding system allows for easy identification and organization of the data material in subsequent analyses.

I will in section 4.2 discuss the grammatical categories included in this thesis. Section 4.2.1 analyses the findings from the subject-verbal agreement errors category in the typewritten and handwritten texts, followed by section 4.2.2, focusing on pronoun agreement errors. Section 4.2.3 discusses the errors concerning article usage errors followed by the last category of irregular past tense errors in section 4.2.4. Section 4.3 focuses on the spelling error category with its sub-categories. Section 4.3.1 focuses on misspelled words; section 4.3.2 discusses the findings of capitalization errors, followed by sections 4.3.3 and 4.3.4 letter addition and letter omissions before ending with section 4.3.5 homophones. A summary of the findings is presented in section 4.4.

The research questions for this thesis are:

RQ(1): To what extent do handwritten and typewritten text differ in terms of grammatical accuracy?

RQ(2): To what extent do handwritten and typewritten text differ in terms of orthographical accuracy?

RQ(3): To what extent are differences in grammatical and orthographical accuracy contingent on the reported gender of the learners who produced the texts?

4.1 Quantitative content analysis

In this study, a total of 10619 words were produced by the participants, with 4516 words produced by hand and 6103 words produced by typewriting. The difference in word count between the two modes of writing is 1587 words. The average word count for handwritten text is 173.7 words with a standard deviation of 53.18, while the average word count for typewritten text is 235.7 words with a standard deviation of 90.36, resulting in a 35.7% increase in word count for typewritten text. The males produced 2035 words for the handwritten assignment with a standard deviation of 37.05, and 2944 words for the typewritten assignment with a standard deviation of 91.14, while the females produced 2481 words for the handwritten assignment with a standard deviation of 63.26 and 3169 words for the typewritten assignment with the standard deviation of 60.78. The word count is displayed in Figure 4.1 (males word count) and 4.2 (female word count).
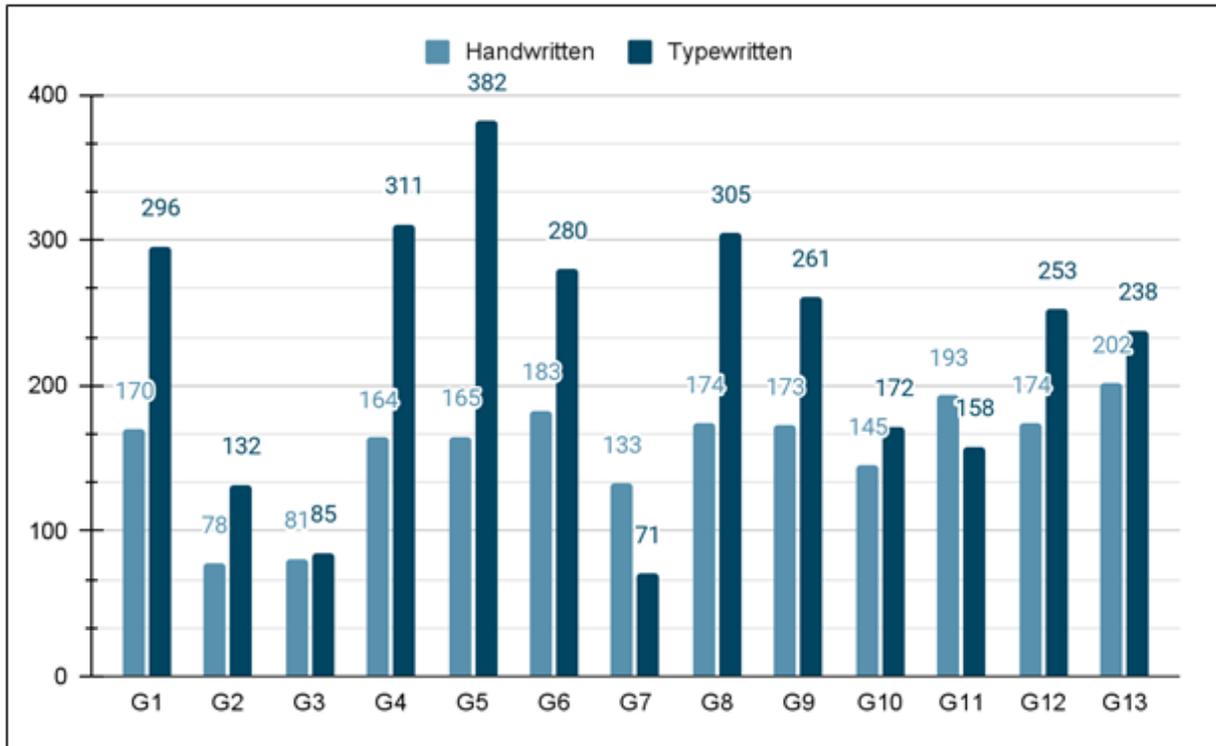
Figure 4.1 Total word count males, handwritten and typewritten.
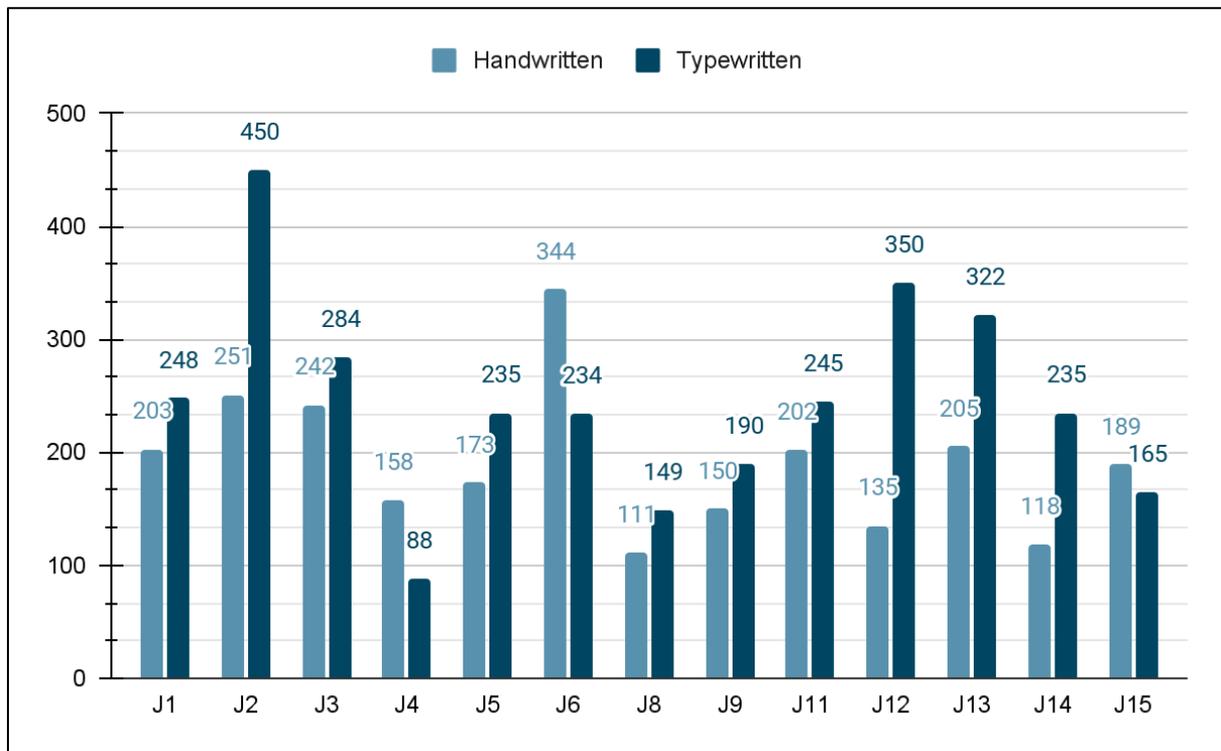
Figure 4.2 Total wordcount females, handwritten and typewritten.

The errors belonging to the five main categories were analyzed and categorized: subject-verbal agreement errors, pronoun agreement errors, article usage errors, irregular past tense errors, and spelling errors. The spelling error category is further divided into five sub-categories in order to identify what type of spelling error that has been made; they are: misspelled words, capitalization, letter addition, letter omission, and homophones. Of the 10619 words counted, a total of 699 errors were counted across all texts. Based on the findings presented in Table 4.3, it is evident that spelling errors are the predominant type of errors identified in this study, with misspelled words being the most common type of spelling error observed, as highlighted in table 2. The subsequent section of this study will provide a more detailed analysis of the distinctions between handwritten and typewritten texts. Specifically, a comparison will be made of the outcomes obtained from the handwritten and typewritten data sets, and their respective frequency will be discussed.

Total errors detected	Handwritten		Typewritten	
Grammatical errors: 284	(M) 102	(F) 74	(M) 54	(F) 54
Spelling errors: 415	(M) 155	(F) 147	(M) 44	(F) 69

Table 3 counts of grammatical and spelling errors in the handwritten and typewritten text (m) males, (f) females.

4.2 Grammatical Errors

Figure 4.3 is a visual representation of the errors found within the handwritten and typewritten texts. The lighter shade of blue represents the handwritten texts, and the darker shade of blue indicates the typewritten texts. The y-axis symbolizes the number of errors, and the x-axis symbolizes the category in which the errors were detected in.
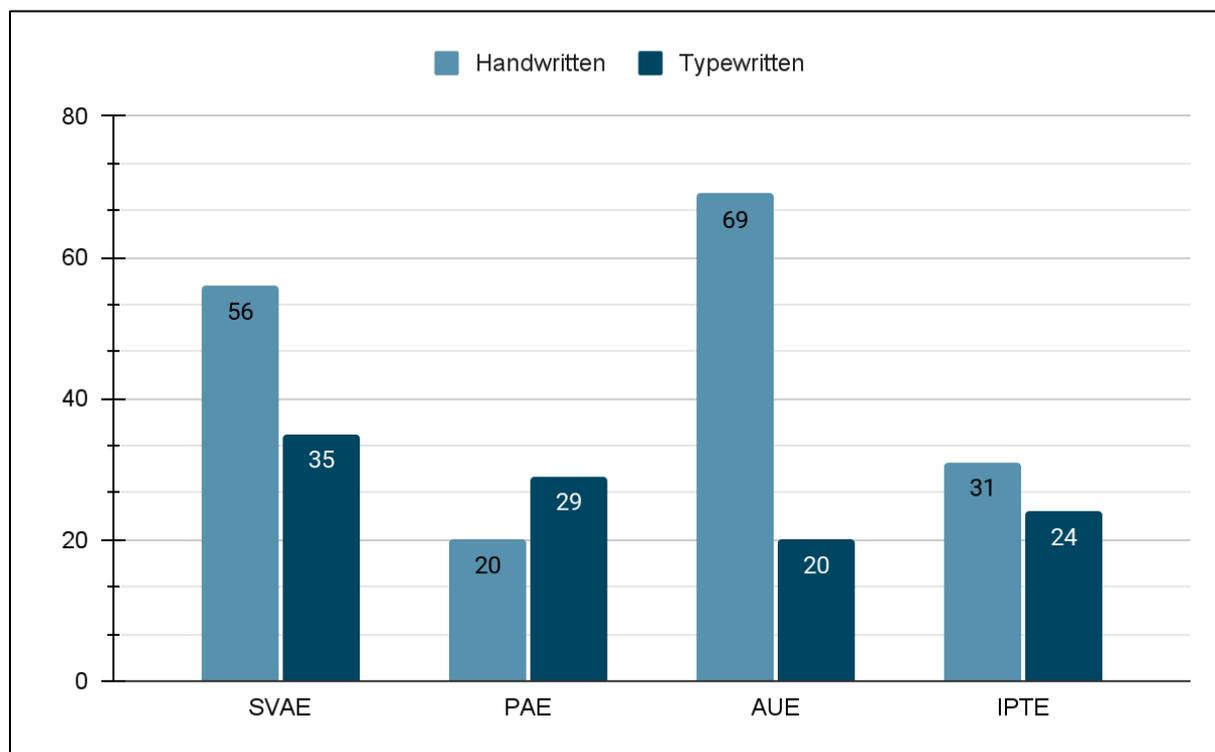
Figure 4.3 Grammatical errors in handwritten and typewritten texts

Figure 4.3 demonstrates the number of errors found in each grammatical category included in this thesis. In this graph, I have used abbreviations in each category, and these abbreviations will be used throughout the analysis. I found that there were 56 errors of subject-verb agreement errors (SVAE) in the handwritten texts and 35 in the typewritten texts. Pronoun agreement errors (PAE) were the only category in which the errors found in the typewritten material exceeded those found in the handwritten material. Article usage error (AUE) displayed a significant difference in errors found between the two modes of writing, with 69 errors in the handwritten material and 20 in the typewritten material. Irregular past tense errors (IPTE) displayed 31 errors in the handwritten material and 24 errors in the typewritten text.

4.2.1 Subject-verbal agreement errors

I seek to investigate how prevalent subject-verbal agreement errors are in the two modes of writing. In order to answer this question, we examined the occurrence of subject-verb agreement errors (SVEA) in the 52 collected texts. My findings demonstrate that subject-verb agreement errors accounted for 12.77% of all grammatical errors detected, with a total of 56 errors observed in the handwritten texts and 35 in the typewritten texts. Interestingly, while the handwritten texts exhibited a higher frequency of subject-verb agreement errors overall, the majority of participants did not struggle with this aspect of grammar, with only a few individuals contributing disproportionately to the overall error count. Figure 4.4
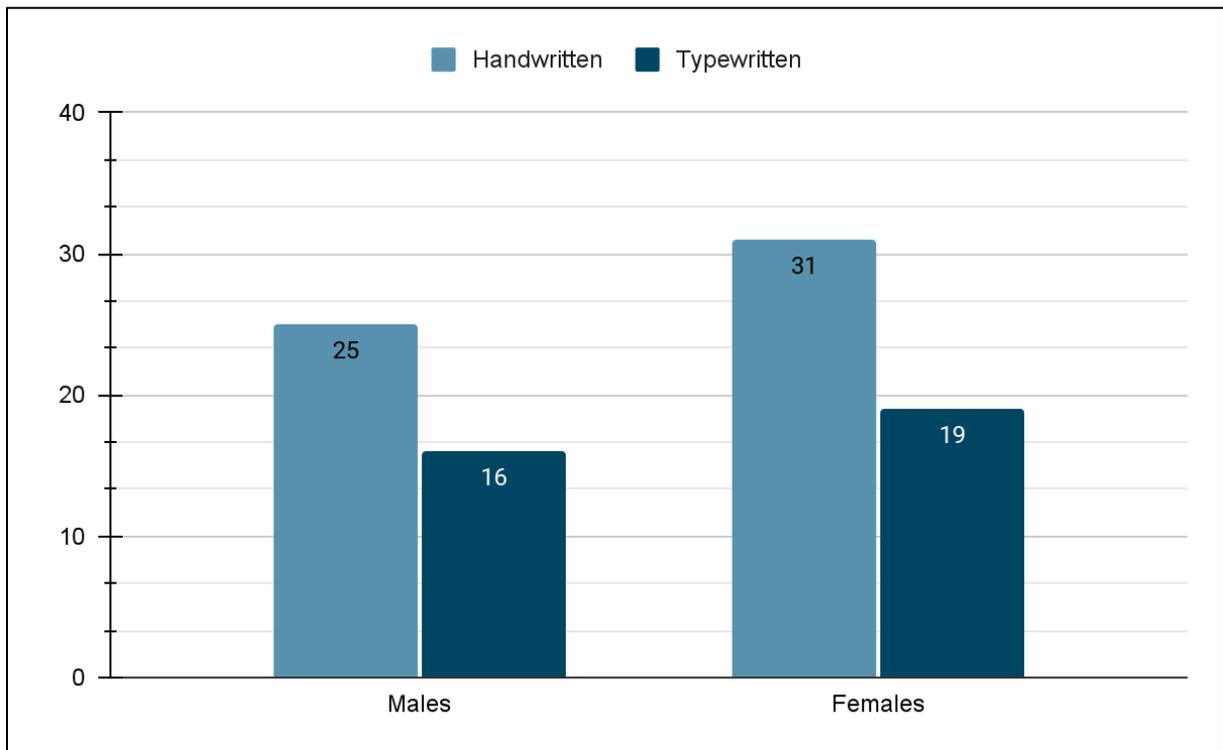
Figure 4.4 Subject-verbal agreement errors, handwritten and typewritten.

