Master Thesis in Business Administration (60 credits) [Magister]

Upper Secondary Schools into the future –

How do artificial intelligence (AI) language models, such as ChatGPT, impact teachers’ ability to develop pupils’ skills and knowledge?

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Abstract

This study focusses on artificial intelligence (AI) in education, AIEd, and focusses on how AI language models, such as ChatGPT, impact teachers’ ability to develop the pupils’ skills and knowledge.

Key words

Artificial Intelligence, AI, Artificial Intelligence in Education, AIEd, Assessment, Education, Examinations, Grades, Learning, Pupils, School, Students and Teacher.

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1. Introduction 1

1.1. Background/Topic 1
1.2. Problem discussion/Problem analysis 2
1.3. Research question 6
1.4. Purpose 6
1.5. Thesis disposition 6

2. Secondary sources 7

2.1. Literature review 7
2.2. Search terms used in search of secondary sources 13

3. Methodology 14

3.1. Knowledge interests 14
3.2. Ethical, environmental/ecological, economical & social sustainability considerations 14
3.3. Disclosure of competing interests 15
3.4. Source criticism 15
3.5. Selection of interviewees & school 16
3.6. The qualitative methodology choices & actions 16
3.7. Analysis method 19
3.8. Validity 20
3.9. Reliability 20

4. Empirics 21

4.1. Empirics of this research 21

5. Semantic thematic analysis 43

5.1. Theme #1: AI language models bring an ending to home assignments 43
5.2. Theme #2: The use of AI language models may have an impact on education 44
5.3. Theme #3: Use of AI language models may offer a learning opportunity – both for pupils and teachers – but not always what was intended 46
5.4. Theme #4: AI language models may have an impact on examinations 48
5.5. Theme #5: AI language models may have an impact on teachers’ assessment of the pupils’ skills and knowledge 49
5.6. Theme #6: AI language models may have an impact on the pupils’ grades 51

6. Discussion, Conclusions & Future directions in research 53

6.1. Discussion 53
6.2. Conclusions 54
6.3. Future directions in research 55

Reference list

Appendices

Figure 1. Teacher’s role in the AI era (Allegra et al., 2023).
Interview protocol for language teachers at Upper Secondary School.
List of abbreviations and terms.
1. Introduction

1.1. Background/Topic

On November 30, 2022, OpenAI (co-founded by Elon Musk and others in 2015) released a new artificial intelligence (AI) model: ChatGPT (Chat Generative Pre-trained Transformer) according to Aubignat & Diab (2023).

The introduction of artificial intelligence in education (AIEd) is likely to have a great impact on the lives of children and young people. (Leaton, 2020). However, as it currently stands, ChatGPT runs the risk of positioning itself as the ultimate epistemological authority, where a single truth is assumed without a proper grounding in evidence or presented with sufficient qualifications as put forward by Cooper (2023).

Like human intelligence, AI is notoriously difficult to define as a concept (Asatiani, Malo, Rådberg Nagbol, Penttinen, Rinta-Kahila & Salovaara, 2021). A definition of AI is the one made by Drew, Kambhampati, Monson and Ramesh “AI refers to the replication of human intelligence in machines that have been programmed to think and behave like humans.” (Aubignat et al., 2023). “In a nutshell, it’s a branch of computer science that creates ‘intelligent’ machines to work and react something like the human brain.” (Karsenti, 2019). The European Commission (EC) has identified AI as “the most outstanding and strategic technology for the 21st century.” European Commission (2018). Accordingly, many future jobs will require employees with a background in AI (Alonso, 2020).

These machines, deem Aubignat et al. (2023), can learn, reason, and solve problems in a manner like human cognition and can perform tasks that typically require human intelligence, such as language comprehension, image recognition, and decision-making.

Makarius, Mukherjee, Fox, Fox (2020) state that AI is increasingly being adopted by schools, yet implementations often are carried out without careful consideration of the teachers who will be working along with it. If teachers do not understand or work with AI, it is unlikely to bring value to a school. As intelligent systems continue to evolve and become more pervasively adopted by schools for a broader range of tasks, they will change teacher roles and the nature of the AI-teacher relationship also is likely to become more complex.

There are two clear standpoints, according to Rensfeldt & Rahm (2023), in the debates and efforts to automate and replace the teacher; both are essentially about whether human factors are problematic or desirable. One side of the argument is about replacing human judgment with automation, creating a more legally secure, impartial, and fair judgment by removing emotions and uncertainties. The other argument is that the core parts of teachers’ work cannot be automated but also that some automation can free them from tedious routine tasks and make more time for them to do their most important work. Ibid concludes by saying when human bias and shortcomings become problems for education, these are often addressed...
through automation. Conversely, when imagined people-centered skills, such as empathy, creativity, or care, are put forward as important, then automation of these skills becomes the problem, while automation of the other more tedious tasks is put forward as a solution.

There are scholars that argue that the role of teachers, school and leaders in education will change since the introduction of AI in the educational field, reports Gocen & Aydemir (2020).

Piccano (2019) also expresses that it is not the AI or machines that will replace human work; rather, it is people with the ability to use smart machines or intelligent systems that will overpower those who do not. Roll and Wylie (2016), writing about the role of teachers, assert that teaching in the existing context will not stay the same any longer: thus, teachers should assume the roles of mentors, teaching their students lifelong skills, interaction, going out of their comfort zone, and focusing on life problems.

AI for education includes excitement and promising developments for schools. It is important to manage the new developments by carefully discussing the context and effects expressed by Gocen et al. (2020). AI technologies are an exciting area for humankind; however, it is not a cure for everything or an improvement that will bring absolute good. Therefore, the legal, ethical, pedagogical, psychological, and sociological harms and benefits are to be considered. Since it is humanity that is most affected by technology, it is important that this entire process is carried out on a legal basis, so as not to harm anyone emphasize ibid.

Since the technology development of AI is very fast and the future is in the hands of today’s pupils, the question of how AI is to be integrated in the education of teachers is, I conclude from what is said above, a relevant, profound and urgent matter within schools.

The ambition and objective with this thesis is through semi structured deep interviews with language teachers at an upper secondary school to understand how AI language models, such as ChatGPT, impact teacher’s ability to develop pupils’ skills and knowledge.

1.2. Problem discussion/Problem analysis

Education plays a critical role in efforts to make teachers and future pupils AI-ready. Bridging the AI skills gap goes beyond the adoption of increasingly powerful technologies to facilitate learning. It also means rethinking the content and methods used to deliver instruction at all levels of education according to Pedro, Subosa, Rivas & Valverde (2019).

As early as in the 14th century Ramon Llull described his concept Ars Magna, a concept for implementing thought and reasoning processes in an intelligent machine. Humble & Mozelius (2022) point out that the idea of building intelligent machines has been around for centuries, with a new wave of promising AI in the twenty-first century. AI in education is a young phenomenon that has created hype and promises, but also been seen as a threat by critical voices. As emphasized by ibid there have been rich
discussions on over-optimism and hype in contemporary AI research. Less has been written about the hyped expectations on AIEd and its potential to transform current education. There is huge potential for efficiency and cost reduction, but there are also aspects of quality of the education and the teacher role.

AI systems with built-in learning components must undergo some level of socialization to alter processes and procedures for their unique operating environment. This may, as put forward by Makarius et al. (2020), necessitate such a system altering some of its activities using learning techniques to provide the best level of collaboration with stakeholders. For an upper secondary school, with youths in the age-span 16-19 years old, the stakeholders primarily include the pupils and the teachers but also the pupils’ parents, school leaders, principals, and owners.

What happens when a system suggests something that a lifelong teacher sees as foolish? Will the system or the teacher be given favor? This is an example of implications of AI and school scholarship which belongs in a future research agenda as expressed by Makarius et al. (2020). They then continue asking what weights should be given to such systems as they gain increased control of various processes. How can one implement proper controls in a decision-making process when an AI system encounters an abnormality that requires human interaction? Future scholars should explore how principals manage the shrinking gap between AI and teachers’ capabilities according to ibid.

The work of Makarius et al. (2020) takes initial steps to develop a novel socialization framework that can be used by researchers and managers alike in studying how to successfully integrate AI into schools. Effective socialization and integration of AI will allow schools to rise with the machines rather than against them; and advance a process that articulates how best to assuage the teachers concerns associated with AI systems and gradually adopt, adapt and assimilate them for complete transformation leading to valued outcomes for the schools.

Makarius et al. (2020), identified boundary conditions related to people and situations that mitigate or enhance the likelihood of AI-teacher integration success. As the boundaries between teachers and AI continue to blur, it may be time to redefine traditional work designs and processes to better guide future teachers’ experiences.

A study launched by Gocen et al. (2020) examine what possible scenarios there are with the arrival of AIEd and what kind of implications it can reveal for future schools. The results in the study show that schools and teachers will have new products, benefits, and face drawbacks with the arrival of AIEd, says ibid. The findings point out some suggestions for use of AI and prevention of possible problems. While participants generally seem to have positive perceptions towards AI, there are also certain drawbacks, especially highlighted by teachers and academicians, regarding the future of
teaching.