When comparing the different modes in terms of relative frequency, we see that subject-verbal agreement errors occurred at a rate of 1.24 per 100 words in the handwritten texts, and 0.57 per 100 words in the typewritten texts. The Log-Likelihood test (LLT) resulted in a statistically significant difference of 13.27 (p<0.05) between the handwritten and typewritten text in terms of subject-verbal agreement errors, with the handwritten texts exhibiting a higher frequency of errors compared to the typewritten text. When looking at gender differences, it was found that the females produced a total of 5640 words between the two texts, with 2481 words in the handwritten text and 3159 words in the typewritten text, with 31 and 19 errors detected in their respective modes of writing. Males produced a lower total word count in both modes of writing,

with 2035 in the handwritten texts and 2944 words in the typewritten texts. 25 errors were detected in the handwritten text, and 16 errors in the typewritten text. As the females produced more text, the likelihood of them also producing more errors is increased. When comparing the differences of subject-verbal agreement errors between the two genders in the handwritten text, we see that the males produced a rate of 1.22 errors per 100 words, and the females had a rate of 1.24 per 100 words. This indicates the relative frequency between the two genders is not as significant as the difference between the modes of writing.

In further investigation of the data material, we see that one participant, in particular, was responsible for 8 errors in the handwritten text and 8 errors in the typewritten text. Her contribution drastically increased the number of errors detected in the female category, and she was therefore seen as an outliner in the data analysis. The results from the analysis are displayed in Figure 4.5.

Figure 4.5 Box and whiskers plot showing distribution of subject-verbal agreement errors in the handwritten texts.

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The box plot is a graphical representation of the distribution of errors in a sample, wherein the box represents the interquartile range (IQR), and the whiskers extend from the box to the minimum and maximum values within a certain range, typically 1.5 times the IQR. The length of the whiskers provides information about the spread of the data and the presence of outliers. Shorter whiskers, located close to the box, suggest a narrow spread of data with no significant

outliers. Longer whiskers, extending further from the box, indicate a wider spread of data with potential outliers. The blue box denotes the error counts for male participants, while the orange box represents the error counts for female participants. The whisker of the blue box is relatively short, suggesting a limited spread of data with no significant outliers. In contrast, the whisker of the orange box is longer, indicating a wider spread of data, with the highest and lowest error counts being 8 and 0, respectively. Due to this skewed data distribution, it would not be appropriate to compute the mean and standard deviation for the female category.
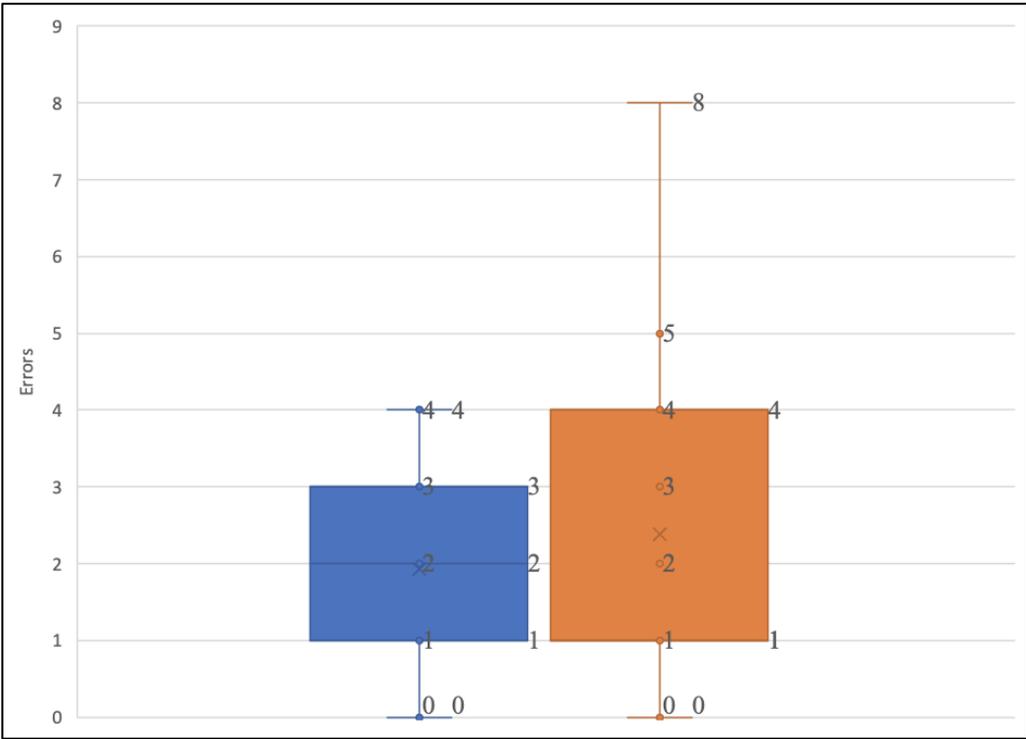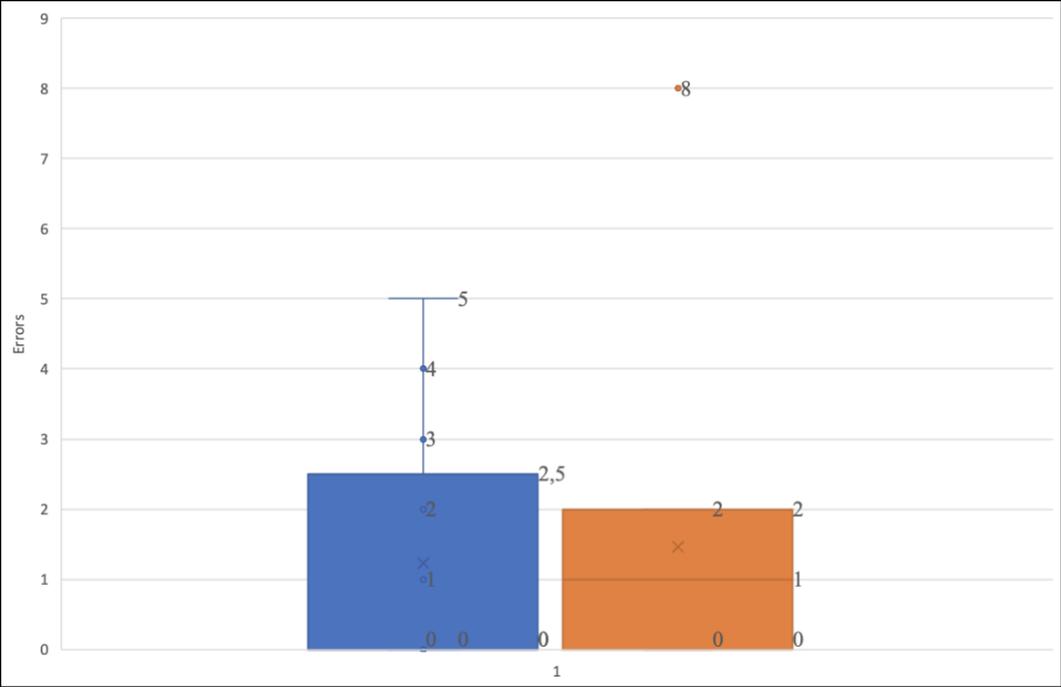

Figure 4.6 Box and whiskers plot showing distribution of subject-verbal agreement errors in the typewritten texts.

The typewritten texts displayed a significant decrease in errors for both genders. Out of the 16 errors detected in the typewritten texts, only six male participants displayed counts of subject-verbal agreement errors, meaning that five of the participants who had previously displayed SVAE in the handwritten text did not do so in the typewritten text. For the females, the number of participants who had subject-verbal agreement errors in the handwritten text was reduced from 11 to 9, with the largest contribution stemming from participant J6. The results from the analysis show that there is a significant difference between the handwritten and typewritten text in terms of grammatical errors concerning subject-verbal agreement errors. The Log-Likelihood showed a LLT score of 13.27 which is a significant result and a clear indication that there is a difference between the handwritten and typewritten text produced by the participants. In the following segment, we will be taking a closer look at the typical errors made by the participants.

A significant proportion (30.77%, 28 out of 91) of the detected errors pertained to the incorrect usage of the singular verb *was* and plural *were*. This error mostly occurred when the participant was referring to "James and Hannah" followed by the singular verb *was* as seen in example (2):

(8)"There **were** blood everywhere. (HWG1)"

(9)" Hannah and James **was** feeling normal again and **there** they are never going to the abandoned house again (TWJ12)

(10)" All of the courtin(s) **was** moving" (HWJ12)

Example (8), the noun *blood* is uncountable, and as such, requires a singular verb form, which is *was*, rather than the plural verb *were*. In (9) we see that the participant is referring to two individuals, Hannah and James and uses the singular verb *was*. *Was* it used as a singular verb referring to a single person, but since the text referred to two individuals, the plural verb *were* should be employed instead, as it agrees with the plural subject. Furthermore, we see that the participant wrote "…and there never going to the abandoned house again". In the last part of the sentence *there* should be switched out with either *they´re* or *they are* in order to agree with the plural subject Hannah and James. In (10) we see that *all* functions as a determiner that modifies the noun *curtain* and indicates that all of the curtains were moving. The participants forgot to modify the noun from singular *curtain* to plural *curtains*, and since the subject is plural the verb should be replaced with *were* in order to agree with the plural noun *curtains*.

4.2.2 Pronoun agreement error

The following category in which this study focused on was pronoun agreement errors. Interestingly this category was the only category in which the errors occurred more frequently in the typewritten texts compared to the handwritten text, as seen in figure 4.7. The males had 11 counts of pronoun agreement errors in the handwritten text, and 10 in the typewritten text. While the females had 9 counts of pronoun agreement errors in the handwritten text, and 19 in the typewritten text.
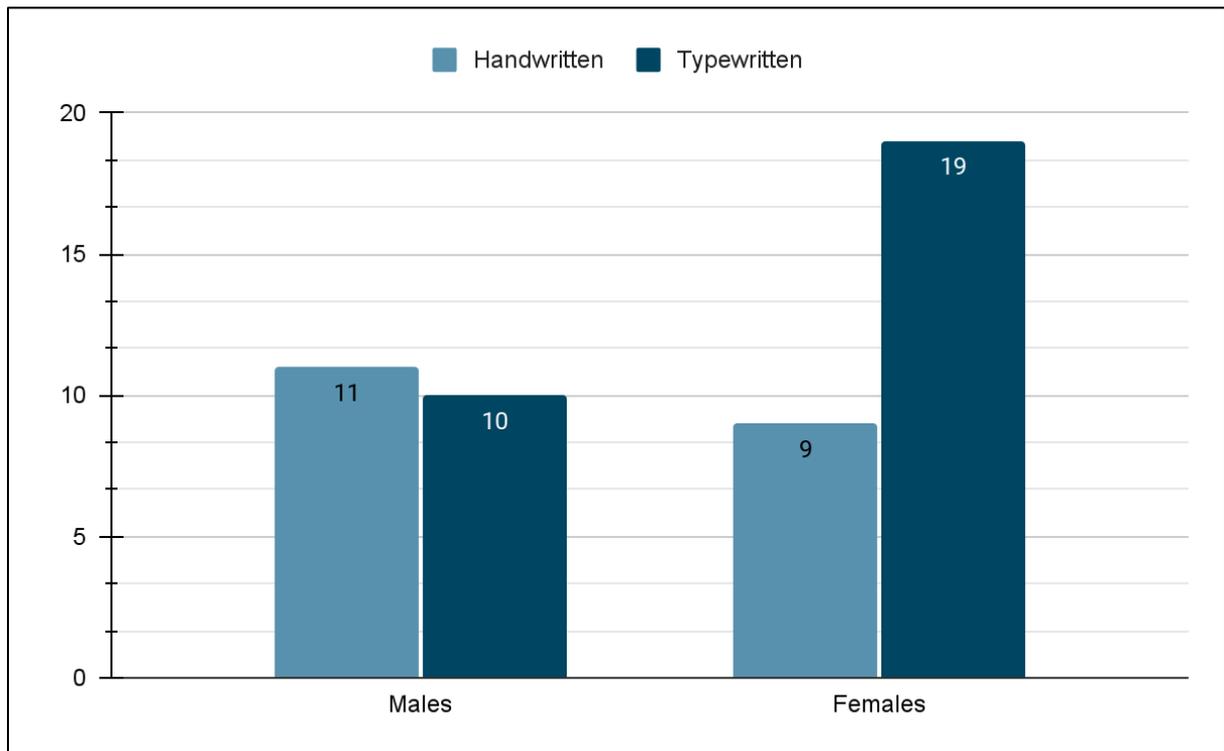
Figure 4.7 Pronoun agreement errors found in the handwritten and typewritten texts.

It was found that the number of errors in typewritten texts exceeded those in handwritten the category of pronoun agreement errors. However, the overall number of errors was relatively low, with only 49 errors identified in this category, making the number of mean in pronoun agreement error 1.15 per text with the standard deviation of 1.24. 29 errors counted in the typewritten text, and 20 in the handwritten text, making the difference of 9 more errors in the first typewritten text. The pronoun agreement errors in the handwritten text occurred at a rate of 0.44 per 100 words, and 0.47 per 100 words in the typewritten text. When conducting the Log-Likelihood test, the score was 0.14, this indicates that there is no significant difference between the two modes of writing. Out of the 52 texts that were produced, 26 of them contained errors related to pronoun agreement. When further analyzing the individual errors made, the

largest count of pronoun agreement errors in a text was from HWJ6 with four counts of this error. In the following segment, we will take a closer look at how the errors occurred.

Pronoun agreement errors arise when the pronoun used in a sentence fails to agree in number, gender, or person with its antecedent. Participants in the study displayed a tendency to write around the use of pronouns as exhibited in J14 text:

(11)"The both of them saw a girl with black hair (HWJ14)"

(12)"The both of them **was** scared" (HWJ14)

(13) "The two of them had some drinks" (TWJ15)

(14) "2 secons later both ran down the stairs (HWJ1)

The examples provided were not considered errors and were not recorded as such, but they display the use of alternatives to using pronouns. In example (11), the participant used "the both of them" instead of using the person plural pronoun "they". (12) displays yet another usage of "the both of them" and one count of subject-verbal agreement error. (12) was counted as a subject-verbal agreement error but not a case of pronoun agreement error. The use of "both of them" is seen in the texts. (13) also display an alternative way of referring to "they" with the use of "the two of them".

Out of all pronoun agreement errors identified, 50% of the errors pertained to the misuse of personal pronouns. Specifically, some of the participants referred to the character "James" in the text and then used the pronoun "she" instead of "he" in subsequent references, despite their interchangeable usage throughout the text. Notably, some participants who committed this error in earlier sections of the text used the pronouns correctly in later sections, suggesting the possibility that the initial error may have been a typographical mistake.

(15)"She didn't believe him because he never drank and because there were no stairs in the area where he was found so she asked him and he told **him** the truth (TWG8)"

(16) "Hannah was *lauthing,* **he** heard someone scream" (HWG5)

(17) "Hannah say that is wird that **she** alsow hear something" (HWG6)

Example (15), (16) & (17) all display counts of pronoun agreement errors. The errors occur when the writer uses the incorrect personal pronoun, *he* or *she,* to refer to the either James or Hannah. These three examples display the similar mistakes recorded in the data material.

In conclusion, the analysis of the participants' handwritten and typewritten texts revealed that there were not many pronoun agreement errors found, and in relation to RQ (1) it seems like this category do not show differences in mode of writing. The low count of errors in this category suggests that the participants have a good understanding of how to correctly use pronoun agreements. However, it is important to note that other types of pronoun errors were found in the texts (e.g., Pronoun reference error). As these errors were not listed as a category for this thesis, they were not recorded and displayed. It is recommended that future studies explore a wider range of pronoun errors to gain a more comprehensive understanding of how pronouns are used in written language. Overall, the results of this study suggest that the participants have a strong grasp of pronoun agreement, which is a key aspect of effective written communication

4.2.3 Article usage error

Figure 4.8 displays the counts of errors found in the two modes of writing. The two shades of blue indicate in what mode of writing the errors appeared in. The graph demonstrates that the males had 46 counts of article usage errors in their handwritten texts, and 10 in the typewritten texts. The females had 23 counts of article usage errors in the handwritten texts, and 10 in the typewritten texts.
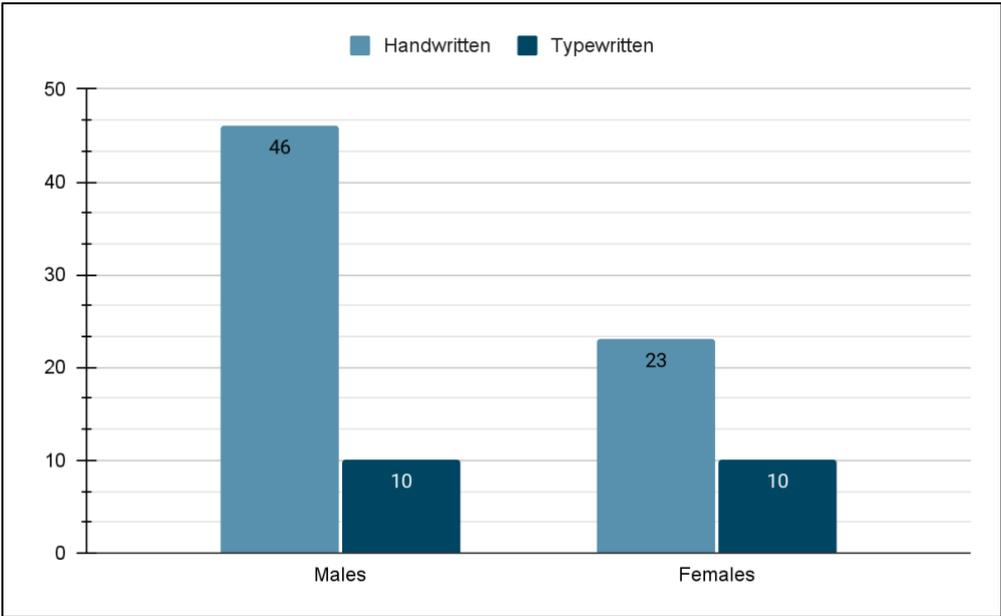

Figure 4.8 Article usage error in the handwritten and typewritten text.

Based on the findings of the analysis, it is evident that a substantial proportion of the grammatical errors (89 out of the total 284) identified in the project pertained to the usage of articles. Figure 4.8 presents the distribution of such errors, indicating that the majority (69) of them originated from the handwritten text. Article usage errors occurred at a rate of 1.52 per 100 words in the handwritten texts and 0.32 per 100 words in the typewritten texts. The Log-Likelihood test (LLT) resulted in a statistically significant difference of 45.31 ($p < 0.05$) between handwritten and typewritten text in terms of article usage errors, with the handwritten texts exhibiting a higher frequency of errors compared to the typewritten texts. It is noteworthy that 22 out of 26 participants who produced handwritten text exhibited at least one article usage error, with the frequency of such errors ranging from 1 to 7 per individual. In contrast, the typewritten text featured a considerably lower number of article usage errors (20 in total), with a mean of 0.76 errors per participant and a standard deviation of 0.89. Of the 26 participants, 13 committed at least one article usage error, with the frequency of errors ranging from 1 to 3 per participant.

In terms of gender differences, the analysis revealed that males had 46 article usage errors in the handwritten texts. Of the 13 male participants, 12 exhibited at least one such error, making the errors of article usage error occurring at a rate of 2.26 per 100 words, and a standard deviation of 1.78. Among the female participants, a total of 20 article usage errors were detected in the handwritten text, with 10 out of 13 individuals committing at least one error, making the errors of article usage error occurring at a rate of 0.86 per 100 words, and a standard deviation of 1.42. Both genders exhibited a lower frequency of errors in the typewritten text, with a similar count of 10 errors per gender. Notably, 8 out of 13 male participants committed at least one article usage error in the typewritten text, while the corresponding figure for female participants was 5 out of 13. These findings suggest that while males committed more individual errors, the number of females who made errors tended to commit a larger number of them.

The article usage was divided into incorrect usage of indefinite articles (a, an) and definite articles (the) or the omission of article in a noun phrase. As Dypedahl & Hasselgård (2018) argued in *Introducing English Grammar:* The indefinite article is usually used in noun phrases that represent new information and the definite article is used when the reader/listener can identify what the head noun refers to (p.44). The correct usage of the indefinite and definite article is displayed in participant J11 texts:

(18) "**A** sweet old lady found him (TWJ11)"

(19) But there were no witnesses, so how do we know for sure **the** old lady just found him? (TWJ11)

Example (18) demonstrates the appropriate use of the indefinite article *a* in introducing a new character into the story. The noun phrase "a sweet old lady" introduces new information and provides the reader with an initial understanding of the character. This use of the indefinite article is common in situations where a speaker or writer is introducing a person, object, or idea that is not previously known to the reader or listener.

In example (19), the speaker switches to using the definite article *the* to refer back to a specific person mentioned earlier in the text, the "old lady." The use of the definite article is appropriate here since the reader can identify the head noun as referring to the previously mentioned character. This switch in article use highlights how the choice between indefinite and definite articles can change depending on whether the noun phrase introduces new information or refers back to something previously mentioned.

The majority of the errors detected in this analysis concerned the incorrect usage of the indefinite *a*, *an,* and the definite *the* articles when either presenting new information or referring to previous information that is known to the reader. Findings from the data material display few counts of missing articles and some examples of under-usage. The following examples is displayed as they occurred in the material and errors are displayed with a bolder text to indicate where the incorrect use of articles is present. In cases where the article is missing, it will be visualized by the zero article (Ø). All examples will be further discussed after presented, and referred to as the number they were displayed in:

(20) "I was walking down the road, and suddenly **the** car drived right towards me"

(21) "When I was driving past **the** big forest (TWG2)"

(22) "It was behind **the** closet (HWG11)"

(23)"[…] next she saw **a** wooden car in front of her face right before she passed out (TWG12)"

These four examples display issues concerning the incorrect usage of the definite article *the*. In example (20) the noun *car* has not been mentioned before in the conversation or in the immediate context, therefore the use of the definite article is not appropriate. In example (21) the *big forest* is unknown to the reader, the forest has not been mentioned in either the task instructions or previously mentioned in the text, the indefinite article *a* is therefore correct article to use and this is the same case displayed in example (22), which *closet* that is being referred to is unknown to the reader. In example (23), the use of the indefinite article "a" is incorrect, as the car has been previously mentioned. In such a case, the definite article "the" should be used instead, as the reader is already aware of which car is being referred to. This would result in a more accurate and clearer sentence, allowing the reader to understand the context without confusion. As the participant used a considerable time to express the importance of the "wooden car" it became quite evident that in example (23) the participant was referring to the car that was previously mentioned in the text.

The follow examples display instances of where either the definite or indefinite article is missing:

(24) "James and Hannah run from (Ø) hus to (Ø) forest (HWG3)"
(25) "After hearing the scream from (Ø) first floor (HWG9)"
(26) "It smelled like (Ø) flower (HWG13)"

The following examples display the under-usage of articles/ the omission of articles. In example (24) we see that the participant is missing the definite article "the" in front of the noun "hus", and in front of the noun "forest". In Norwegian, the definite article is not a separate word like in many other languages, the definite article is combined with the noun to create a single word, as seen in example (24) in Norwegian "Huset" means "the house" and "skogen" means "the forest". Example (25) displays the similar omission of the definite article "the" when referring to "the first floor". In example (25) it is important to note the use of the definite article 'the' before the floor number. By including 'the' before 'first floor,' the sentence specifies which particular floor the scream came from, avoiding ambiguity and ensuring clarity. Example (26) is different in comparison to the two other examples, as the previous examples may be excused or explained due to the linguistic differences between the Norwegian and English language.

The analysis of article usage error(s) revealed that a considerable proportion of the participants demonstrated a significant understanding of both definite and indefinite articles usage. It is important to note that the participants who displayed counts of errors in this category had small counts of errors within their text, meaning that when articles were needed, they tended to use them correctly. Further elaboration of this category will be discussed in chapter 5.

4.2.4 Irregular past tense error

Figure 4.9 displays the number of irregular past tense errors found in the handwritten and typewritten text; the figure further displays how the errors were separated between the two genders. The figure demonstrates that the males had a total of 20 errors in their handwritten texts and 18 in their typewritten texts, while the females had 11 errors in their handwritten text, and 6 in their typewritten texts.
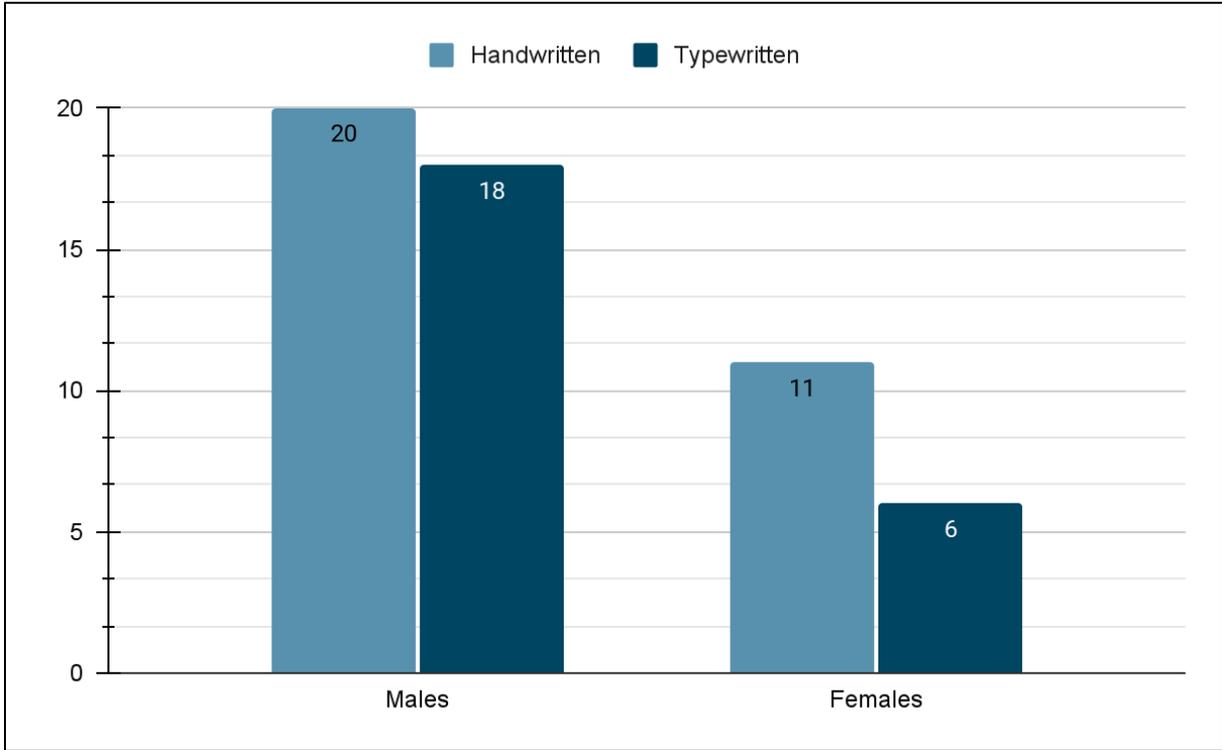
Figure 4.9 Irregular past tense error in handwritten and typewritten texts.