Gocen et al. (2020) says the in-depth development of AI will affect many situations, from restructuring of the social order in the broadest sense to the education and administration processes in classes and schools. Schools that are expected to adapt to the digital age and embed 21st century skills in their main agendas are some of the main institutions that could be most affected by the development of AI. With more usage of AIEd, major transformations can be foreseen in the education systems and their processes.

AI and big data technology provides a strong technical support for personalized learning according to Chang & Lu (2019). However, in student-centered learning mode, the main body, students, of education activities becomes more prominent, so students’ participation is a key element to determine teaching effect directly. The teaching system is built with a variety of advanced technologies. Its biggest challenge is not the technology itself, but the students are in “passive acceptance”, lacking active participation. To go beyond technical rationality and to return to educational nature is the key core of the AI education from concept to landing and is also a realistic difficult problem of large-scale application. The perspective of the research of ibid is to understand students to follow people-oriented cooperation concepts, study students’ participation from motivation and epistemic beliefs, and provide experience, methods, and theory for reference to integrate AI into education and promote personalized learning.

Student-centered personalized education is the core of contemporary educational ecology. No matter what kind of technology teaching mode is used with, the biggest challenge is that students are in "passive acceptance" and lack active participation. In the student-centered personalized learning mode, students’ participation is the most important core part. Therefore, the analysis of key factors affecting students' participation in learning and the study of strategies enhancing participation are the key to effectively improve the teaching effect and promote the better development of students. Big data and AI technology provide strong technical support for the implementation of these strategies. Meanwhile, the study also provides the theoretical support for integrating AI technology into education as claimed by Chang et al. (2019).

It is likely that students’ motivation to interact and learn with AI technologies will be affected by how well such technologies are applied in practice. It is therefore crucial, according to Chiu, Moorhouse, Chai & Ismailov (2023), to explore the relationship between student motivation and AIEd. In addition, understanding the teacher’s role, as a core facilitator of student motivation and academic progress, in mediating and supporting learning with AI technologies in the classroom, will provide a clear understanding of how such technologies could be used in practice.

The future holds the promise of creating technologies designed specifically for learning and teaching by combining the power of AIEd with
advances in the field of robotics and in the increasing use of sensor devices to monitor our surroundings and actions, claims Timms (2016). Let us imagine for a moment a future in which the technologies used in learning are designed for that purpose and not just adapted from business machines, as to a large extent today. What would a teacher want help with within the classroom? What would a student want from a learning system? And how will AI be integrated in this future world of education? Over the years until around 2040 robots will appear in many aspects of our lives and it seems inevitable that education is a sector where they could be very helpful. Ibid states that the next 15-20 years will develop what he would like to call Educational Cobots. A cobot is a robot co-worker that works alongside humans to help them perform their work, so an educational cobot is a robot designed to support human teachers.

Edwards & Cheok (2018) goes a step even further, suggesting replacing human teachers with robot teachers. Achievement in dialogue systems and conversational capabilities in robotics agents combined with affective computing holds the promise of a robust system that can overcome the current limitations of machines in performing many of the duties of an independent teacher. When the current progress in AI, coupled with machine learning, and especially deep learning approaches are combined, the realization of a completely developed or independent robot teacher may be much nearer than it is currently being imagined. The added advantages of cheaper and higher quality service will further promote the achievement of reality much faster.

To finalize their futuristic view Edwards & Cheok (2018) state that the economic benefit of tireless labour inspires the need of teachers who are unlimited by natural human demands, highlighting consideration for the affordances of robotics and AIEd, as currently obtainable in other areas of human life. However, though we believe that independent robot teachers are possibilities soon, and that they will cause a disruption of the educational landscape, including the loss of many jobs related to teacher roles, we envisage that new types of roles/jobs will emerge to replace these ones. Hence, all stakeholders must begin to figure out what such roles might entail and what skills will be required for them.

My conclusion is that there are several recent studies performed for K-12 schools but not conducted enough research of specifically upper secondary schools in relation to AI, since the introduction of ChatGPT. Therefore, I hope my thesis will shrink the knowledge-gap in answering the research question and fulfilling the purpose of the thesis below.

From the technological development within AI in general and more specifically AIEd as described above I realize that the research question as stated below in a very large extent is a result of the recent introduction of ChatGPT and all the implications it brings to upper secondary school and the teacher’s ability to develop pupils’ skills and knowledge. In the case of robot
teachers, the research question would possibly instead be evaluating the robot teachers’ ability to develop the pupils’ skills and knowledge instead.

1.3. Research question

\textit{RQ1: How do artificial intelligence (AI) language models, such as ChatGPT, impact teachers’ ability to develop the pupils’ skills and knowledge?}

1.4. Purpose

The purpose of this research is to contribute with an understanding of how to develop pupils’ skills and knowledge through successfully integrating artificial intelligence in education (AIEd) in an upper secondary school.

1.5. Thesis disposition

The thesis is structured as follows: Section 1. Introduction includes background/topic, problem discussion/problem analysis, the research question, purpose and thesis disposition. Section 2. Secondary sources introduce the literature review and the search terms used in search of secondary sources. Section 3. Methodology introduces the methodology foundations of the research. Section 4. Empirics will go through the empirics of the research. Section 5. Analysis put in place the semantic thematic analysis of the research. Section 6 includes the discussion, conclusions and future directions of research.
2. Secondary sources

2.1. Literature review

In recent years vast research has been conducted within the area of AIEd. For example, Allegra, Città, Gentile & Perna (2023) make a recent and systematic analysis of the literature which analyzes the change in the teacher’s role triggered by the integration of AI into educational systems. The picture offered by the systematic analysis of the literature conducted in their study reveals a less than total awareness of the urgency with which the challenges imposed by AI in the educational field must be addressed. Therefore Allegra et al. (2023) proposes a manifesto to guide the evolution of the teachers’ role according to the paradigm shift concept proposed by Kuhn (1962) in the scientific field.

Technological “evolution” has always, as put forward by Allegra et al. (2023), influenced the world of education by providing new opportunities and challenges for those who form such a foundational part of it as schools and their key players such as students, teachers and school leaders, and the students’ families. Nonetheless, say ibid, what is missing and what prompted them to commit the research is the need to focus analytically on the paradigm shift in the role of the teacher introduced by the AI era.

Teachers have always been called upon to change their teaching approach by attempting to integrate new technology rather than rejecting it out of hand. However, even at first glance, the potential changes introduced by AI signal a radical change, what can be called a genuine paradigm shift deem Allegra et al. (2023). Therefore, their research aims to provide a systematic view of the revolution, not by simply offering an overview of the various AI-based tools already available but by trying to grasp the profound changes in the role of the teacher the AI may entail.

The study of Celik (2022) indicates that it is not only technological knowledge (TK) that the teachers need to get the ability to use AI to the fullest. If teachers have more knowledge to interact with AI-based tools, they will have a better understanding of the pedagogical contributions of AI. Further, TK allows teachers to better assess decisions of AI. However, only TK is not sufficient educational integration or to effectively use of AI-based tools in education. For teachers to deploy AI in education efficiently. TK is meaningful when it is combined with pedagogical knowledge (PK), reflected in technological pedagogical knowledge (TPK). When adding the content knowledge (CK) ibid developed the TPACK framework including CK, PK and TK.

In addition to the TPACK framework by Celik (2023) Edwards, Edwards, Spence, & Lin (2018) emphasize that the need to study human-
machine communication (HMC) in instructional contexts will continue to grow as AI and social robots’ instructors find their way into a variety of teaching and learning contexts, within and outside traditional classroom walls, as co-instructors. HMC can unsettle our basic assumptions and expectations about communication and instruction by adding a new type of teacher, perhaps being perceived more as a threat than an opportunity. Yet scholars invested in communication and instruction have much to add to the conversations about possible design, implementation, and evaluation of these new machine agents in the classroom environment.

Reducing the student-teacher proportion toward the utopian goal of one-to-one interaction has historically been one goal that has driven the implementation of AI systems in the educational sector, claim Allegra et al. (2023). In addition to this underlying objective the first area allows us to explore all the new monitoring and interaction management scenarios AI present.

Regarding teaching strategies, the innovative challenge of teaching and learning activities connected to integrating new technology into the educational arena is even more prominent if we consider AI’s exponential growth. AI also impacts the educational content either regarding the need for new professions revolving around the world of AI, as well as considering the possibilities of such techniques to support the creation of ad-hoc content customized to the needs of learners (Allegra et al., 2023).

In addition, the assessment-centered approach is one of the critical goals of professional development in the AI era. AI grant for overcoming the limitations of the traditional summative assessment, making it feasible to move toward continuous formative assessment fully integrated into the teaching process. Allegra et al. (2023) reports that teachers need professional development opportunities that support them in the transformational process and satisfy these needs.