Based on the finding of this analysis, a total of 55 errors concerning irregular past tense errors were detected. Specifically, 31 such errors were found in the handwritten text, making the error occurring at a rate of 0.68 per 100 words, while 24 errors occurred in the typewritten texts at a rate of 0.39 per 100 words. The Log-Likelihood test (LLT) resulted in a significant difference of 4.24 ($p < 0.05$) between the handwritten and typewritten text in terms of irregular past tense errors, with the handwritten texts exhibiting a higher frequency of errors compared to the

typewritten texts. Furthermore, analysis of the texts revealed that 32 of the 52 texts were error-free with respect to irregular past tense usage, leaving 20 texts to account for the 55 errors observed. Notably, two participants displayed difficulty with this grammatical feature. Specifically, G3 made 9 errors in the typewritten text and 4 in the handwritten text, while J6 had 7 errors in the handwritten text and none in the typewritten text. The significant decrease in number of errors between the two modes of writing in J6 text would argue in favor of the typewritten text being able to assist with the grammatical feature in relation to RQ1.

The examples are retrieved from the participants who displayed errors concerning adding the -*ed*/ -*d* ending to the base form of the verb in order to make past tense:

(28) "Hannah **rund** fast" (HWG3)

(29) "he **speaked** to his friend" (TWJ1)

(30) "James **comed** to Hannah but he was still behained her".

Participant G3 had the most counts of the irregular past tense errors with 9 counts in the handwritten text and 4 counts in the typewritten text. We see in example (28) that the participant adds the letter -*d* to the end of the irregular verb *run* instead of *ran*. This participant struggle with irregular verbs because they do not follow the usual pattern of adding -*ed* to the base form of the verb to form the past tense and past participle. Instead, irregular verbs have their own unique forms that must be memorized. We see a similar error in example (29) where the participant wrote *speaked* instead of the *spoke*. (30) is yet another example where the participant adds the -*ed* to the base from of the verb to form a past tense, but since *come* is an irregular verb this becomes incorrect, as the past tense of the verb *come* is *came*. Errors detected in the analysis also displayed errors that did not concern adding the -*ed* ending to the verb form in order to make it correct in the past tense:

(31) "He **drink** alcohol" (HWG12)

(32) "He **come** from the house" (TWG1).

(33) "anymore I **trowed** the rock on the floor (TWJ12"

Irregular verbs take a different from in contrary to regular verbs who take -*d* in past tense and -*ed* in past participle. Therefore example (31) displays the incorrect form of the past tense of drink. As drink is an irregular verb, it should take the past tense form *drank*. (32) Most of the

participants displayed knowledge of the irregular verb come and wrote *came*. Participant G1 did not display the same knowledge and wrote *come* instead of the past tense *came* in his texts, making him one of the contributors to this category. Example (33) is yet another example that displays the importance of memorizing the different irregular verbs, as there is no standard rule for irregular verbs. *trowed* is incorrect and should be replaced by the correct from *threw*.

4.3 Spelling errors

In this chapter we are going to focus on spelling errors, and seek to analyze the data I order to potentially answer the research question: **RQ2:** *To what extent do handwritten and typewritten text differ in terms of orthographical accuracy?*

As previously stated in section 3.4 the spelling category was divided up into five-subcategories, misspelled words, capitalization errors, letter additions, letter omissions and homophones. Each specific spelling error was classified using the coding manual provided in section 3.3.1. In the follow section, the errors found will be displayed in their respective categories. The LL test was used in order to determine if there is a statistically significance between the number of errors found between the two modes of writing. In addition to this, I used relative frequency to compare the occurrences of errors per 100 words between handwritten and typewritten texts.

4.3.1 Misspelled words

Figure 4.10 displays the number of errors in the y-axis and the gender in the x-axis. The figure visualizes how the errors occurred between the handwritten and typewritten text. For the males, 106 errors were detected in the handwritten text, and 24 errors in the typewritten text. The females had 88 errors in their handwritten texts and 25 in their typewritten text.
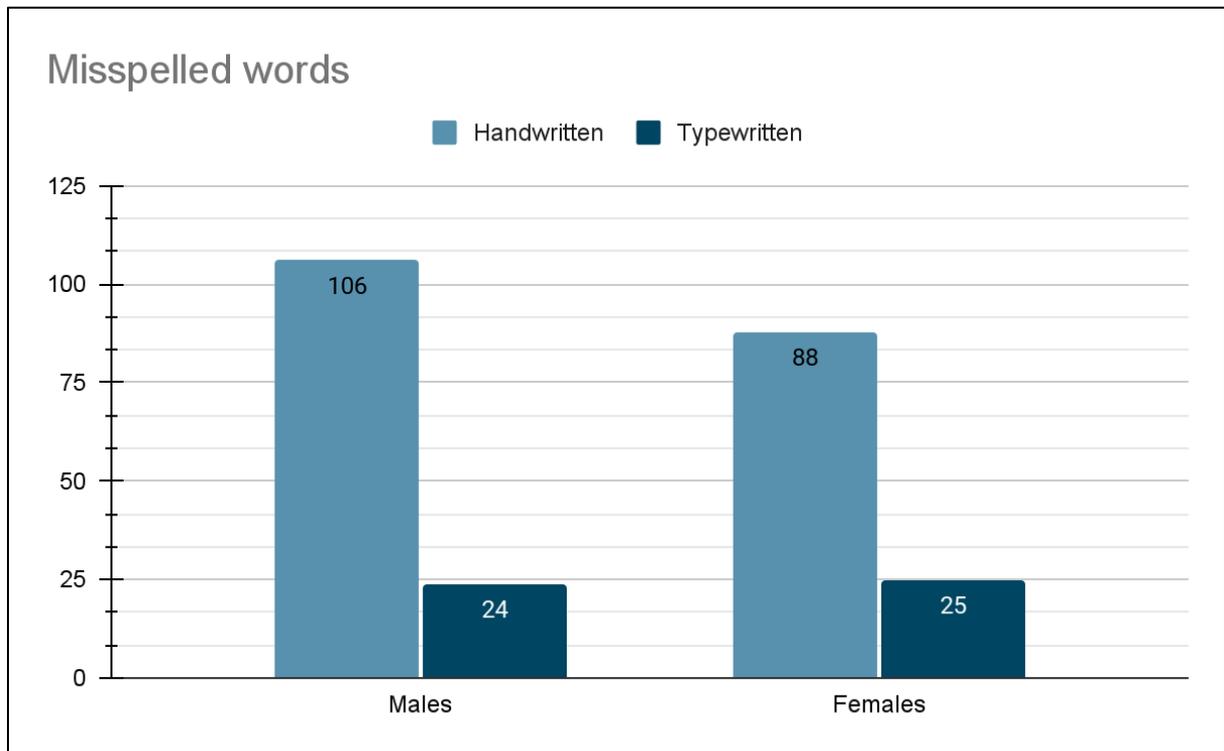
Figure 4.10 Misspelled words in the handwritten and typewritten text displaying gender differences and type of mode.

Out of the 416 words within the spelling category, misspelled words comprised a significant proportion of 58.41% (243). Notably, this category exhibited the most pronounced difference between handwritten and typewritten texts. The handwritten texts had a significantly higher proportion of misspelled words compared to the typewritten texts. Specifically, the average number of mistakes per handwritten text was 7.46 (194) with the number of errors occurring at a rate of 4.29 per 100 words, in contrast, typewritten texts had an average of only 1.88 (49) errors, with the errors occurring at a rate of 0.80 per 100 words. Moreover, when considering gender differences, males demonstrated an average of 8.15 (106) errors in handwritten text with the errors occurring at a rate of 5.20 per 100 words, compared to the average number of 1.84 (24) errors in typewritten text with the errors occurring at a rate of 0.81 per 100 words.

The females exhibited an average of 6.76 (88) misspelled words in handwritten text with the errors occurring at a rate of 3.54 per 100 words. The reduction of errors occurring in the male

category was also seen in the female category, as they had an average of 1.92 (25) misspelled words in the typewritten text, with error occurring at a rate of 0.76 per 100 words.   The Log-Likelihood test (LLT) resulted in a statistically significant difference of 141.71 (p < 0.05) between handwritten and typewritten texts in terms of misspelled words, with the handwritten texts exhibiting a higher frequency of error compared to the typewritten texts. These results illustrate a noticeable divergence in error rates between handwritten and typewritten text, regardless of gender.   Out of the 88 misspelled words in the handwritten text, two participants, J5 and J6, were found to be responsible for a major portion of these errors, with 34 and 30 misspelled words respectively. As such, these participants introduced considerable anomalies into the statistical analysis. Conversely, the remaining eleven female participants produced a combined total of 24 errors.

In the typewritten text J5 and J6 demonstrated distinctly lower rates of errors in the typewritten text, with J6 exhibiting a considerable decrease in misspelling frequency (from 30 in the handwritten text to 4 in the typewritten text). Among the thirteen female participants, seven produced texts with no misspellings detected, while the remaining six were responsible for the 25 errors observed. As indicated earlier, the misspelled words category comprises by errors that did not fit into the other categories and also included words concerning word choice errors. The word choice errors were determine based on the context they appeared in as we see in example (37) and (39). This study aims to examine spelling errors in handwritten and typewritten texts of both genders. The errors will be presented and briefly commented on. Errors found in this category will be further discussed in relation to relevant theory in chapter 5.

Examples found in the handwritten female sample:

    (34) "The smell was starting to kik inn so Hannah thoht maybye it was a good **aidia**" (HWJ5)

    (35) "They rund at the **doer** but it was **locct** James rund up **stayrs** and finde a **windaw**" (HWJ6)

    (36) "James was Hannah was **discusted** by the smell" (HWJ4)

In the handwritten text we see that the participants displayed a significant difference in misspelled words compared to the typewritten text. The examples used contain several spelling errors. Due to the different sections provided in this thesis, I will only focus on errors that has been coded as misspelled words. (34) the participant most likely spelled *idea* in a phonological

manner, meaning that she spelled the word in the same manner it is pronounced. (35) the participant replaces <o> with <e> in *door*, adds an additional <c> and omits the <k> and replaces the ed ending with a <t> in *locked*. (36) the participant misspelled *disgusted* by chancing the letter <g> to <c>.

Examples found in the typewritten female sample:

(37) "James got hit **bye** a big **trunk**" (TWJ4)

(38) I did **olosho** send her a picture of me" (TWJ5)

(39) "Jerry **massaged** me today and asked if I wanted to drink a beer" (TWJ3)

Upon comparing the misspelled words in the typewritten text, it is evident that many of the errors found in the typewritten texts differ from those made in the handwritten texts. As previously indicated, these words are classified as misspelled based on the context in which they appear, resulting in a word-choice error. For instance, in example (37), the participant wrote *bye* and *trunk*. In this example, *bye* was used as a preposition to indicate that the subject, James, was hit by the direct object, the truck, which is an incorrect usage. Moreover, the participant intended to write *truck*, which refers to a wheeled vehicle, instead of *trun*k, which pertains to the storage compartment of a car. Example (38) showcases a word that is misspelled to an extent where neither the autocorrect function nor the "suggestion function" can discern the intended word. The participant aimed to write the adverb *also* but failed to do so. Example (39) illustrates how altering a single letter can completely change the meaning of the sentence. Based on the context in which the incorrect word was identified, it is apparent that the participant intended to write *messaged* but replaced the letter <e> with <a> which resulted in the incorrect word *massaged*.

In the handwritten texts, 10 out of 13 male participants exhibited errors related to misspelled words. Upon comparing the data material, it was found that five participants were responsible for 77.32% (82 of 106) of the errors detected in the handwritten texts produced by the males. The remaining five participants were responsible for the remaining 24 errors. The results suggest that there are remarkable differences between the participants in terms of spelling abilities. As seen in the female category, the males also display a significant difference in misspelled words occurring in the typewritten text. Out of the 2944 words in the typewritten text, only 24 misspelled words were detected. These results suggest a significant difference in misspelled words between handwritten and typewritten text, particularly among participants

who demonstrated a large number of misspelled words in their handwritten text compared to their typewritten text. This is clearly shown in the text of G5 with 20 errors out of 165 words in the handwritten text, compared to 7 errors out of 382 words in the typewritten text and G13 with 13 errors out of 202 words in the handwritten text compared to 0 errors out of 238 words in the typewritten text.

4.3.2 Capitalization
Figure 4.11 displays the number of errors in the y-axis and the gender in the x-axis. The figure visualizes how the errors occurred between the handwritten and typewritten text. For the males, 33 errors were detected in the handwritten text, and 11 errors in the typewritten text. The females had 22 errors in their handwritten texts and 42 in their typewritten text.
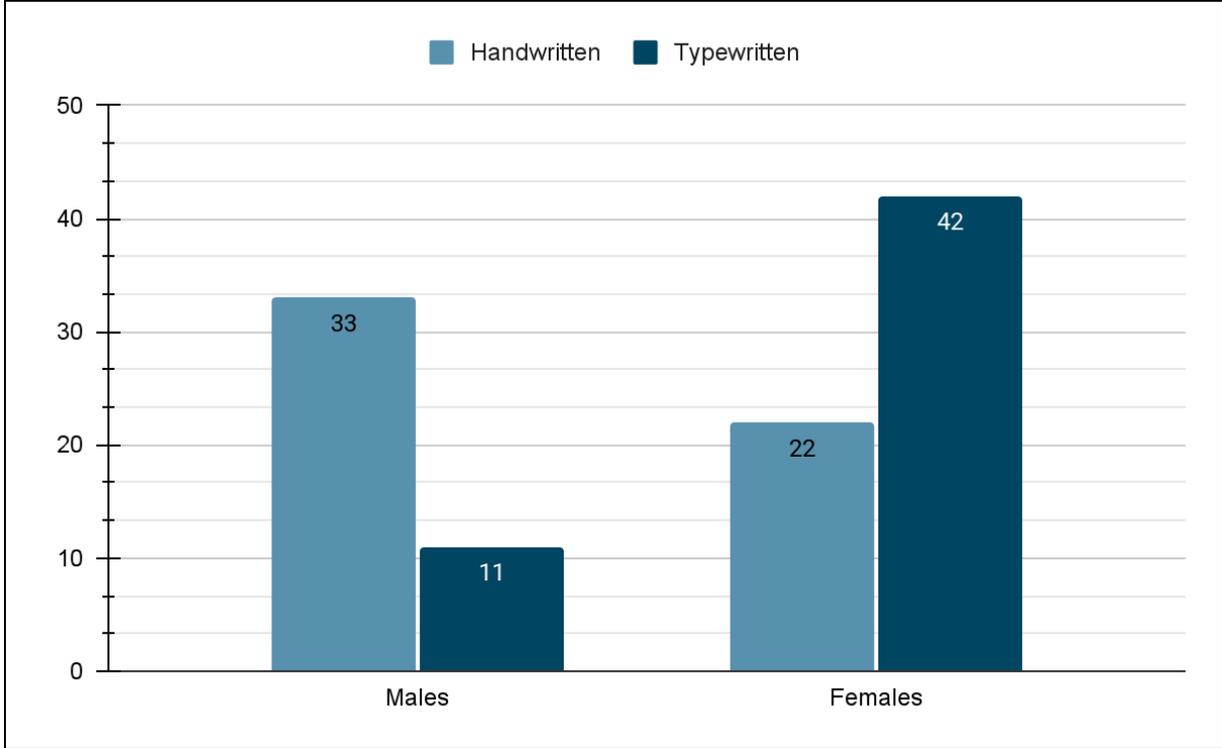
Figure 4.11 Capitalization errors in handwritten and typewritten text and gender differences.