The relationship between teachers and learners, with the interactions that arise and develop within it, is one of the most critical elements in the context of the educational paradigm. The literature analyzed in the research extensively points out how technological developments, specifically the advent of the AI era, have profoundly challenged the teacher-student-teacher interaction models to which we are accustomed, emphasize Allegra et al. (2023). Clearly, the human factor is an irreplaceable characteristic of the teacher. The teacher is a guide and reference for students’ growth and a compass for their ethical and moral development. In this sense, these tools, which at first glance seem averse to the teacher, are facilitators of the quality interactions that distinguish the teaching process.

A smart or future classroom, claim Allegra et al. (2023), is intended as a highly integrated environment with sensors and devices capable of automatically controlling and acting on environmental factors, such as temperature and lightning, enhancing communication and real-time interactions both between students and between students and teachers, by fostering inter-group participation and teamwork together with resource sharing, and overcoming the boundaries and limitations explicitly created by the traditional classroom environment.
AI offers the opportunity to create new occasions of interaction that are free from the timing and structure of traditional school organization and can center the attention on those factors that make a person a teacher, state Allegra et al. (2023). These new moments and modes of interaction can be a key stimulant for implementing proper educational ways tailored to the needs of individuals. Teachers need to encourage and nurture students’ passion for learning, capacity to think critically, and ability to navigate the immense information and educational resources surrounding us.

Rather than seeing AI as a competitor, educators need to learn to coexist with it, moving from binary (learner-student) to a ternary (learner-machine-student) relationship in which interactions are mediated, modified, and occasionally initiated by technology in a way that is amplified, rather than reduced. AI-based tools such as Intelligent Tutoring Systems (ITS), chatbots, and robots are often seen as a danger and an attempt to replace the role of the teacher, when in fact the literature shows us that they can be great tools through which to build new opportunities for cooperation, developing the current state in both quantitative (more actions) and qualitative (more productive interactions) terms, express Allegra et al. (2023).

Additionally new opportunities are offered to us by the development of smart classrooms and new school environments that are extensively integrated with technology and AI, challenging us to rethink the paths in which we teach and learn. Specifically, one of the most disruptive sides of AI is to provide agency to technology, transforming the human-machine interaction from unidirectional to bi-directional, report Allegra et al. (2023). This is in line with Leaton (2020) who goes even further suggesting social robotics as “the digital classroom assistant”. Robotics is an interdisciplinary branch of engineering that develops physical apparatus that can be used as a substitute for humans.

As today and the future, machines autonomously and independently start interactions equal with humans, and this new way of interacting necessitates extensive ethical and methodological considerations. Given all this, says Allegra et al. (2023), the teacher must revise their role, learning to coexist with AI and technology, look at it as an associate and co-worker rather than an opponent.

The change of teaching processes and models from teacher-centered to learner-centered through AI liberates the teacher from veral of those activities that students used to perform and that needed his or her direct help or supervision, say Allegra et al. (2023). The focal point of “personalized learning” makes it possible to build and implement a systematic teaching model that together with the individual student’s personalized learning ways that goes beyond the classroom environment, pre-class, in-class, and after-class.

The analysis of the literature made by Allegra et al. (2023) regarding the teaching methods and strategies has shown that a change of the educated process on the student is not, however, matched by a change in scientific reflection on specific important dynamics profoundly linked to teaching practices. It appears that, due to the intervention of AI, teaching methodologies and strategies change, but; despite the reflection relating to
the wide range of possibilities that can be implemented thanks to AI technology has in depth been expressed, there seems to be an inadequacy of a sufficient and systematic reflection on the cognitive implications that these new methodologies require or will require. The role of the teacher, in this context, is not relegated to the background, but the description of the new practices that can be applied seems to confine it in limbo.

Essential issues such as the changes that occur in the cognitive processes of both the student and the teacher - problem-solving processes, decision-making and critical thinking - as a direct consequence of the action of these new methodologies are not examined in depth. The teachers’ perception of novelty is not sufficiently thematized deem Allegra et al. (2023). It is not an easy task to deduce from the papers what skills required of the teacher should be to welcome such a change. And there is no in-depth and exhaustive thematization of the new skills that the teacher, thanks to the new methods and strategies, will have to encourage and nurture in the student.

Connected to teaching strategies is, naturally, the teaching content. The customization of teaching content given at hand by AI technology implies that it needs to be, in contrast to the past, automatically generated, explorable, flexible, and manipulatable. This can help teachers to create customizable teaching content that can increase students’ sense of personal autonomy and fulfillment. Nevertheless, the context shows a clear tendency to conceive a new role of teacher. The landscape that emerges about teaching content seems to be built on two focuses: The student and 2. The AI technology that enables the personalization of resources, Allegra et al. (2023) points out.

Between these two cores would move the teacher who, thanks to the technology he or she has at his or her disposal, can analyze student data to implement the personalization process or, maybe, select, according to teaching objectives, the resources to be included in the courses report Allegra et al. (2023). There are scarce references to the crucial phases, didactic implications, and problems of the customization processes of resources, and what role the teacher can play in them. There is an inadequacy of in-depth focus on the centrality of the teacher in giving methodological direction to the process of constructing teaching content, from design to delivery, and on the skills that the teacher must obtain in the management of AI technology both in the phases of the teaching content generation process and in the delivery stage.

The literature review made by Allegra et al. (2023) shows that evaluation is one of the most debated topics when considering the application of AI in educational processes. Firstly, assessment has intrinsic value as it is considered a critical and key step in teaching methods. Additionally, AI-based assessment exploits models and techniques in which AI has proven to be particularly effective, such as classification and modeling tasks. The analysis and research of ibid suggests that AI and learning analytics can help teachers in various activities and positively influence teaching processes. What’s more, evaluation also plays an essential role in other processes related to the application of AI in education, such as the personalization of
student learning ways. AI integration in assessment processes could enhance it by extending what, when and where, thus in what context, to evaluate the student. Several studies, claim ibid, suggest how AI can support the teacher during the assessment process by cultivating a greater focus on learning processes and individual student development and enabling faster assessments and formative feedback.

In line with the study made by Allegra et al. (2023) the study of Celik, Dindar, Muukkonen & Järvelä (2022) showed that AI has been reported as generally beneficial to teachers’ instruction. Teachers can take advantage of AI in their planning implementation and assessment work. AI assists them in identifying their students’ needs so that they can determine the most suitable learning content and activities for their students. Another study in accordance with the study of Allegra et al. (2023) is Liu, Chen, & Yao (2022) who state that AIEd changed the subject of teaching and learning. For teachers, AI technology can be used as an assistant to help teachers with intelligent lesson preparation, answering questions, and grading assignments, which provides teachers with more energy and time to know each student better. AI technology can also act as a companion to learning, indicating the problems that teachers face during the teaching process at any time and giving suggestions for improving teaching. AI technology can also, ibid point out, act as a virtual student to help teachers practice in-class teaching in advance or prepare for demonstration teaching.

The picture offered by the systematic analysis of the literature conducted in the study made by Allegra et al. (2023) reveals a less than total awareness of the urgency with which the challenges imposed by AI in the educational field need to be addressed. For this reason, ibid proposes a kind of manifesto, see figure 1., below, for guiding the change of the teacher’s role that can reaffirm a “new centrality” of the role, forcefully countering the idea that it can be degraded to a mere mediator or tutor of a path built in by “an artificial intelligence”. This urgency originates from the enormous difference introduced by AI compared to other technologies from the point of view of agency. The autonomy that characterizes such technologies, their ability to be initiators of interaction with students, and the complexity of the tasks that AI can already perform and increasingly will be able to do, imposes an evolution of the teacher’s role. An evolution that can preserve, or perhaps restore, that beneficial authoritativeness that makes the teacher the point of reference in the student’s growth path.
Such a manifesto must, as outlined by Allegra et al. (2023), start from a few main points:

Shifting the teaching objectives from a disciplinary to a “humanistic” approach by focusing on the individual as a person and as a social group member. The teacher should play a more significant role in shaping people, their brains, souls, and moral values than before.

Elevating the level of the challenges posed to our students. In the AI era, the teacher can no longer ask students the same outcomes that they were used to asking in the past. We need to demand a quantum leap toward students being able to actively learn, discover problems, communicate, interact, and deal with complex problems.

Fostering the development of students’ 21st-century skills. Allegra et al. (2023) argues that teachers should focus on social skills like collaboration, autonomy, and exploration as well as the high-level cognitive processes that characterize them (e.g., critical thinking, problem-solving, etc.). This argument of Allegra et al. (2023) is in line with Lameras & Arnab (2022) who express that human-centered and learning-focused AIEd competency frameworks are needed to help teachers to plan, self-assess, and reflect on existing and new skills for empowering the evolution of the teacher’s role in terms of facilitating students to acquire creative mindsets, becoming empathic, and transfer learning to other contexts through learning what makes sense to them.