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The study revealed that incorrect capitalization was present in handwritten and typewritten texts. A total of 108 instances of such errors were identified, with 55 instances in the handwritten making the errors occurring at a rate of of 1.21 per 100 words, and 53 errors in the typewritten text occuring at a rate of 0.86 per 100 words. The Log-likeliehood test did not result in a statistically significant difference of 3.08 (p < 0.05) between the handwritten and typewritten text in terms of capitalization error. As the score is less than the critical value 3.84 indicates that there is no statistically significant difference between the two modes of writing.

However, analysis displayed that one participant (J3) was responsible for 17 of the errors detected in the typewritten text, which skews the data and the LL test score. If we remove her from the LLT we get a get a score of 11.77 ($p < 0.05$) which is statistically significant result.

When looking at the source material, it was observed that participants tended to write longer sentences in the handwritten text without adequately incorporating punctuation, leading to difficulty in identifying the beginning and end of each sentence. The participants exhibited a tendency to attend to capitalization at the outset of the text. However, as the text progressed toward the middle and end, an increase in the number of capitalization errors was observed. This phenomenon may be attributed to fatigue, time pressure to complete the assignment or other variables. Participants frequently used coordinating conjunctions instead of punctuations, with the preferred use of *but*, which resulted in the absence of necessary capitalization in the following words, thus leading to fewer instances where capitalizations are required, and thereby not being able to determine if the writer uses them correctly, or incorrectly. Interestingly, some participants employed the physical format of the A4 paper with lines and margins as sentence starters and enders rather than using proper punctuation. This practice resulted in unclear transitions between sentences, making it challenging to discern whether the previous sentence had concluded or if it was a continuation.

In comparison to the capitalization errors observed in handwritten texts, the frequency of errors found in typewritten texts was similar but attributed to a smaller number of participants. The handwritten text contained 55 errors, contributed by 18 participants, with the highest number of errors (8) found in participant J6 text. In contrast, the 53 errors in the typewritten text were produced by 13 participants, with participant J2 contributing to 17 errors. The majority of errors pertained to the use of first-person singular pronoun "I", at the start of her text she did in fact capitalize the first-person singular pronoun "I", but later failed to do so, indicating that participants were aware of the capitalization rule but failed to apply it consistently. Interestingly, Microsoft Word generally tends to automatically capitalize the first-person singular pronoun "I" as the software is aware of the general accepted rule. Furthermore, many students who have worked with the software are familiar with the red underlining indicating spelling errors. Despite these cues, participants may have either ignored them or changed the autocorrect settings to prevent correction or notification of the error, which might be the case for participant J2.

(40) "James says – I just wanted to go for a walk because **i** love this kind of weather, but when **i** was walking.." (TWJ2)

(41) "[…] they anted **hannah** to come to the hospital" (TWJ12)

(42) "Louder but **hannah** knew she had to help **james**" (HWG12)

The provided examples serve to illustrate the frequent errors identified within the participants' work. Example (40), extracted from a J2 typewritten text, exemplifies an error where the first-person singular pronoun is capitalized at the beginning of the sentence, but not in subsequent parts of the text, resulting in a grammatical error. Similarly, examples (41) and (42) serve as noteworthy demonstrations of errors found among the participants who had errors in this category. In addition to the misspelled word, *anted* in example (41), the participant(s) failed to capitalize proper nouns, such as the names *Hannah* and *James*.

4.3.3 Letter Addition

Figure 4.12 displays the findings from the analysis in a pie chart in order to visualize the errors occurring on an individual level. As seen in the figure, participant J6 had 12 counts of letter addition errors in her handwritten text, furthermore, participant J6 was the only participant who had a letter addition error in her typewritten text. The remaining errors found within this category is displayed with the individual candidate numbers.
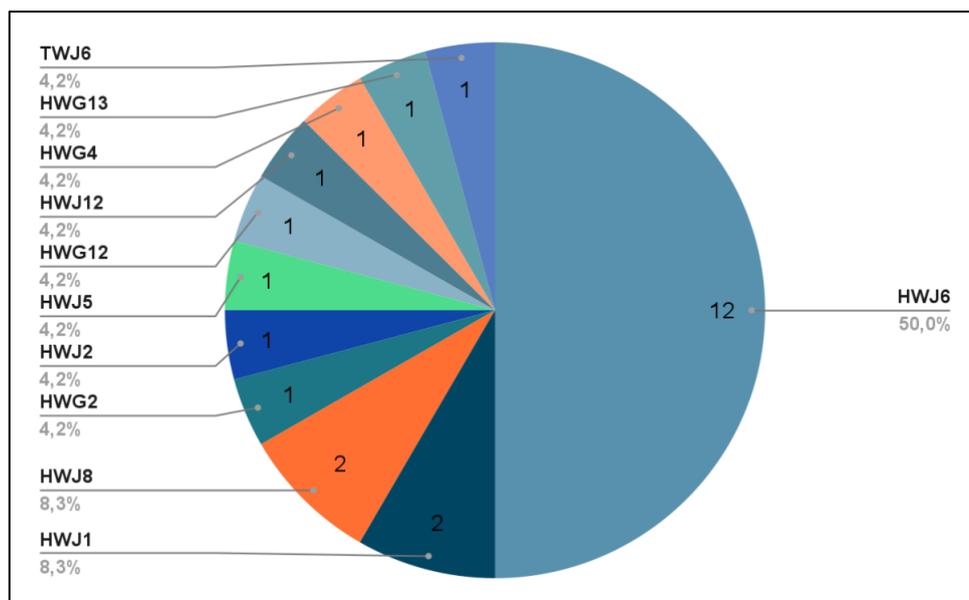

Figure 4.12 Pie chart displaying all errors found in both handwritten and typewritten text.

The study examined the incidence of spelling errors in a group of 26 participants, among whom 11 participants displayed occurrences of letter addition errors. The result from the analysis is displayed using a pie chart in order to accurately display individual errors made by the participants. The letter addition errors accounted for 5.77% (24/416) of the total spelling errors detected. Notably, one participant exhibited an unusually high rate of letter addition errors compared to the rest of the participants, contributing 12 errors alone, which represented half of all errors detected. This participant's data was considered anomalous and distorted the data analysis. Furthermore, the letter addition errors were predominantly found in handwritten text, with only one occurrence observed in typewritten text. The rate of letter addition errors in handwritten text occurred at a rate of 0.50 per 100 words, compared to 0.016 per 100 words in typewritten text. The Log-Likeliehood test (LLT) resulted in a statistically significant difference of 32.12 (p <0.05) between the handwritten and typewritten text in terms of letter addition errors with the handwritten texts exhibiting a higher frequency of errors compared to the typewritten texts. With only one error found in the typewritten text, it becomes quite evident that these errors are pertained to the handwritten category. Errors displayed in the following segment is sampled from the text where the participants had letter addition errors. The errors found within this specific category is bolded out, and other mistakes found in the example that are not related to letter addition errors are marked in *italics*.

(43) " **gett** out of hear hannah" (HWJ6)

(44) "James was wearing **veary** ecspensive shirt and Jorden shos" (HWJ5)

(45) "They **hearid** a scream" (HWG13)

(46) "They **diddnt** want any part of it" (HWG12)

Letter addition means adding an unnecessary letter to a word. This is seen in the example (43) in J6 handwritten text. In this example we see that the participant adds an extra <t> to the word *get*. When the unnecessary letter is added to the word it could be ruled as a typo on in typewritten text, but since this was in the handwritten text it was not. She had four counts of where she wrote *get* with the double <t>. She also displayed a misspelling in the word *hear* instead of *here*. Example (44) the participant adds the letter <a> to the adverb *very*. Example (45) the participants added the letter <i> in "*hearid* which is incorrect, and example (46) displays the similar error made in example (33) by adding an addition <d> to the word *didn't*.

While the category of letter addition errors exhibited a statistically significant of 33.12 (P<0.05) difference as measured by the Log-Likelihood test (LLT), it is worth noting that a single participant was responsible for twelve of the errors in this category. Additionally, the vast majority of participants did not display any errors involving letter addition. Among the few errors that were observed (23 out of 24), they were found exclusively in the handwritten text. This analysis thus provides useful insights for addressing Research Question 2, namely, the differences in orthographic accuracy between handwritten and typewritten text.

4.3.4 Letter Omissions

Figure 4.13 displays the findings from the analysis in a pie chart in order to visualize the errors occurring on an individual level. Out of the 36 errors found within this category, 30 of them stem from the handwritten text, while 6 errors were found within the typewritten material.
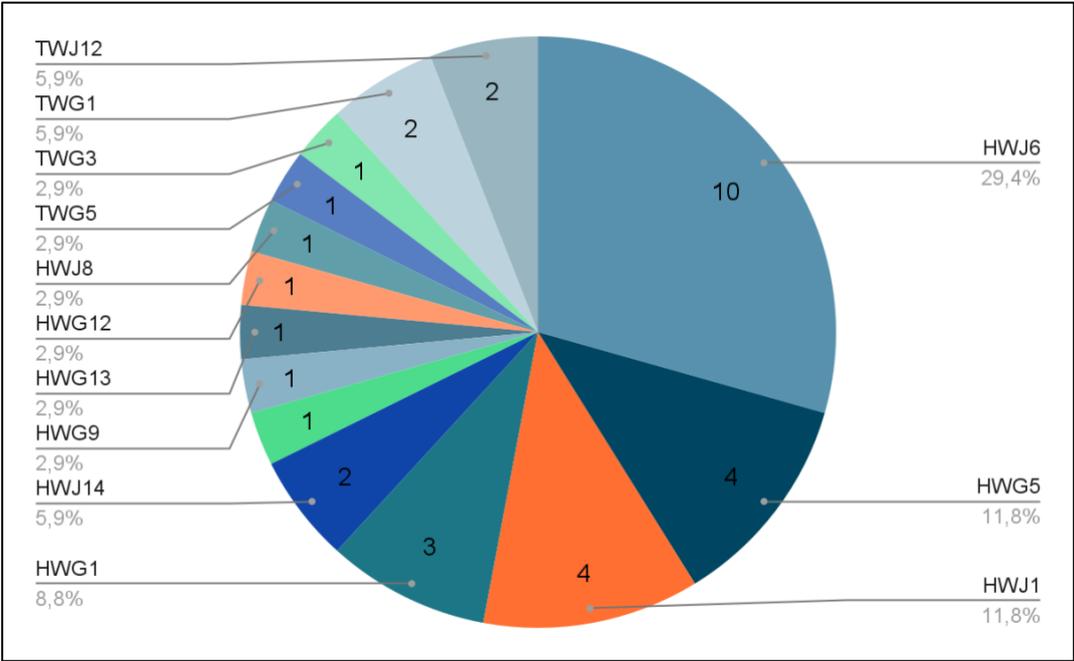
Figure 4.13 Pie chart displaying all errors found in the handwritten and typewritten text.

The prevalence of letter omission errors in spelling was examined. Of the total 416 spelling errors detected, 8.71% (34) were identified as letter omission errors. Among these errors, 28 were identified in handwritten text with the errors occurring at a rate of 0.49 per 100 words, while the remaining six were observed in typewritten text occurring at a rate of 0.098 per 100 words. The Log-Likelihood test resulted in a statistically significant difference of 22.84 (p<0.05) between the handwritten and typewritten texts concerning letter omission errors, with the handwritten texts exhibiting a higher frequency of errors compared to the typewritten texts.

Out of the 26 participants, 14 exhibited counts of letter omission errors, ranging from one to 10 errors each. Notably, participant J6 accounted for 29.4% (10/34) of all errors detected in the sample. It should be noted that the errors in the letter omission category were mainly made by a few participants, and therefore the low rate of 0.098 errors per 100 words in the typewritten text may not be representative of the entire group. However, the rate of 0.49 errors per 100 words in the handwritten text suggests that this category is a significant source of spelling errors in this mode of writing.

The majority of the errors identified in the handwritten text category involved the omission of the letter "e" in words such as "silenc" (-e), "somthing" (-e), "injurd" (-e), and "becaus" (-e). Additionally, the omission of the letters "o" and "u" was also observed in words such as "thoght" (-u), "sholder" (-u), and "loder" (-u). In contrast, the typewritten text accounted for 17.65% (6/34) of the errors detected, and the errors observed were dissimilar to one another. Examples of such errors included "woried" (-r), "realy" (-l), and "whisperd" (-e)

4.3.5 Homophones

The homophone category exhibited the lowest incidence of spelling errors. Out of a total of 415 spelling errors detected, only 7 of them stem from the homophone errors category. Results from the analysis shows that only participant G4 and G9 had errors concerning homophones. G4 had four counts in the handwritten text and one in the typewritten text. G9 had one error in the handwritten text, and one in the typewritten text. Due to the low number of errors found in this category, it would not be possible to conduct any statistical analysis on the results. The errors made by the participants will be displayed as they appeared in the material.

(47) "He just stood **their** and laughed" (TWG4)
(48) "They **new** that there was two zombies there" (HWG9)

In the G4 text, it was observed that all of the errors identified were attributable to the erroneous usage of "their" and "there". For instance, in Example 47, the participant attempted to use "there" as an adverb of place to denote the location of an action, but erroneously employed the possessive pronoun "their" instead. Similarly, in Example 48, the participant omitted the silent letter "k" in the word "knew".

It is not feasible to ascertain definitively whether the errors categorized under this category are uniquely linked to either handwritten or typewritten text, as they were generated by only two participants. Nevertheless, the scarcity of errors identified in this category implies that the majority of participants did not encounter difficulties pertaining to homophonic confusions.