And finally, Allegra et al. (2023) points out leveraging the opportunities AI provides for designing and implementing innovative teaching methods, managing workload, and extending and enhancing the educational space-time continuum.

Fostering this paradigm shift cannot work only through groundwork on the technological skills of the teacher deem Allegra et al. (2023). Lameras...
& Arnab (2022) however underline the importance of helping teachers to develop necessary digital competencies and skills for using AIEd applications and tools in ethical and informed ways is central to enhancing the student learning experience and attainment of learning outcomes. In line with Lameras & Arnab (2022) the study of Salas-Pilco, Xiao, & Hu (2022) high-light that in recent years, AI and learning analytics (LA) have been introduced into the field of education, where their use has profound potential to enhance the teaching and learning processes. Researchers have focused on applying these technologies to teacher education, as they see the value of technology for education.

2.2. Search terms used in search of secondary sources

All scientific articles searched for were published within the last five years and were within one area of subject of: Business & economics, Psychology, Anthropology, Pedagogic or Sociology.

Search #1, March 2023. The title of the articles included the two terms Artificial intelligence AND Sociotechnical. Number of available articles were 12, of which 10 were printed.

Search #2, March 2023. The title of the articles included the two terms Artificial intelligence AND School. I briefed the first 25 of the 145 articles available and printed 7.

Search #3, April 2023. I went through all references to the article Artificial Intelligence in Education and Schools, Gocen & Aydemir (2020). I found 13 articles. After briefing them I printed 7 in addition to the article Do we still need teachers? Navigating the paradigm shift of the teacher’s role in the AI era, Allegra et al., published 2023.03.31., which I found when I searched for one of the 13 articles. I reference several times in my thesis to the article by Allegra et al. since, according to my assessment, it is both newly published and is highly relevant to this work.

Search #4, April 2023. The title of the articles included the two terms Artificial intelligence AND School. I briefed a great number of the 152 available articles and printed 3.

Search #5, April 2023. The title of the articles was included two terms Artificial intelligence AND Teacher. I briefed a great number of the available 131 articles and printed 11.

Search #6, April 2023. The title of the articles included the two terms Generative Artificial Intelligence AND ChatGPT. One article available, which I printed.
3. Methodology

3.1. Knowledge interests

I have worked as a teacher in an upper secondary school in Sweden, with 16-19 years old youths, for more than 5 years. As such I am curious to expand my knowledge in what way AI language models, such as ChatGPT, shape and change the work for the teacher and how the job changes because of integrating AI language models into the education of upper secondary school, in developing the pupils’ skills and knowledge.

3.2. Ethical, environmental/ecological, economical & social sustainability considerations

Discussions regarding ethical principles in civics research are usually pertinent within certain questions. These ethical questions are as follows, Bryman & Bell (2017, 146) b.
- If there are any damage for the participants in any way and confidentiality?
- If there are lacking any consent in any way from the participants?
- If there are any intrusion in the participants private life?
- If there are any fraud, false promises or concealment of important information?

In order to act ethically in the research in this work, the reader must not be able to connect any of the interviewees’ answers to any interviewee and therefore the answers are presented anonymously. The same is with the upper secondary school in which the research was conducted, it is also not presented in the study.

The environmental/ecological impact has been held back to a minimum. Paper waste has been reduced to a minimum and paper has only
been printed out when really needed. The same for travel, in connection with the thesis, has only been done by walking or train. Only three round trips from Falköping to Växjö have been conducted by train for the seminars. This also brings the economic impact to a minimum since we used Zoom-meetings for the introduction to the thesis and for one seminar. The four meetings with the supervisor were also held on Zoom which was environmentally/ecologically sound and economically very effective.

The interviews were booked well in advance and on all interview occasions we were sitting comfortably in a suitable room. The last two respondents were giving a hint about the interview time, app. 35 min, a time-estimate from the time from the first interview, just so they had a feeling of control of the time and did not need to stress through the questions and in given answers. The dialogue and meetings with the opponents and examiner through the seminars have been executed in an open and mutually respectful atmosphere. The same for all the contact with the supervisor.

3.3. Disclosure of competing interest

I declare that the research was conducted in the absence of any commercial or financial relationship that could render a potential conflict of interest.

3.4. Source criticism

I found all the sources through my account at Gothenburg University library and its Super search (Supersök). I primarily looked for peer-reviewed scientific articles in scientific magazines. The Super search consists of:

- All printed material that the library bought after the year 1976.
- All e-books of the library.
- Articles from the e-magazines that the library has a subscription for.
- GUP, the database of publications at the University of Gothenburg.
- Gupea, the electronic archives with theses and essays in full text at the University of Gothenburg.
- KVINNSAM, interdisciplinary database with a genus perspective.
- Magazines, both printed and electronic.
- Databases, bibliographic and full text.
- Notes.
- Sound and video recordings.

Since my earlier experience reading scientific articles within AI, languages models, AIEd and subjects nearby are very limited I have little, close to none, experience valuing the different authors credibility within the
field of knowledge.

The purpose of the articles is to bring more understanding and knowledge within the field of research which all bring some value for the study. Some articles with only a small and others with larger contribution.

All references in the reference list are peer-reviewed scientific articles, except reference 12 which is a technical report for the European Commission, 17 a book by Khun, 22 is a document published by UNESCO (Paris) which is UN’s organization for education, science, and culture and finally 28-37 which all are from a business economic research book by Bryman & Bell. The level of complexity in the references are well suited for this Master Thesis.

Since the development of the field of AI is developing at a very fast pace the focus has been on using primarily scientific articles not older than five years. Only five references (13, 15, 25, 27 & 28-37) are older than five years of which 28-37 are a methodology book which, I would say, does not render such a swift change of content. Eleven of the remaining 23 scientific articles are from this or the last year (2023 & 2022), which leads to the references to a large extent being recent.

The scientific articles are, to the best of my knowledge, trustworthy to a large extent, for the reasons mentioned above. The references cover, from different starting points, research that the analysis of the empirics could take brace on when answering the research question and fulfilling the purpose of this Master Thesis.

3.5. Selection of interviewees & school

The selection of interviewees was made by a criteria-based selection as described in Bryman & Bell (2017, p. 407) d., which means interviewees are chosen by meeting certain selection criteria. In this study, the criteria are being a language teacher at one and same upper secondary school since, I was understood by some colleagues, the language teachers are the ones who face the largest impact of all teachers when coming to the introduction of ChatGPT. Besides being an experienced language teacher at the upper secondary school I did not let any other selection criteria, such as age, sex or years in the profession, be part of the selection process. It is also a a priori-selection, which, stated by ibid, means the criteria for the selection of interviewees is determined at the start of the research and are kept the same through the whole time of the investigation.

3.6. The qualitative methodology choices & actions

In this study a qualitative data analysis is used through a semantic thematic analysis through the voice recorded interviews. As described in Bryman & Bell (2017, 42-46) a. the choice of theoretical approach in this
study is an abductive theoretical approach. Similarly, to deductive and inductive approaches an abductive approach is used to draw logical conclusions and develop theories over the reality.

An abductive approach is however used since it is to be told not to have the limitations of a deductive or an inductive approach. The limitations, according to ibid, when it comes to a deductive approach is that it trust itself on uniquely strict logical approach concerning test of theories and the falsifying of hypotheses and that it becomes a problem as it is not clear of how to choose the specific theory that are meant to be tested.

The difficulty with the inductive approach is about the criticism that no number of empirical data necessarily can enable a stated theory. An abductive approach suggests a third alternative that can overcome the limitations with the deductive and inductive approaches. The abductive approach starts with a problem or a surprise that is to be explained. Problems and quarrels can arise when scientists are facing empirical phenomenon that current theories can not explain.

An abductive approach is that you are trying to identify the conditions that could to the phenomenon less puzzling and to make surprising facts to something clearly and naturally. An abductive approach means that scientists are choosing the “best” explanation among competing explanations and interpretations of data states ibid.

Bryman & Bell (2017, 452-453) e., explain thoroughly the qualitative choices and implications of those choices. The approach used to be considerably less structured in qualitative research than in quantitative research. In qualitative research the interest is focused on the point of views of the respondents. Furthermore, in qualitative research it is desirable to let the interview move in different directions in his/her thoughts while answering, as this brings knowledge to what the respondent experiences to be relevant and important. In qualitative research the researcher seeks ample and detailed answers.

In this study the decision was to use a semi structured interview technique. Bryman & Bell (2017, 454) f., let us know that in this interview technique the researcher uses a list of relatively specific themes which are to be investigated, please look in the Appendix for reading this works interview protocol. The questionnaire starts with a few multiple questions to enter the work smoothly. In addition, the interviewee has great freedom to formulate the answers in his/her own way. The questions need not be in the intended order as in the interview protocol. Questions which are not part of the interview protocol may be asked, if the interviewer asks a follow-up question for something said by the interviewee. But most of the time, as during the interviews in this study, the questions are asked in the intended order.