4.4 Summary of findings:

Results from the analysis shows that there is a statistically significant difference between the two modes of writing in terms of grammatical and orthographic accuracy. A total of 284 grammatical errors were detected, and 415 spelling errors were detected in the data-material. Section 4.2.1 displayed a LL score of 13.27 ($p<0.05$) indicating a significant difference between errors found in the handwritten and typewritten texts. Section 4.2.2 displayed a LL score of 0.14 ($p<0.05$) demonstrating that there were no significant differences of pronoun agreement errors between the two modes of writing. Section 4.2.3 displayed a LL score of 45.31 ($p<0.05$) demonstrating that article usage error was the one category which displayed the most significant difference between the two modes of writing in the grammatical category. Section 4.2.4 displayed a LL score of 4.24 ($p<0.05$) indicating that there a small significant difference of errors related to irregular past tense. Spelling errors was the category in which the LL test scored the highest number of differences, mainly the misspelled category with a LL score of 141.71 ($p<0.05$) indicating a huge difference of errors occurring in the handwritten texts compared to the typewritten texts. Section 4.3.2 displayed that a LL score of 3.08 which is not statistically significant, however, the data was skewed due to one participant committing 17 capitalization errors. Furthermore, section 4.3.3 and 4.3.4 had a LL score of 32.12 ($p<0.05$) and 22.84 ($p<0.05$) respectively. The Log-likelihood test was not administered on section 4.3.5 homophones, due to the small number of errors found within this category. The overall results from the analysis show that the spelling category had a greater significant difference of error found in the handwritten and typewritten text, with the handwritten texts exhibiting a higher frequency of errors compared to the typewritten texts.

5. Discussion

In this thesis, I have tried to answer the question, "What the is difference between spelling and grammar in using handwritten versus typewritten texts with the help of autocorrect/grammar-checking software. In order to explore this case study, three research questions were created. **RQ1:** To what extent do handwritten and typewritten text differ in terms of grammatical accuracy? **RQ2:** To what extent do handwritten and typewritten text differ in terms of orthographical accuracy? **RQ3:** To what extent are differences in grammatical and orthographical accuracy contingent on the reported gender of the learners who produced the texts? In order to establish if there were a statistically significant difference between grammatical and orthographical accuracy found in the two modes of writing, the LL test was employed. In addition to establishing if there were a statistically significant result or not based on the LL test score, the relative frequency of errors occurring in the data material was presented by taking the number of errors found in the different categories, divided by the total number of words in the two means of writing, and multiplying it with 100 to establish the relative frequency of each category, and thereby being able to discuss the differences of errors occurring based on the mode of writing. In section 5.1, I will discuss the difference in word count, followed by section 5.1.2, where we will discuss gender differences in relation to RQ3. In section 5.2, we discuss the grammatical errors found within the typewritten and handwritten text in relation to RQ1 and RQ3 and discuss the implication of autocorrect usage in section 5.2.1. Section 5.3 discusses spelling errors in the handwritten and typewritten text in relation to RQ2 and RQ3. Sections 5.4 and 5.5 discusses the importance of digital competence in relation to RQ1 and RQ2, and lastly, a conclusion to the discussion chapter is seen in Chapter 5.6.

5.1 Text length differences in handwritten and typewritten texts.

The present study conducted an analysis comparing the difference of grammatical and orthographic accuracy as they appeared in the handwritten and typewritten texts. One of the first differences I examined was the word count between the two modes. The results showed that the typewritten category yielded a higher word count of 6103 words in contrast to 4516 words produced in the handwritten category, indicating a difference of 1587 words. The average length of the typewritten text across all participants was 234.73 words, while the average length for the handwritten texts was 173.69 words. Previous research has also examined the difference between word counts in handwritten and typewritten texts, as demonstrated in Christensen's (2004) study, which examined 276 participants from the 8th and 9th grades. Similarly, to the current study, Christensen observed a substantial disparity in word counts between the two

modes of writing, with an average word count of 556.23 words in the typewritten text and 169.43 words in the handwritten text (Christensen, 2004, p. 556).

Several factors could contribute to the observed difference in word count between the two modes of writing. One factor is the prevalence of computer usage in personal and academic contexts, which might lead to increased computer-mediated text production and note-taking, as noted by Bouriga and Olive (2021, p. 2228). Individuals with proficient typing skills can efficiently produce text by looking at the screen instead of the keyboard. The ability to type proficiently may be considered analogous to handwriting proficiency, with the main difference being the use of a keyboard to form words instead of a pen. It is reasonable to speculate that participants who had to look at the keyboard while typing, commonly referred to as "keyboard gazers" (Johansson et al., 2010, p. 836), may have produced fewer words than those who could look at the screen while typing, also known as "monitor gazers" (Johansson et al., 2010, p.836). Unfortunately, this study did not capture the participants' typing behavior. Therefore, it was impossible to determine if the individuals who produced the most words were either keyboard or monitor gazers.

5.1.2 Gender differences in the handwritten and typewritten text

The female participants in the study produced more words than their male counterparts, with an average of 190.84 words compared to 156.23 words in the handwritten texts and 243 and 226.46 words in the typewritten text. Upon examining the handwritten material, it became evident that the females had better handwriting and demonstrated a higher level of proficiency in terms of readability. This observation is consistent with previous studies by Rosenblum et al. (2004) and Graham and Miller (1980), which found that males tend to experience greater difficulty with handwriting, resulting in some words being unreadable and challenging to decipher. During an informal conversation with seven participants (5 males and 2 females), most of them described handwriting as "boring and tedious" work, and some reported experiencing numbness and soreness in their hands during prolonged periods of writing. This corresponds to the findings of Sassoon (2006), who suggests that physical discomfort during the writing process can negatively impact the quality and legibility of the content produced. The participants' statements also suggest that a lack of proficiency in handwriting may negatively affect motivation and self-esteem, as described by Sassoon (2006). The participants also reported varying levels of exposure to computers in a classroom setting, ranging from 5th to 8th grade. This information is not directly relevant to the study but provides additional

context for understanding the variations in handwriting proficiency observed among the participants.

5.2 Grammatical errors compared to word count in relation to RQ1 and RQ3

When comparing the number of words to the grammatical errors identified in the typed and handwritten texts, we observed that 108 errors were detected out of 6,103 words in the former, whereas 176 errors were detected in 4,516 words in the latter. In order to establish if there exists a statistically significant difference between these two modes of writing, we conducted a Log-likelihood test, which yielded an LLT score of 44.33 (P<0.05), indicating a significant difference in errors occurring in the different modes of writing. In relation to RQ1, this displays a significant difference in grammatical errors occurring between handwritten and typewritten texts. In order to add valuable information about RQ3 in relation to gender differences based on the mode of writing, we assessed the errors occurring in the handwritten and typewritten text as they appeared in the different genders. The Log-Likelihood test yielded an LLT score of 32.25 (P<0.05) for the males and a LLT score of 0.90 (P<0.05) for the females. The males had a statistically significant difference, while the females did not. However, the LLT score for the females was greatly affected by one participant in particular, who displayed a substantial number of errors compared to her peers. In the following chapter, I will discuss the different grammatical errors found and their relation to the autocorrect software and its influence on the result.

5.2.1 Autocorrections pros and cons in relation to grammatical errors.
As we examine the results of the subject-verbal agreement errors, we see that participants who produced errors in the category produced similar counts of errors in both texts, as seen in J6 and G1 texts. J6 had eight errors in the handwritten text and eight errors in the typewritten text, and G1 had four errors in the handwritten and six errors in the typewritten (G1). This tendency is similar to the participants who had 1 or 2 counts of errors in their handwritten text and had either similar or fewer counts in their typewritten text. Participants with 0 counts of errors in their typewritten text had 0 counts in their handwritten texts. These findings suggest the limitations of grammar-checking tools, as seen in Kaushik et al. (2020); Cai et al. (2009); Vernon (2000); Rüdian et al. (2022). They argue that grammar-checking software is still quite limited in what it can assist with due to the complex nature of English grammar. Vernon (2000) further argues that the software struggled with subject-verbal agreement. The log-likelihood test scored 13.27 (P<0.05), which displays a significant difference between the two modes of

writing, errors occurring more frequently in the handwritten texts compared to the typewritten texts. This indicates that the grammar-checking software could detect and assist some of the errors concerning subject-verbal-agreement in the typewritten texts but failed to do so in cases where the sentences became too "complex". Vernon argues that the limitations of grammar-checking programs are limited to checking on a sentence level.

Furthermore, he argues that the software cannot identify inconsistent verb tenses or vague pronoun references across terminal punctuation (Vernon, 2000, p.340). He contends that the limitations are based on the checker requiring contextual knowledge beyond the checker's purely structural knowledge (Vernon, 2000, p.340). It is reasonable to think that the grammar-checking program has improved since Vernon (2000) tested its capacity. However, Cai et al. (2009), Kaushik et al. (2020), and Rüdian et al. (2022) still depict the same struggles as Vernon did back in the year 2000. Cai et al. (2009) explained that the complexity behind developing a grammar-checking tool is very difficult and labours work. In addition to this, the software struggles with providing suitable suggestions for more complex sentences, meaning that the more advanced the sentence is, the less chance it is for the software to be able to suggest suitable assistance.

When looking at the pronoun agreement errors, we see that there were 20 counts of this error in the handwritten text and 29 in the typewritten category across both genders. This was the only grammatical category in which the typewritten text exceeded more errors than the handwritten text. In similarities to the subject-verbal agreement errors, the grammar-checking-program struggles with identifying the more complex sentence; as Vernon (2000) found in his studies, the grammar-checking program struggles with identifying vague pronoun references and is therefore not able to determine if the pronoun used is the correct, or incorrect one (p.340). This was also found to be the case in Rüdian et al. (2020) studies. It could therefore be plausible to suggest that due to the relatively similar number of grammatical errors found between the two modes of writing suggest that pronoun agreement error may be less affected by the mode of writing and may be more closely tied to the writer's overall skill level and attention to detailed when it comes to usage of pronouns. However, it should be acknowledged that determining whether participants used incorrect pronouns intentionally or inadvertently may be challenging. In the following section, we observe that the article error category had a significant difference in errors.

The study identified a significant difference in the occurrence of article usage errors between handwritten and typewritten text, as indicated by the Log-likelihood test score of 45.31 (p < 0.05). Specifically, among male participants, the errors of article usage errors occurred at a rate of 2.26 per 100 words in the handwritten text, with a total of 46 errors among them. On the other hand, the typewritten text had an occurrence of errors of 0.33 per 100 words, totalling 10 errors among them. For female participants, the errors occurred at a rate of 0.92 per 100 words in the handwritten text, with 23 errors in total and 0.31 errors per 100 words in the typewritten text, with 10 errors. This grammatical category exhibited the largest error discrepancy between the two modes of writing, with 69 and 20 errors occurring in the handwritten and typewritten texts, respectively. Notably, the typewritten text demonstrated a drastic reduction in article usage errors compared to the handwritten text. This finding is consistent with previous research by Kaushik et al. (2020), who found that the use of a grammar-checking program resulted in a notably decreased number of article errors, indicating that the program's ability to suggest correction concerning this grammatical category is viable.

The irregular past tense category had a total error count of 55, whereas 31 stem from the handwritten text and 24 from the typewritten text. The Log-likelihood test scored it 4.24 (p<0.05), which is a statistically significant difference between the two modes of writing, indicating that the errors occurred more frequently in the handwritten text than they did in the typewritten texts. When taking a closer look at what types of errors the irregular past tense consisted of, we can see that the grammar-checking-software struggles with detecting this category as well, and these findings agree with the findings by (Cai et al., 2009; Kaushik et al., 2020b; Rüdian et al., 2022; Vernon, 2000). The distinction between regular and irregular verbs is based on how two types inflect in the past tense and the past participle. The grammar-checking program struggled with identifying the cases where irregular past tense verbs were used incorrectly; my findings agree with the findings of Kaushik et al. (2020) and Vernon (2000). Vernon proposes that educators need to discuss with students what grammatical features these programs (autocorrect) simply cannot check, both because of technological limitations and because of what (Bizzell, 1992) has called the "infinite regress context" (p.96).

5.2.2 The limitation of the autocorrect- and grammar-checking software

My study's findings display similarities to (Bizzell, 1992; Cai et al., 2009; Kaushik et al., 2020; Rüdian et al., 2022; Vernon, 2000). I argue that Patricia Bizzell (1992) touches on the essence of why grammar-checking-tool might never be able to assist students to the same degree as spelling errors. She argues that programming a computer to use language comes up against a problem of an infinite regress of context, meaning that how can we be able to program a computer to determine if a grammatical feature is correct or not and whether the meaning of a word or phrase is correct or incorrect depends on the context in which it is used, and that the context, in turn, requires further context to be understood (Bizzell, 1992, p.96).

5.3 Spelling errors in the handwritten and typewritten text in relation to RQ2 and RQ3:

In relation to RQ2, "To what extent do handwritten and typewritten text differ in terms of orthographical accuracy? When seeking to answer RQ2, we may first look at the Log-likelihood test between spelling errors occurring in the two modes of writing. In the typewritten category, 103 errors were detected with a word count of 6103, and in the handwritten text, a total of 301 errors were detected with a word count of 4516 words. The LLT scored 154.55 ($p<0.05$), which is a statistically significant difference between handwritten and typewritten text in terms of misspelled words, with the handwritten texts exhibiting a higher frequency of errors compared to the typewritten texts. When looking at how the two modes of writing differ between the two genders, we see that the males had an LLT score of 112.05 ($p<0.05$), and the females had an LLT score of 50.80. This result showed a statistically significant difference in errors occurring between the two modes of writing and especially for the males.

Upon examining the distinct categories that exhibited the most notable disparities between the two writing modes, it became clear that the "misspelled words" category had the most errors in handwritten and typewritten texts. This category comprised words that did not fit into any of the other categories included in this project (homophones, letter addition, letter omission & capitalization). Notably, errors in word choice were also subsumed within this category and were designated as "misspelled" words based on their contextual usage. Such errors were mainly prevalent in the typewritten text, potentially attributable to the autocorrect feature or instances where the participant opted to select a word recommended by the autocorrect function

or simply misspelled the intended word, which was unsuitable for that specific sentence. A pertinent instance of this phenomenon can be observed in the following example:

"Jerry **massaged** me today and asked if I wanted to drink a beer" (TWJ3)"

Based on the context in which the incorrect word was identified, it is apparent that the participant intended to write *messaged* but replaced the letter <e> with <a> which resulted in the incorrect word *massaged* which led to the word being counted as a misspelled word.

The results from the analysis showed that there was a total of 194 errors of misspelled words in the handwritten text and 49 in the typewritten text. This category showed a significant difference in errors occurring in the two modes of writing and had a remarkable result on participant who displayed many errors in the handwritten text, compared to the number of errors found in the typewritten text. The participants identified as J6 and J5, whose level of contribution to the total amount of misspelled errors was found to be disproportionate in comparison to their peers, exhibiting a total of 30 and 35 errors in the handwritten text, respectively, and 4 and 11 in the typewritten text. Across all spelling error categories, we see a decrease in errors except for homophones in table 4.13:

	Handwritten	Typewritten
Misspelled words	194	49
Capitalization	55	53
Letter addition	23	1
Letter omission	28	6
Homophones	1	5

Table 4 Spelling errors found within handwritten and typewritten texts.

In order to discuss the implications of using autocorrect, further investigation is required to understand why misspelled words have a different error count between handwritten and typewritten modes of writing. To achieve this, one has to examine the operating principles of autocorrect software and identify the particular challenges and implications it faces when dealing with spelling and grammar errors. Autocorrect operates at the word level. It examines each word the author writes and compares it to its pre-loaded dictionary to identify if it matches any with known words. The correction software is comprised of two distinct features: the automatic correction function, which, as its name suggests, automatically rectifies errors, and the spelling checker function, which becomes operational when a word is written in a manner that the autocorrect feature is unable to ascertain the intended word.

The misspelled words category exhibited a significant reduction in the number of errors identified in both the handwritten and typewritten modes of writing. Specifically, misspelled words occurred at a rate of 4.29 per 100 words in the handwritten text, compared to a rate of 0.80 per 100 words in the typewritten text. Furthermore, in addition to the typewritten text containing fewer misspelled words, there was also a marked improvement in readability, structure, and sentence construction. This finding lends support to Christensen's (2004) assertion that students who have encountered persistent difficulties with writing may benefit from using computers, which require less intricate movements to form letter shapes and elaborate joins compared to handwriting (p.561). Additionally, Christensen argues that: "[…] computers enable multiple drafts, promoting a sequencing of tasks that allows for the appropriate allocation of attention to different aspects of the writing task (p. 561)". As evidenced by the texts of participants J6 and J5, the prevalence of misspelled word errors was greatly reduced most likely due to the autocorrect function.

The present study investigated the impact of additional spelling categories on the occurrence of errors by the means of using the two modes of writing. The results indicated that the *capitalization* category did not have a statistically significant difference, as reflected by the LLT score of 3.08 (P<0.05). However, the analysis revealed an interesting pattern for one participant, J2, who made 17 capitalization errors while exhibiting no errors in other spelling categories. Further inspection of J2's text revealed a consistent failure to capitalize the first-person singular pronoun "I" throughout the text, except for the initial occurrence. The reason for why this has occurred is hard to determine, but one could suggest that the participant noticed the red underline, but as the autocorrect did not automatically change it, the participant might find it unnecessary to change the mistakes manually, and thereby left it as is.

In contrast, the remaining categories, notably "letter addition and omission," showed significant differences between the two modes of writing, indicating that the autocorrect function effectively corrected such errors. The Log-likelihood test scored letter additions as 32.12, which showed a statistically significant difference between the two modes of writing, the letter omission had a LLT score of 22.84 which also indicated that there was a statistically significant difference between the two modes of writing. It is noteworthy that the handwritten text contained only one homophone error. In contrast, the typewritten text contained six such errors, primarily attributed to the confusion between "there/their" and "where/were." Notably, participant G4 committed similar mistakes in both modes of writing, suggesting that the error

was not necessarily due to incorrect autocorrect on but rather a struggle with correct spelling *their* in instances where *there* occurred instead.

5.4 Exploring the Role of Digital Competence Concerning the Benefits and Limitations of Autocorrect for Teachers and Students: Insights from a Comparative Study:

When looking at the results from the analysis, it became quite evident that the autocorrect and grammar-checking software had different effects on the participants' texts in terms of errors detected between the two modes of writing. Throughout this project, results showed that the participant produced more words and fewer errors in the typewritten text, mainly due to the autocorrect function but may also be due to the familiarization with using the technological device. My studies showed that the participants produced more words in the typewritten text than in the handwritten text; similar findings were found in Christensen's (2005) studies. The reason for this is perhaps due to what William and Beam (2019) found in their review of twenty-nine studies on comparing the different modes of writing, where they found that the use of technology had a profound effect on reluctant writers (p.230). The average word count across all text was 204; the ones who produced texts under the average also had more errors, except for one participant, J6. The findings of my study suggest that the participants who committed the most errors in their handwritten text had the largest decrease in errors found in their typewritten text. The significant decrease in errors was mainly in the spelling category and not as significant in the grammatical category when comparing individual differences.

These findings agree with the findings of Vernon (2000) and Kaushik et al. (2020). The nature of correcting grammatical and spelling errors is quite different in terms of technological limitations. The autocorrect functions as an automatic "dictionary checker" for each word, where there is a correct way of spelling a word, and an incorrect way of spelling a word, the grammar-checker, on the other hand, has a much more difficult time assessing if the tense, aspect and mood is the correct one, and to determine that is almost impossible, as explained by Bizzell (1992) due to the infinite regress of context (p. 96).

Blikstad-Balas and Klette (2020) found that among 47 Norwegian middle schools, the students used 71% of their time on Microsoft Word (p.62). Based on their findings, teachers and students should have great knowledge about the ins and outs of Microsoft Word in related applications such as autocorrect and its in-built grammar-checking software, as it is the primary tool used for text production in Norwegian schools. However, this might not be the case, as we see in the results from Fenty and Andersson (2014). In their study where they asked teachers about their knowledge, beliefs, and practices regarding technology use with young children. They acknowledged that there were potential benefits of incorporating technology in their instructions but expressed confusion regarding the appropriate timing and methods for integrating technology into their teaching practices (Fenty & Anderson, 2014, p. 12). This assumption that teachers have the digital competence necessary to utilize digital tools effectively was also questioned by Krumsvik (2014), who studied several policy documents provided by the OECD in 2014. He argued that "Several chapters remark that teachers should develop ICT skills, but what this actually means is not discussed to any substantial degree (Kirschner et al., 2008, p.435)". Relying on the idea that teachers possess necessary digital competence without having a measurement for it may lead to an unfortunate assumption about technology concerning its capability and, perhaps most important, its limitations.

Comprehension of the limitations of autocorrect and grammar-checking software is crucial for various reasons, including the quality of generated texts and their pedagogical implications. The limitations of these software tools in identifying grammatically incorrect sentences may result in flagging correct sentences as incorrect, causing confusion and adversely affecting the motivation of writers (Vernon, 2000, p. 344). To prevent students from letting the limitations of the technology hinder their writing abilities, it is imperative for teachers to educate them about the limitations of the software. Therefore, For the students to acquire knowledge of the limitations of this technology, teachers must possess the required competence to effectively convey and teach the information to their students.

5.5 The Importance of Handwriting in relation to errors detected in the two modes of writing:

This project looked at the difference observed between handwritten and typewritten texts. It was observed that the participants with the most spelling errors in the handwritten text had the most errors in the typewritten texts, even though the total errors were drastically reduced. In order to understand why some participants had more spelling errors compared to their peers, one might consider a few factors. One of the factors that some participants produced more errors than others might be due to learning disabilities or other factors such as previous exposure to the English language in terms of education. As this project did not sample any personal data/information about the participants, I could not determine if the participants who displayed an increased frequency of errors compared to their peers had underlying challenges. As seen by Kaushik et al. (2020), results from their analysis showed that there was a clear correlation between errors per word and English experience (L2, L3 & L4), confirming that less experienced learners made mistakes than experienced learners (p.280). I could not collect any previous material or grades from the participants to determine if there was a correlation between previous English experience and errors occurring.

Most of the text production done by the participating class was done employing typewriting; there were seldom any handwriting assignments done in the classroom. Homework related to the English subject was to be done on a computer and was assessed using Google Classroom. Completing homework and assignments using a computer leads to a greater deal of exposure and familiarization with producing text by using a Computer and might reduce the experience and knowledge of handwriting. Using a computer means the participants also had the autocorrect function available, which they do not have when writing by hand. Karlsdóttir & Stefansson's (2002) study of 407 primary schools observed that 27% of the sample displayed dysfunctional handwriting skills at the end of grade 1, which decreased to 13% by the end of grade 5. It is plausible that the time the participants were introduced to the usage of computers might have affected their handwriting proficiency and development. Not being proficient in handwriting may lead to participants using a lot of their cognitive resources on what Gathercole et al. (2004) describes as "Lower-level processes" as writing down individual letters in order to form words and sentences. Another significant factor that can influence writing ability is memory, specifically long-term and working memory (Medwell & Wray, 2008, p. 38). Gathercole et al. (2004) proposed that working memory is closely linked to young children's

literacy scores (p. 12). They further posited that if students must devote a significant amount of working memory to controlling lower-level processes such as handwriting, they may have limited resources left for higher-level processes (Gathercole et al., 2004 p. 13), such as selecting appropriate vocabulary, monitoring progress, and revising the text (Medwell & Wray, 2008, p. 38). Revising the text includes looking for grammatical and spelling errors made during the writing process. The analysis revealed that the participants who made the most grammatical and spelling errors also struggled with revising and syntax-related errors, which may be attributable to their working memory and distribution of cognitive resources.

5.6 Alternative usage of the spelling- and grammar-checking software.

As we have been discussing in this chapter, we see that the autocorrect and grammar-checking software can assist students on various forms concerning spelling and some of the grammatical categories included in this thesis. Teaching English grammar can be a challenging task for many teachers. However, incorporating technology through autocorrect and grammar-checking tools can make the learning process more engaging and enjoyable for students who might experience fewer grammatical errors and help with their orthographic accuracy. Additionally, these tools can provide a practical and effective alternative to traditional grammar instruction. By leveraging technology, teachers can help students develop their grammar skills in an effective and fun way. This idea is consistent with the findings of William and Beam (2019), where they found that the usage of technology positively impacted students in terms of it becoming more engaging, especially for reluctant writers (p.230).

The question, therefore, becomes, how can the technology be used to access new knowledge without making the users over-reliant on the functions of the software in the L2 classroom?

Using a computer to produce text has been seen as a more motivational and enjoyable process for many students. Based on the results from the analysis, we see that the participants produced significantly fewer errors in the typewritten text than in the handwritten text. The software may be used in a learning environment rather than just being a tool for improving the writer's grammatical and spelling skills. To display the limitations of the grammar-checking tool Vernon (2000) propose the idea that one could use it in a classroom setting. For instance, the teacher of a class could write a text in which he deliberately made mistakes that the software would detect and perhaps not detect. The results from the analysis made by the software could then be used as an example for the students, and they could discuss the errors detected by the

software and simultaneously decide on the program's limitations. Another alternative could be to ask the students to write a text without editing the errors flagged by the software program. When the students are done with their text, they could then go back into the errors detected and try to rewrite the word or the sentence which has been flagged, without the assistance of the software, and by doing so, become aware of the mistake being made. The main focus should be that the students learn from their mistakes and not just opt for the option provided by the software.

5.7 How to determine students' grammar and orthographic accuracy.

Findings from this study demonstrate that the participants produced fewer grammatical errors and had a more proficient orthographic accuracy in their typewritten text than in their handwritten texts. This raises the question of how teachers should evaluate their student's English writing competence based on the type of text in which it was produced. Based on my findings, if the evaluated text is mainly produced using a computer it would suggest that it contained fewer errors than it would have had if it was written by hand. However, is this the case? Or has the autocorrect and grammar-checking software helped the students to a degree in which their competence is accurately displayed? And how do we determine and eventually grade the students' performance? Chomsky (1957) discussed the difference between competence and performance and that it is not possible to determine a student's competence based on their performance simply due to the many factors that may influence their performance in a given time and space.

A good example of this was displayed in J6 and J5 texts; overall, they had fewer errors in their typewritten text than their handwritten text, e.g., the significant decrease in errors in terms of misspelled words. If one were to evaluate their text solely based on their typewritten performance, it would be hard to determine if they were struggling with this aspect or not; compared to their handwritten text, the results showed quite a different picture. That the participants were in fact, struggling with the aspect of orthographic accuracy. But that autocorrect might have greatly helped them with this aspect of writing. Based on the list provided by the Norwegian Ministry of Education and Research (Ministry of Education and Research, 2017b), students writing ability is determined based on their ability to revise their text based on feedback and their own evaluation of the text produced. In addition to this, students are expected to write grammatically correct and show orthographic accuracy in handwritten and typewritten text (Ministry of Education and Reserach, 2017b, p. 22). However, some students might be able to do this by writing with a computer, but not by hand. Should

teachers then base their evaluation of students' performance on students' typewritten text? Or based on their handwritten text? The Ministry further explains that the importance of being able to write is so that individuals are able to contribute and be a part of a functioning society (p.22). What does it mean for a society to function in terms of writing, and is it determined by handwriting or the use of technology? Is it through handwriting? Or with the help of a typewriter? If the latter is correct, this might indicate that some students who display difficulties in their handwritten text would, by definition, be functional typewriters and thereby be defined as functioning writing citizens. How individual teachers evaluate their pupils in terms of English writing competence is unknown; however, as this thesis has discussed, the utilization of both modes of writing should, to a degree, be incorporated.

6. Conclusion

The inspiration for this project arose from my observations of the widespread use of computers in Norwegian classrooms. Specifically, I was interested in exploring how computer-based spelling aid programs were impacting student writing. To gain deeper insights into this phenomenon, I conducted a comparative analysis of students' handwritten and typewritten texts. As I conclude this thesis, I will reflect on the key findings and share my recommendations for how teachers can leverage spelling and grammar-checking software in a more effective and pedagogical manner. I will additionally include a section in this chapter where I reflect on the limitations of my study and finally, I will highlight potential directions for future research on the relationship between handwriting, typewriting, and student writing outcomes.

6.1 Summary of the results

In order to gain a deeper insight into the difference made between 8th graders spelling and grammar using handwritten versus computer written texts with autocorrect/grammar-checking software. Two main research questions were constructed:

RQ(1): To what extent do handwritten and typewritten text differ in terms of grammatical accuracy?

Research question one consisted of four grammatical categories: Subject-verbal agreement, pronoun agreement, article usage and irregular past tense. These categories were chosen based on their prevalence in the material used.

RQ(2): To what extent do handwritten and typewritten text differ in terms of orthographical accuracy?

Research question two consisted of five categories: Misspelled words, capitalization errors, letter addition, letter omissions and homophones. These categories were chosen based on their prevalence in the material used.

RQ(3): To what extent are differences in grammatical and orthographical accuracy contingent on the reported gender of the learners who produced the texts?

In addition to investigating the grammatical and orthographic accuracy found within handwritten and typewritten text I wanted to explore if there were any significant gender differences in the two modes of writing, as seen by Rosenblum et al., (2004) and Graham & Miller (1980).

In terms of the grammatical errors found in this thesis, analysis showed there was a statistically significant difference between grammatical errors occurring in the handwritten and typewritten text, the LLT score was 44.33 indicating that the grammatical errors occurred in a higher frequency in the handwritten texts than they did in the typewritten texts. However, when comparing the LLT score between the individual categories, the difference is not as significant. The category which yielded the biggest difference between the two modes of writing was article usage error with a LLT score of 45.31, with the errors occurring at a rate of 1.52 per 100 words in the handwritten text, and 0.32 per 100 words in the typewritten text. Subject-verbal agreement had a LLT of 4.77 with the errors occurring at a rate of 1.24 per 100 words in the handwritten text and in a rate of 0.57 per 100 words in the typewritten text. Irregular past tense had a LLT of 4.23 with an error rate of 0.68 per 100 words in the handwritten text and an error rate of 0.39 per 100 words in the typewritten text. The only grammatical category which did not yield a significant difference was pronoun agreement with a LLT score of 0.14, with an error rate of 0.47 per 100 words in the handwritten text and an error rate of 0.44 per 100 words in the typewritten text.