I recorded the interviews through the voice memo-app on my iPhone. The quality of the sound was more than sufficient. Recording is a crucial methodologic choice when coming to qualitative research and its’ detailed
analysis of the answers, as put forward by Bryman & Bell (2017, 460-461) g., and that you can grasp the interviewees’ answer in his/hers answers in their own words.

Every single question was read out loud, during the interviews, and handed over on a single piece of paper, for every numbered question, to make sure the interviewee understood the question in full. As mentioned above at 3.2., the last two respondents were giving a hint about the interview time, app. 35 min, a time-estimate based upon the time from the first interview, just so they had a feeling of control of the time and did not need to stress through the questions and in giving the answers. All three interviews were conducted in calm surroundings, in a separate room suitable for an interview, and no risk for anyone hearing what was said in the room. In addition, all three interviews were conducted in an open and mutually respectful atmosphere.

In order to make sure the interviewees got a proper and as equal understanding of the terms as possible in question #3. What is your attitude towards artificial intelligence (AI) algorithms and language models, such as ChatGPT? Please, choose the choice that best corresponds to you. The choices are Innovator, Early adopter, Early majority, Late majority and Laggard. For question #4. How do you describe AI’s, in the form av algorithms and language models, relation to you? Please, choose the choice that best corresponds to you. The choices are Substitution, Supplementary, Complementary, Symbiotic, Independence and finally (Technological) singularity. These are the descriptions I gave to the interviewees prior their answers.

- Innovator: The person responsible for realizing an innovation.
- Early adopter: Early adopters are those individuals that use new products before the majority of people.
- Early majority: A stage in the diffusion of a new technology that represents the first sizable segment of a population to adopt the innovation.
- Late majority: The large group of consumers who buy or use new products only after others have tried them first.
- Laggard: Laggards are the last people in a population to adopt a new system or product.
- Substitution: The action of replacing someone or something with another person or thing.
- Supplementary: Things are added to something in order to improve it.
- Complementary: Mutually combining in such a way as to enhance or emphasize the qualities of each other or another.
- Symbiotic: Symbiosis refers to the close relationship amongst two different organisms or living things belonging to different species.
- Independence: Freedom from the control, influence, support, aid, or the like, of others.
- (Technological) singularity: The point in time at which artificial intelligence surpasses human intelligence, which could mean rampant technological development with potentially fatal consequences for human existence.

Concerning question #3 I gave the respondents the opportunity to mark more than one alternative if it was hard to pick only one.

I also made the ethical choice not to reveal the number of years the interviewees have been employed at the upper secondary school in order not to reveal their true identity even for their employer.

To conclude, Kvale (referred in Bryman & Bell (2017, 461)) introduce the characteristics of a successful interviewer: 1. Familiar with the focus of the interview, 2. Structured, 3. Clear, 4. Considerate, 5. Sensitive, 6. Open/Flexible, 7. Governing, 8. Critical, 9. Present/Have a good memory and finally 10. Assist with interpretations. Bryman & Bell (2017, 461) include 11. Be in balance and 12. Ethical consciousness. I am overall pleased with the way the interviews were conducted, as said above, but will in the analysis analyze what was explicitly good and what I can improve for future research.

3.7. Analysis method

Before exploring the findings through a semantic thematic analysis, some insight into these concepts is in place. Bryman & Bell (2017, 556-558) suggest a two step-process in identifying the key themes of a study. In a first step, create a Framework, which describes as a “matrix-method based upon the data being ordered and synthesized” says Ritchie et al. (quoted in Bryman & Bell, 2017, 556-558). In a second step Ryan & Bernard (referred in ibid), recommend the following when looking for themes. 1. Repetitions (occurs several times), 2. Occurring typologies or categories, 3. Metaphors & analogies, 4. Transitions or change of subject, 5. Similarities and differences, 6. Linguistic connections, 7. Missing data and finally 8. Theoretical relation to the material.

The study started off by stating the research question:

**RQ1: How do artificial intelligence (AI) language models, such as ChatGPT, impact on teachers’ ability to develop the pupils’ skills and knowledge?**

Despite thematic analysis obviously often being used in connection with qualitative analysis, it is a remarkably underdeveloped procedure since there are few specifications that refer to the steps or details of the procedure. In rough features, as stated by Bryman & Bell (2017, 558), a theme is 1. A
category which the analysts identify on the foundation of the data at hand. 2. Has to do with the analysts’ locus of research, and as such certainly connected to the research questions. 3. Are built on codes retrieved from transcripts or field notes and finally 4. Gives the researcher a basis for a theoretical understanding of the data at hand, something that can lead to a theoretical contribution to the literature covering the actual locus of research.

Bryman & Bell (2017, 558) continue giving further insight into thematic analysis. A focus on repetitions is certainly one of the most common criteria in determining a pattern in the data, making sure it constitutes a theme. Repetition is, however, an insufficient criterion letting anything be called a theme. It is crucial that the repetition is relevant for the research question of the investigation and locus of research. Only because several interviewed individuals say the same thing it does not mean it is justifiable to view it as a theme.

Despite the prominent status of thematic analysis to conduct qualitative analysis, the approach lacks a clear and specified series of procedures. Thematic analysis can be used in several qualitative analysis methodologies, such as grounded theory, critical discourse analysis and qualitative content analysis. Bryman & Bell (2017, 558) continue by saying that it is this flexibility, that the thematic analysis can be used with several different qualitative data and approaches when it comes to qualitative data analysis, that certainly explain the popularity of thematic analysis, despite lack of a large extent of codification by the central procedures. Qualitative data analysis is a broader term than qualitative content analysis since it also consists different methods to analyze non-numerous data, including not only qualitative content analysis, but also methods such as thematic analysis and grounded theory.

In this study I started to read through all the transcribed interviews. Then I marked different sentences and phrases that I found relevant for my study with a highlighting pen. I did notes in the margin of the document in order to remember what was relevant in the sentences and phrases for the purpose of the study.

3.8. Validity

In Bryman & Bell (2017, 378-384) c. we can read that validity is about whether you observe, identify or measure what is intended to be measured. I would say the validity is good for this work since the questions are relevant to the area of research interest.

3.9. Reliability

In Bryman & Bell (2017, 378-384) c. we can read that external reliability is in what extent research can be repeated. In most cases it is hard
to meet this criterion in qualitative research, since it is impossible to “freeze” a social environment and the social conditions existing in the beginning of a study to make it repeatable in the way you usually intend. I would therefore say that the external reliability for this study is as good as it gets from the perspective it is a qualitative research method in this study.

4. Empirics

This study includes three deep semi structured interviews conducted with language teachers at an upper secondary school in Sweden. With the outset of the research question in 1.3. and the purpose of this thesis stated in 1.4. the hope is to provide some insights into the impact AI language models have on teachers’ ability to develop the pupils’ skills and knowledge.

The three respondents, Amanda, Bodil & Cecilia are all experienced language teachers at the selected upper secondary school. They all educate in the Swedish language in all levels at the upper secondary school level. The names indicate all respondents are females, which is correct, and is a fact I choose to pay no further attention.

I choose only to include answers from the three respondents, Amanda, Bodil and Cecilia, I recognize to be of any value to my work and further analysis and conclusions of this thesis.

In chapter 5. Semantic thematic analysis, 6 themes are presented. Number 1, 2, 3, 4, 5 and 6 are included in brackets in the text of 4.1. Empirics of this research and refers to respective theme in chapter 5. In this way you as a reader can see the connection between the empirics and the semantic thematic analysis when reading the empirics below.

4.1. Empirics of this research
The three respondents, Amanda, Bodil and Cecilia, are all certified and experienced language teachers at upper secondary school level at the chosen upper secondary school of this research.

Their attitude towards artificial intelligence (AI) algorithms and language models, such as ChatGPT varies all from Bodil who assessed herself being an early adopter; Cecilia who assessed herself being an early majority and Amanda who assessed herself being either or both late majority and laggard.

All three, Amanda, Bodil and Cecilia, appraised the AI’s, in the form of algorithms and language models, relation to themselves as being supplementary, thus being, as described in 3.6. The qualitative methodology choices & actions, things added to something in order to improve it. This means that all three respondents appraise the algorithms and language models adding value to the education in some way, but the education is not in a large extent dependent upon it.

When it comes to how the interviewees, in their own words, describe how your upper secondary school has onboarded this new type of resource and technology, both Amanda and Cecilia express that it’s every single teacher that maybe uses it. There have been some discussions between colleagues about it. But it’s not the way that the school as a unit uses it in any manner. The school as a unit, has taken no position in any way.

Bodil:

We had a meeting in which the school manager talked little about it and he said that we must reflect on our examinations (#4) and that we may no longer have home assignments (#1) any longer to the same extent. The pupils need to write the exams on sight (#4). He also said that the teachers may use it as a part of the education (#2), however, as mentioned, we may no longer have a lot of home assignments no more (#1). Moreover, I feel, there is mostly a talk between colleagues, about the fear of how we can really know, and colleagues feel that this is not the pupil him/her-self, but we can’t find anything of it on the web, and at that point get hesitative over who has written this.