The spelling categories displayed a higher LLT score compared to the grammatical category with an LLT score of 141.73 with an error rate of 4.29 per 100 words in the handwritten text, and an rate of 0.80 per 100 words in the typewritten text. The remaining spelling categories also displayed a significant difference between the two modes of writing except for the capitalization error category, which was mainly affected by only one participant. Results from the analysis show that the spelling-aid-program had a significant influence of misspelled words in students' text, compared to the errors made in the handwritten text as seem by the relative frequency. In this study, a considerable decrease in errors related to spelling was observed among students who experienced significant challenges with this aspect of writing. Specifically, the six participants who contributed almost 50% of all the identified misspelled words in the handwritten text (a total of 135 errors) exhibited a noteworthy decrease in errors, collectively

producing only 26 errors in the typewritten text. This represents a substantial reduction of errors by 80.74% between the two modes of writing.

6.2 Spelling and Grammar-checking software on enhancing English education:

Throughout my project, I have explored various academic viewpoints on using spelling and grammar-checking software. While it is important to acknowledge the limitations of these tools, English learners should prioritize developing the ability to form grammatically correct sentences and strive for orthographic accuracy. Over-reliance on software can hinder students' writing skills, so it is essential to strike a balance between utilizing these tools and developing one's writing abilities. With that being said, upon analysing the data, I have found that these tools offer considerable potential for students who utilize them. In today's age of technology, spelling and grammar-checking software have become ubiquitous, with virtually every computer or mobile device user employing it in some capacity for writing purposes. I support Vernon's (2000) stance that autocorrect tools serve as a valuable asset for students in the writing process, especially those struggling with complex aspects of text production. The software can facilitate the writing process by freeing up cognitive resources, such as those needed for ideation, text monitoring, and pragmatic awareness (Christensen 2005). However, it is important to note that the software should not serve as a replacement for human feedback but rather as a learning and study aid. To harness the benefits of correction software more effectively, I suggest that teachers play an active role in educating students about its functions, capabilities, and limitations.

In summary, there are three key factors that must be in place to enable students to derive maximum benefit from using autocorrect:

- *Understand the capabilities and limitations of the of the autocorrect tool: To use autocorrect efficiently, it is important to understand how the tool works and what it can and cannot do. This knowledge can help users avoid over-reliance on the tool and reduce the likelihood of errors.*

- *Active engagement with the autocorrect tool: To benefit from autocorrect, users should engage with the tool actively: This means paying attention to the corrections and using them to learn from their mistakes, rather than simply accepting or ignoring the suggestions.*

- *Human feedback and guidance: While autocorrect/ grammar-checking-software can be a valuable tool for improving writing, it is not a substitute for human feedback and guidance. Users should seek input from teachers or peers to help them refine their writing skills and develop a deeper understanding of language rules and conventions.*

In order for these three key factors to be in place, the teachers have to have the necessary knowledge in order to educate their students. Some teachers might have the necessary tools to efficiently educate their pupils, while others might not (Fenty & Anderson, 2014; Kelentrić et al., 2017; Krumsvik, 2014).

6.3 Limitations of this study

During the course of this thesis, several limitations were identified in the study. The first limitation pertained to the data analysis, as some participants exhibited a considerable difference between their handwritten and typewritten texts with regard to e.g. *misspelled words*. It was estimated with the use of the LLT that this was due to the influence of autocorrect/grammar-checking software. In retrospect, it would have been advantageous to access the history-log of the typewritten texts of each participant, as this would have enabled an accurate measurement of the extent to which autocorrect software was utilized. Furthermore, it would have been informative to determine if errors that occurred in the typewritten texts were identified by Microsoft Word´s red-underlining feature, thereby providing insight into the software´s ability to detect such errors across the various categories.

In addition, the sample size of the study was limited, consisting of only one 8th-grade class with 26 participants. As such, individual differences in grammatical and orthographic accuracy may have contributed disproportionately and, at times, skewed the data. To address this, in categories in where individual participants demonstrated disproportional errors compared to their peers, was addressed. Furthermore, time constraints presented a significant obstacle for data collection, as data was only obtained on a single date and time, resulting in a rapid rate of data

collection. This may have influenced the writing ability of some participants, as some may require more time to complete the task, and the presence of the me being there during the writing process may have created unnatural environment. Some participants might perform better under more ideal situations. Pre- and post-test was not administered due to time constraints but would have been beneficial as they could have helped me to control for potential confounding variables. The limited number of participants and the potential variables this thesis is potentially exposed to, makes it hard to generalize the results to a larger population.

The analysis of the data was performed by a single coder, which raises concerns regarding potential limitations. As highlighted by Mackey and Gass (2015) in section 3.3, sole reliance on one coder may result in a limited perspective, as the I was required to code all the material alone. The prolonged duration of coding may lead to fatigue and stress, thereby increasing the likelihood of errors and oversight. Furthermore, the absence of a second coder may result in the coder making assumptions, thereby compromising the accuracy of the results. In order to address these limitations, a coding manual and schedule was developed to regulate the coding process. I limited myself to only be able to code a specific amount of data per day. (i.e., 10 texts) and I consulted with the thesis supervisor whenever there was uncertainty regarding the coding of errors. Additionally, each text was meticulously reviewed multiple times, with only one category being coded at a time. This approach ensured that teach text was read through approximately ten times, which further enhanced the accuracy of the coding process.

In conclusion, while this study provides valuable insight into the grammatical and orthographic accuracy found within participants produced with means of handwritten and typewritten text, it is not without limitations. These limitations include the small sample size, reliance on single coder, and potential confounding variables. Nonetheless, this study lays the groundwork for future research to build upon and expand our understanding of the factors that influence grammatical and orthographic accuracy in written language. Ultimately, it is my hope that this study will contribute to the broader body of knowledge on written language and facilitate further exploration in this field.

6.4 Further studies

To further investigate the topic, it would be advantageous to examine the generalizability of the findings of this study across various age groups. A comparable study of younger or older students would enable the exploration of potential developmental or age-related discrepancies in writing proficiency and the types of errors made. Furthermore, a longitudinal study similar to Christensen (2004) could be conducted to establish a control and experimental group and to

test diverse strategies for employing software programs. This could entail administering a pre-test to the participants to assess their writing abilities and providing a training program on the use and functions of autocorrect/grammar-checking software as a typing conditioning. Following the training program, the same writing task as the pre-test could be administered to the participants to determine any significant differences.

Additionally, to enhance the value of this research, observation of participants' interactions with the program could be carried out through screen recordings, as demonstrated by Kaushik et al. (2020). Researchers could gain insight into which corrections are deemed relevant or ignored by participants, and analyzing the program's correction log could provide additional insight into participants' perceptions of the software's effectiveness. It would also be interesting to determine whether participants understand how many changes the autocorrect function made to their text and whether this correlates with their perceived effectiveness of the software. The number of changes made by the autocorrect function could provide an indication of how effectively it assisted the participants and the level of dependency they have on the software.

Moreover, it would be valuable to collect qualitative data through interviews or surveys to explore students' attitudes and beliefs toward handwriting versus typing. Gathering information on students' trust in the autocorrect function, potentially through a Likert scale, and comparing these beliefs to their actual results could reveal any correlations between them. Such data would provide additional insight into the impact of typing and autocorrect functions on students' writing abilities and attitudes toward writing.

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English summary

What would happen if pupils from an 8th grade class were to create a story without the help of autocorrect and grammar-checking-software? This Master thesis seeks to explore how handwritten and typewritten texts differ in terms of grammatical and orthographic accuracy, in addition to this, the thesis seeks to investigate to what extent are differences in grammatical and orthographic accuracy contingent on the reported gender of learners who produce the text.

To achieve these research objectives, a quantitative content analysis was conducted on the text material produced from an 8th grade class from a mid-sized Norwegian city. The participants were required to produce one handwritten and one typewritten text. The study utilized a coding manual that consisted of four grammatical categories and one spelling category with five sub-categories. Statistical significance was established using the Log-Likelihood to compare the handwritten and typewritten text material. Findings from the analysis suggest that the grammar-checking-software was better equipped to assist with certain grammatical features, as some grammatical categories showed a more significant statistical difference than others. On the other hand, orthographic accuracy had a significant difference across all spelling-categories, suggesting that the autocorrect efficiently assisted participants on this aspect. Gender differences in grammatical and orthographical accuracy was reported to have minor significant differences, however, two individuals from the female group had a disproportionate number of errors compared to their peers, resulting in a skewed data. Making it difficult to discern if there is a statistically significant difference between the two genders.

Based on these results, this study recommends that teachers should incorporate handwritten tasks and assignments in the English language classroom. Evaluating the English competence of pupils based solely on their typewritten work may not accurately reflect their actual performance in terms of grammatical and orthographic accuracy. The study suggests that teachers should administer handwritten assignments on a regular basis in order to see and detect trends and challenges concerning their pupil's English language development, which can inform specific educational interventions to address these challenges.

Norwegian summary

Hva ville skjedd hvis elever fra en 8.klasse ble bedt om å skrive en fortelling, uten hjelp av autokorrektur og grammatikk-sjekk-programvare? Denne masteroppgaven har til hensikt å undersøke hvordan håndskrevne- og tekster skrevet på datamaskin skiller seg fra hverandre når det gjelder grammatikk og ortografisk nøyaktighet. I tillegg til å undersøke forskjeller mellom grammatikk og ortografisk nøyaktighet, vil oppgaven også utforske om det er observerte forskjeller mellom kjønn i denne sammenheng.

For å oppnå disse forskningsmålene ble det gjennomført en kvantitativ innholdsanalyse av et tekstmateriale som ble produsert av en 8.klasse fra en mellomstor norsk by. Hver deltaker ble bedt om å produsere en tekst skrevet for hånd og en tekst skrevet på datamaskin. Analysen brukte en kodemanual som bestod av fire grammatiske kategorier og en stave-kategori med fem underkategorier. Statistisk signifikans ble etablert ved å bruke Log-Likelihood-testen for å sammenligne det håndskrevne- med det dataskrevne tekstmaterialet. Funn fra analysen antyder at grammatikk-sjekk-programvaren var bedre utstyrt til å hjelpe med enkelte grammatiske kategorier, ettersom noen av grammatikk-kategoriene viste en mer betydelig statistisk forskjell enn andre. På den andre siden hadde ortografisk nøyaktighet en betydelig forskjell på alle stavekategoriene, noe som antyder at autokorrektur effektivt hjalp deltakerne når det kom til ortografisk nøyaktighet. Kjønnsforskjeller i grammatisk og ortografisk nøyaktighet ble rapportert å ha mindre signifikante forskjeller, men to personer fra kvinnegruppen hadde en disproporsjonal mengde feil sammenlignet med jevnaldrende, noe som resulterte i skjev data. Dette gjorde det vanskelig å skille ut om det er en signifikant forskjell mellom de to kjønnene.

Basert på følgende resultater, anbefaler denne studien at lærere bør inkludere håndskrevne oppgaver og lekser i engelskundervisningen. Å evaluere elevenes engelskkompetanse basert utelukkende på tekster skrevet på en datamaskin kan trolig ikke gi en nøyaktig gjenspeiling av deres faktiske kompetanse når det gjelder grammatisk og ortografisk nøyaktighet. Studien antyder med andre ord at lærere bør prioritere håndskrevne oppgaver jevnlig for å kartlegge gjentagende feil og eventuelle utfordringer som gjelder elevenes engelskspråklige utvikling. Dette kan gi lærere informasjon som er nødvendig for å kunne tilpasse og tilrettelegge for elevers engelskspråklige utvikling i skolen.

Appendix

Appendix 1

Hei alle foresatte!

Jeg heter Anders Rynning-Tønnesen og skal skrive en masteroppgave ved lærerutdanningen på Høgskulen på Vestlandet. Målet er å sammenligne elevtekster skrevet for hånd og skrevet på tastatur. I Uke 48 vil jeg besøke klassen for å gjennomføre skriveøktene der klassen skal skrive to tekster som jeg ønsker å samle inn og bruke som datamateriale i masteroppgaven min. Alle tekstene vil bli anonymisert og behandlet konfidensielt, i samsvar med personvernregelverket. Elevene vil få utdelt et kandidatnummer som tekstene skal signeres med, i tillegg til dette vil det bli gjort ytterlige tiltak for å sikre elevens anonymitet. Jeg vil understreke at det er frivillig for elevene å delta i dette prosjektet og at de på hvilket som helst tidspunkt har muligheten for å trekke seg. Dette gjelder både før, under og etter at tekstene har blitt levert inn. Jeg legger vekt på at dette skal være en positiv opplevelse for elevene, og skriveoppgavene vil være knyttet til relevante tema og læringsmål.

Hvis du ønsker at ditt barn ikke skal delta på dette prosjekt, vennligst ta kontakt med ~~xxx~~
Mobil: *
Mail: *

Dersom dere har spørsmål til prosjektet eller innsamlingen kan jeg nås på:

Mobil*:* 97 50 44 50

Mail: Anders.97rt@gmail.com

Mvh

Anders Rynning-Tønnesen.

Candidate number: _____

(1) James and Hannah had just finished watching a movie at the cinema. On their way home, they took a shortcut through the dark forest. James was a bit scared, but Hannah convinced him to join her, so he did. When they were halfway through the woods, they saw this abandoned house. They decided to enter the house, and when they reached the second floor, they heard a scream from the first floor….

Continue the story: *elements you can choose to use as inspiration: Use at least 3 of the elements below:*
- Describe what the inside of the house looks like:
- Describe what James and Hannah were wearing.
- How did the inside of the house smell?
- What happened next?
- Did James and Hannah go down to see where the scream came from?
- And if so, who screamed?
- Did anyone try to harm them?
- Did they try to escape?

(2) It was a gloomy night; the date was the 28th of November. Hannah had just eaten dinner with her family; on the menu was a turkey roast, her favorite. Suddenly the phone rang, it was from the local hospital. They said that they had found James in the middle of a road. They wanted Hannah to come to the hospital to see if she could ask James what had happened to him. He would not speak with anyone else but Hannah, so she went. When she arrived at the hospital, she saw James lying there, he could barely speak, but after a while, he started talking, he told Hannah what had happened...

Continue the story: Elements you can chose to use from as inspiration: use at least 3 of the elements below:

Describe what had happened to James:

- How did he end up there?
- How did he look? Was he bruised? Scared? Pale?
- What did James remember from that night?
- Was he alone?
- Where had he been before this happened to him?