The next question is, is there any specific onboarding process in place which all teachers are to follow, if not, would this be preferable, according to your point of view and in that case why?

Amanda:
We do not have anything that everyone must follow, but everyone needs to be aware that we can no longer leave the pupils with home assignments (#1), which are not locked to Exam, since an AI can even pass an exam test for a law school. All (teachers) must understand where we are in respect to it, but we do not have to work with it in any specific way (#2).

Bodil:

I do not feel that the school really has, it is mostly up to us (teachers). It is mostly like a recommendation, I felt like, in the meeting we had, that it should not be used that much as a basis for assessment (#5), that type of assignment. But we have not received anything in writing. It could be a good thing if we had used it in the same way, I believe. Some experience that they need to change the way they work, due to the danger, and some do not change the way they work. It can become a bit odd.

Cecilia:

Mmm ... A little bit. I believe it has started off a little bit. It is not the way that they have grounded it or the way we properly should relate to it, like this is the regulations we are to follow in the future. But it has certainly been discussed that the assignment to a larger extent must be done during the lessons in school and collecting the cellphones (#1). We work with Exam, which is a locked system, which works in a way that it is impossible to enter external homepages (#4). So (the pupils) will, to a larger extent, will have to work with “closed frames” and we really need to control it (#4). That type of discussion has started about what way we should handle it, but not in a way that there are any decisions made, but the process is absolutely initiated.

Next question is, what are your experiences in using AI algorithms and language models in your classrooms?

Amanda:

That I have never done. We have more Swedish where they learn how to write their own texts, are reading texts and learn grammar. I don’t know how I could add it (to the education).

Bodil:

I have most tried because I would like to know a bit how the pupils can use it, but I have in fact let AI robot write some questions to an analysis of a short story e.g. (#3) I have also asked it to summarize the genre of
horror novels because I didn’t find a schoolbook that did it in a good way. (#3) Since I know what’s correct, I can say that the text was good, and I have even given it to my pupils. (#3) For one short-story the questions to an analysis were very good, but then I tried to do the same for some more recent short-stories, then the questions were not relevant anymore. Then the AI robot even included characters and things that are not part of these short stories. So, you really need to be in control of the things (you work with). (#3) So, I absolutely check what it says, but I don’t have the courage fully to … I have used it a little bit, but, nevertheless, I must know my topic. I can’t believe it will replace me and take all it says for granted. (#3)

Cecilia:

I have not used it so much yet. A few pupils say … But yesterday when I had a tutorial there was one pupil who said “I have lost where the quotation comes from in this book, I really don’t find it anywhere. Then I searched for it on ChatGPT and then I found it. OK, but you could have asked before. Great! The situation was solved through it and in that case, it was a tool that worked in some way. It was used as a shortcut to find things. And it is generally used as a shortcut. (#3) If you don’t really have the energy to look up anything, then you go there. It is not so structurally used so far, but only used to raise some questions. (#3)

The next question is, could you please describe in what way, pros and cons, AI algorithms and language models have had/have an impact on your education?

Amanda:

I have mostly experienced drawbacks since I had an assignment regarding a book with questions that you cannot find on the internet. But they anyway used artificial intelligence to try to find the answers. And this I noticed immediately that it was. This was cheating. (#2)

Bodil:

The drawbacks are that I do not always trust that what I receive from the pupils is from the pupils themselves. (#2) Even if I let the pupils write in Exam, sometimes I want them to write not only in one lesson, but it also overlaps over several lessons, sometimes several weeks have I had an assignment in Civics 2. Of course, they can go and ask at home and from that get a lot of ideas. It has been an open assignment, but I also want them to search for sources. It is a part of the course to search for, collect and sift. So,
Of course, they could have asked a Chat Robot, I cannot be 100% sure. That is a drawback, I do not know, I cannot with complete certainty know that it is one of my pupils. (#2, #4) Then I have, a bit like that, I have tested it myself. I have noticed that I must raise follow-up questions to get detailed and nuanced answers and above all get concrete examples that I always request from the pupils, at least for the higher grades. So, I think that the pupils that use it, if it will be good, they cannot be completely stupid either, they need to be able to raise the correct follow-up questions. They must see in a specific answer that it is missing this and this. And ask the robot to develop this or can you give some concrete examples or something like this. And then it may feel a little bit more OK, if you understand? In this case, the pupil has, after all, processed and worked with it. And in this way, it could be an advantage that you can use it in education in this way. (#2, #3) What is scary is that I don’t see, and the pupils don’t see, from where the robot has received the information. Since not everything is correct you can’t possibly know that everything the robot writes in fact is correct. If you Google something pupils also can cheat, can copy and write off and so forth, they at least can think critically over the source, what kind of source is this? They know where the information comes from. That they do not know with a chat robot, if it’s correct.

Cecilia in dialogue with Morgan says:

On certain assignments, there are a few pupils that I suspect have used it. In assignments, where I acknowledge, this is not really your own voice. This has been produced little too fast and similar things, then I have observed it, and it is considered as cheating. (#2, #4)

Morgan: What have you done then?

Cecilia:

I have tried to talk with them specifically, for instance in one case, there came very much text in a very short time. I said to the pupil, that it went very fast, and it is important that you have a process in the writing, that you have time to produce the text, and that it is possible to see the progression and similar things. It is not possible to approach the pupils with “you have cheated”, since there is no concrete proof. So, I have like, ask them to pay attention to the fact that I have noticed that something is dodgy in the text. So, it is mostly in this way. (#2, #4, #5) Then I know that there are a few colleagues that use it to create questions for examinations for example. And then they found very good questions. Much more effective. (#3) So, it is not only negative things, I think. I believe it will be used more and more by teachers also ahead. Specifically, questions for examinations and likewise.
The next question is, could you please describe in what way, pros and cons, AI algorithms and language models have had/have an impact on the pupils’ learning?

Amanda:

Yes, they already knew in advance that they would cheat, so I couldn’t understand why they were so relaxed and reclined. And I said, you need the book since you will use quotes from the book, and they said, no it’s still going well anyway. So, I was cheated in four weeks. I was not able to put my finger on what it was that the book didn’t make them dedicated to. Have they not understood it? But it was that they never had the intention to understand it. It was a large betrayal. (#3, #4, #5)

Morgan: And they cheated themselves also you could say? They both tried to cheat you and themselves when it comes to their own reflection and learning over the book, you could say?

Amanda:

Yes, so there were pretty much that made it so that the pupils didn’t learn anything, (#3) while a few, of course, read the book and did it the way they should. Furthermore, this had an impact on the examination of the whole class, that I couldn’t give the assignment any weight at all. (#4)

Bodil:

I have already to some extent already talked about this. An advantage is if they use it in the correct way. But they do need to be very critical to what it writes since it is not always correct what it writes. But it's an advantage if they can use it in the correct way. (#3) You may create assignments, but I am not there yet.

Morgan: So, the source criticism is leveraging even more in this you could say?

Bodil:

Exactly! Then they possibly need to ask the AI-robot something and then they need to support the found information by finding the information in any other place also. The drawback is if they only use it without critical
thinking or asking to follow up questions or only accept the answer straight off. On one hand, it will not be good, it will be rather brief, and if I may say it, they don’t learn anything. (#3)

Cecilia:

> In the cases that it is used I believe it is used by laziness, so far. That one sees it as a shortcut, and therefore has worsened their learning. (#3) I do not think it necessarily needs to be that way but the more mature the technique becomes, then maybe one more and more may use it and it may be a way you in fact can learn things instead. (#3)

Morgan: Is it the learning process that is worsening or that they do not have to work as much as otherwise to attain the knowledge? Or is it, even, that the knowledge, maybe, is not even reliable, I mean, that what ChatGPT is producing? Or how do you believe that it is not really reaching the same level or …?

Cecilia:

> I think it is more that they do not really work that much with the content themselves. And that they do not necessarily understand themselves what they have written but they just are writing off the text and that they therefore not have learned the actual content in it. (#3)

Morgan: Simply to analyze and reflect!?

Cecilia:

> Exactly! And that is what is missing. If you instead could use it as a textbook or likewise. Then it could be something positive. But it is not my experience that it is used that way so far. (#3)

The next question is, could you please describe in what way, pros and cons, AI algorithms and language models have had/have an impact on your examinations?

Amanda:

> Yes, I did, with another book. Luckily, I had the time to do it, since this was around Christmas, and then I could introduce a new book. (#4)
Bodil:

I have already approached this a little bit earlier. I have already, prior to all this, had everything on Exam anyway. So, for me this hasn’t had any impact or meant a big change. My pupils have not had assignments in several years, since I have noticed that they have been cheating. They plagiarize. So therefore, for my part, it hasn’t changed a lot yet. (#4, #5)

Cecilia:

So far, it has not led to me changing my examinations. (#4) And the reason is that I already use Exam then where it already is controlled and likewise. It is the best tool that exists, now, it feels like. But, nevertheless, I believe I will use it, so it is more closed more often. So, they cannot enter other webpages and that they will hand over their cellphones more in the future. So, the assignments will certainly be more closed ahead. (#1, #4)

The next question is, could you please describe in what way, pros and cons, AI algorithms and language models have had/have an impact on your assessment of the pupils’ skills and knowledge?

Amanda says:

No, I know their abilities since I have had the pupils in two years. (#5) There will not be lowered grades in the end, because of this. It was more of a betrayal. I will not penalize them with lowered grades. (#6) This, I believe, would be wrong. You can’t lower grades for anyone because they are cheating. (#6)

Bodil expresses:

That have I also mentioned since before. It is difficult sometimes on certain assignments. I have one assignment that I have corrected. I cannot see that the sources are correct. I have controlled the sources. I reacted since I thought it was a little too good to be the pupil’s own work. It is often that way we react. It was a far better language than this pupil normally has e.g. This was in civics, but one noticed the language anyway. Then I started to check the sources and I asked why the pupil didn’t use the sources I recommended to the assignment, like that. And then I don’t get it right. The text can’t possibly be from the mentioned sources. And then I think a little that the pupil has used a robot and then the pupil has added sources that are approximately about the topic in the text. And I have searched in the source mentioned, on words and likewise, and I do not find what is referred to the
source. And then at the same time, now I can state, now I want that the pupil will change this and use correct sources. But the pupil still states that the sources are correct. We will meet and look at it. So, it becomes difficult. (#5)

Cecilia:

Oh! I have assessed exactly what they have handed in. However, it can have an impact on my attitude towards the pupil. If I suspect what he/she handed in is made by cheating. (#5)

Morgan: So, if you may think an assignment is made by cheating, but you assess what you have at hand, it may lead to you not taking the specific assignment into consideration as much as otherwise in the overall assessment? (#5)

Cecilia:

Absolutely! Specifically for the pupil that I return to, I will focus much more on the examinations we have had on oral things and that the others will, in fact, become more of a complement. (#5)

Morgan: Mm … I understand. In the case that you suspect cheating you will use another weighting of examinations, oral things and assignments in those cases you suspect cheating!? (#5)

Cecilia:

Yes, but at the same time, I assess the assignment as if the pupil has not been cheating. (#5)

The next question is, could you please describe in what way, pros and cons, AI algorithms and language models has had/have an impact on the pupils’ grades?

Amanda:

The unpleasant part of it could be if the pupils succeed in rephrasing what AI presents so I get the impression it is the words of the pupils. Then a pupil could submit a perfect text. And it’s impossible to find it in Urkund or
Google. And then this pupil can get an A. And then it would be negative. (§6) On the other hand, can I see that it is possible to use it to give the pupils more perspectives on things, what other people in the world have thought of the main character. In this situation you could look at it as a support and you are open with it in education, now we are looking into AI. But as a teacher you usually want to receive the pupil’s own thoughts. What they have understood and what they know. (§6)

Bodil:

It relates to that I do not know. But at the same time. If I can’t prove that they have been using it, I will need to proceed with what I have at hand. But if they use it for a positive purpose, in order to learn e.g., then I could possibly give them a better grade than otherwise. But I do not believe that the pupils are there yet. (§6)

Cecilia:

It is the weighting in that case. It may depend. If the specific individual happens to be very bad at examinations but in fact is better in written assignments, then it can be worsened. (§6)

The next question is, could you please describe in what way, pros and cons, AI algorithms and language models have had/have an impact on the ability for a pupil to achieve his/her objectives?

Amanda:

Yeah, well, I think that when they are cheating, that they have a very high level of stress, that they must get an A and are trying to reach his/her objective with such a shortcut. But they don’t understand how it is like to be a teacher. I would have given several A in this group if they had been writing what they think and analyze on their own. But that trustworthiness they didn’t really have in themselves since they have much more going on in their lives and they have several more courses, and sports. (§6)

Bodil:

It depends on what the objectives are. To get high grades but to get away and not need to do so much in order to get a high grade, then it is not
that good. But if the pupil feels that he/she wants to learn about it, so the pupil can have some use for it in the future, then it is better. (#6)

Cecilia:

Well, potentially it may help them to get higher grades. If you are weak at this kind of assignment, and you can get away with it, to produce something better. I don’t think there is a guarantee for it, but it could be that way. (#6)

Next question is do you recognize any shift in your role as a teacher towards and/or socially with the pupils since the arrival of AI algorithms and language models?

Amanda:

Socially, I don’t know really. It’s the same relationship, but you as a teacher need to think of this.

Bodil:

That I do not think has changed anything. Possibly that one gets a little bit more suspicious, but I don’t think the pupils recognize it on me, I hope.

Cecilia:

Yes, it is a little bit in the part with the assessment. (#5) One becomes more skeptical towards the pupils, in some way.

Morgan: Towards what they produce you mean?

Cecilia:

Exactly! And question, is this really this good that you are? And that is an awful development of the view of the pupils. One always wants to think good of one's pupils. (#5)

Morgan: It is too good, simply!
Cecilia:

You cannot have been this good! (#5)

Morgan: Or am I such a good pedagogue that you have developed this far!? Can it be this way? (#5)

Cecilia:

One can choose to think in a positive manner. (#5)

Morgan: May it go so far so you will give them a new occasion? Do you know what! I am in fact unsure, if it is really you that actually have done this, I therefore need a new assessment opportunity? (#5)

Cecilia:

Yes! Orally or in any other way. Absolutely! (#5)

Morgan: In order to ensure that you feel confident that this really is correct!? (#5)

Cecilia:

Absolutely! Then, the difficulty is in my topics, one very much assesses disposition of texts and likewise. Well! How is your language? Is it grammatically, correct? Is it comma splice? And that you cannot conduct orally. Sure. You can say, can you explain what comma splice is? But it is something different to practice. Such things cannot be complemented in this way. (#5)

Next question: In your own words, and through your own experience and knowledge, could you please explain what is the quality of the output the AI algorithms and language models provide?

The answers to this question are not included here since they do not contribute to the themes #1-6 in chapter 5. Semantic thematic analysis.
Next question: In your own words, and through your own experience and knowledge, could you please explain in what ways may AI algorithms and language models improve your education?

Amanda:

If it would be possible to give even more examples and more perspectives of a book or a topic, through it. (#2)

Bodil:

If I would find a way to work with it so the pupils can learn more, then absolutely. (#2) I feel I haven’t got to that point yet. If it could help me in my preparations, for example to write analysis questions, as it actually has done in one instance, then it helps me as I save time, in that way. (#2) So that would be good.

Cecilia:

If you can use it, if you find a good way to control it, then I believe it can be improved a lot. And that it also can make my job more effective. That one does not have to come up with a lot of questions for examinations, come up with things and not have to read in text for an equally long time. To achieve knowledge quicker and then you can learn more things. (#2) It can absolutely improve things.

Next question: In your own words, and through your own experience and knowledge, could you please explain what types of assignments or activities are specifically appropriate to use in AI-supported education?

Amanda:

Nothing that would be assessed. (#2, #5) Something that they could look at what is said and find out facts. Nothing that is going to be assessed by what they say themselves. (#5) I don’t really know. If they ask AI about the reason why the first world war started? What is mostly said about this? Then you can use this in education, it can be that the Nazism says that the concentration camps didn’t ever exist. And this is obtained by AI and then you can work with source criticism. (#2)

Morgan: So, an assignment within source criticism could be suitable? Search for your material, and then work with an exercise of source criticism!? (#2)
Amanda:

Yes, it would. What have people been writing on the Internet? What will AI come up with based on that? (#2)

Bodil:

If you want them to quickly receive information and to answer easy questions, maybe. (#2) Then it is the question if it is correct or not, if it is trustworthy or not. I already know that pupils have used it when they are to answer a few questions. This is really ridiculous, this isn’t something that should be handed in to me, this is because you should learn something in advance for an examination or a test. Then it is a little awkward since there is a pedagogical thought to answer the questions. But, I think, an assignment within source criticism, you could have an assignment where in a first step let an AI-robot do something and then you check if this is correct. To add sources of your own and to add source references in a reference list for example. (#2) An assignment within source criticism, maybe. (#2)

Cecilia:

Well, it is knowledge acquisition, I think. (#2)

Morgan: I think, specifically, assignments to specific assignments or activities, then, certain design of the lesson, one talks about then, arrangements of the lessons that could be suitable and extra good for this type of usage? What do you believe?

Cecilia:

Yes! Well! Then the difficult thing is with handling sources and source criticism. (#2) That is a very important competence for the pupils to learn. You can not only use it for gaining information since then you will totally lose that competence. You may have to divide it in some way. In certain assignments you may use it and then you have other specific assignments where they work with handling sources and source criticism. I do not know. You may need to be a bit more aware when you are allowed to use it. (#2) And have some ulterior motive with it.

Morgan: Could you even say, now I want you, everybody, to log on and that everybody uses it, like a partial exercise in some way? (#2)

Cecilia:
I think like that, yes, that I believe. (#2) And then can you also open up for, I know this, I can also handle it in a good way. Well, I think, maybe, it is good to keep up with the development in this way and show them that you are that and that you not only are new to it and that you do not think it exists. Maybe. (#2)

Next question: In your own words, and through your own experience and knowledge, could you please explain what are the major challenges you have encountered working with AI algorithms and language models in your education? How have you handled these challenges?

Amanda:

It was an examination task of a book that was to be assessed where they were to describe the main character, message and language as described in previous answers. (#2)

Bodil:

I haven’t worked with it a lot, but what I have done is to try to help me in preparations. Sometimes it has helped me with questions and sometimes not since I haven't prepared questions, I think. (#2)

Cecilia:

Well, it is just that. That one, with cheating. Where it is not the thought that one should not use it, but that they have used it as a shortcut through it. And then it is hard to trust the knowledge. (#2, #5)

Morgan: Then, how have you handled these challenges, that is what you told about earlier then? (#2)

Cecilia:

Well, I guess, it is the weighting. (#2, #5)

Morgan: That you do not put the same weighting on it if you make the assessment that it is cheating? (#5)

Cecilia:

Yes! And try to talk with them and try to bring about a change. (#5)
Next question: In your own words, and through your own experience and knowledge, could you please explain how well do you understand how the AI algorithms and language models work?

The answers to this question are not included here since they do not contribute to the themes #1-6 in chapter 5. Semantic thematic analysis.

Next question: In your own words, and through your own experience and knowledge, could you please explain what education and competence does the teacher need, according to your view, so that he/she uses AI algorithms and language models in education in an effective way?

Amanda:

This can come more in the future, and they must learn how to see the whole ... Otherwise we move forward to a school where everything can be retrieved from AI. And the teachers really need to work so he/she finds out the pupil’s own knowledge. (#2, #5) And the challenge becomes larger now not to have too many home assignments. (#1)

Morgan: Do you believe there will be any home assignments? (#1)

Amanda:

Well! It can go in that direction. Do you dare to ... Suddenly you can identify that nothing works. Or that you hand out home assignments, but you will not use it for assessment but more that it is good for them to train. (#1, #5) Until tomorrow you will write a report, in 100 words, as homework. And then will we experience, will AI manage it? It may not manage to do everything.

Morgan: Then if the pupils ask, will this be a basis for assessment, and you say no? (#5)

Amanda:

Then in Swedish we have National tests that will catch up the pupils knowledge rather good in Swedish. Both in Swedish 1 and Swedish 3 where they are at site in the school. But as a teacher I believe that you shouldn’t tell the pupils too much, that it’s not a basis for assessment, since it will lower
their motivation, so usually I don’t do that. (#2, #5) But, rather for myself I can … By now I have a certain feeling of safety in myself that I recognize AI. They didn’t fool me. I saw it on text no 2 when I sat on the break correcting the texts. It was never the case that I was fooled. And then I can feel a bit secure as a teacher, but I will be very insecure the day the AI will be so good, so I can’t know if it’s Anton or … I can have Anton in education in two years and I can be insecure about Anton's knowledge in Swedish in this. (#2, #5)

Morgan: When you did the second Book-review, did you change the way you examined them in any way? (#4)

Amanda:

Yes, I did. I borrowed an English-lesson so I could conduct the examination all at once. It wasn’t even a pause between different lessons. We started at 8:00 am all the way to 10:20 am on Exam. You can go to the WC, of course, and you have the book and work with quotes, which is my wish. (#4) And then they said, now won’t we be able to correct the language, now you can’t be so hard on the language. Then I said, no, I won’t. I want to see the content. You are to describe the main character, message, and the language in the book. And then they write very well, and I got confirmed who will get an A, B or C. And the pupil who wrote a few careless errors, and of course I pay no notice of that. So that was much better, and that correction was fun since I knew with safety it was them. (#5) It was also psychological; it was fun correcting it. Then I felt joy, here is the text of Anton, what has he thought of the text? Here he has really understood it’s about unrequited love, and why it turned out the way it did. So, I got a good finish in that class. (#2, #3, #4, #5)

Morgan: So, you turned something negative to something positive you could say?

Amanda:

Yes, after some analyzes. You need to be analytical as a teacher. What will I do next time? Then I thought, I won’t dare saying we are to meet Monday, Wednesday, and Friday to write, I don’t even want to give them the Pauses in between, they will write all at once. (#4)

Bodil:

I think teachers need continuing education to be able to handle the new technique. Partly to be able to examine without the risk that the pupils
will be cheating, partly to be able to use the technique in the education. (#2, #4)

Cecilia:

You maybe do not need to have a specific education then, but absolutely have had discussions. Like this, it is also that, in some way. Only to reflect on it a lot and to discuss with others and from different angles, I believe is very important. Just so you become aware of it. (#3) Then, you do not necessarily need to know the technology behind, like that. To be aware that it exists and to be aware in what way the pupils use it, and yes. Yes, but the type of questions we are having now, that one in fact are reflecting on it and coming up with some answers about it myself. (#3)

Next question: In your own words, and through your own experience and knowledge, could you please explain if you see opportunities to improve and expand the use of AI algorithms and language models in your education?

Amanda:

Oh well, this is very difficult, the school is a little bit old-school. (#2) AI is, I think it’s super good in the community. I have, for example, read that it can even be anticipated when the garbage bins in the city of Gothenburg are overfull. It’s possible to have such intelligence in any way, or how many people is riding with the bus right now, and similar. I understand the thing with technology, but in the school it’s after all the knowledge. (#5) I understand that many are going to be engineers and be developed technically. In certain subjects it’s very good. Or the stock exchange, can we predict what it will look like? Can AI calculate it? I see that whole picture, that it needs to be modern individuals who are leaving the school and maybe will work with AI and develop it. And maybe won’t get jobs because there are robots and AI who has taken over certain jobs. I was previously an accounting economist, but I couldn’t work there anymore because an AI would do my duties. But in my subject Swedish it’s not that modern.

Bodil:

There sure are, but once again, I believe the teachers need continuing education. (#3) I do not experience that I have the knowledge yet to be able to develop the use of AI-technology in my education.

Cecilia:
Yes, I do, but it is in some ways, in the ways that I have said, I believe. I do not have so much to add.

Next question: In your own words, and through your own experience and knowledge, could you please explain how do you believe AI algorithms and language models can have an impact on the future of education and learning?

Amanda:

I believe a skillful technology-teacher can really add to it, but I believe teachers in Swedish, or History can have a bit more difficulty. The school is pretty much divided in subject and course.

Bodil:

Well, if the teachers can get help in preparing their lessons, that would be great, I think. Exactly how to work with the pupils ..., there are surely ..., we need to learn a lot about it, I think. I think, little about, question c, I thought, you could, for instance, if you want. In Swedish one speaks a lot of model texts, if you want them to write a debate article you want to show them a debate article. And there are not always textbook examples, on exactly what you want to have, then you could let an AI-robot write one. Where you want to include this and where you want to include that ... For the student to analyze and similar. That could be something for the future, that you could possibly use it for.

Morgan: So, it could be both a support for the teachers and in some way also for the pupils?

Bodil:

It will gain the pupils in the extension, since just today I wouldn’t have had this specific text to show the pupils. Then I could have shown the pupils how it can look like. And like that. Possibly. Otherwise, you must ... I know other teachers that have written texts like these by themselves. It takes a very long time.

Cecilia:

I think it will impact however much. Then, it is always when something is new one thinks it is big and scary. So hopefully we will find a way that we will handle it in a good way, that works fine. But we probably
need to be more aware about it and really need to work more actively with it, in order to become good. Otherwise, I believe that there is a risk that it instead will replace us. That the pupils can do what they want and not learn anything. So ... Or they do not do that, now they talk a lot about it and then they will forget about it even existing, but, they realize, I also must learn things. (#2, #3)

Morgan: It becomes everyday life, you mean, or?

Cecilia:

Yes! But, maybe, in that way. One does not know. But I think that the safest thing is to educate oneself, likewise ... (#3) And to come up with and to be well aware of strategies, in case, it does not go so well.

Next question: In your own words, and through your own experience and knowledge, could you please explain what pros and cons do you see in the use of AI algorithms and language models in education compared to traditional education methods?

Amanda:

Oh well, I believe, anyway, that the teacher should teach, and this is a traditional teacher-centered teaching where the teacher tells and instructs and then the pupil will do and learn. But what the teacher tells and instructs, the teacher may have obtained from AI to give them different perspectives. Sometimes it’s the teachers’ own knowledge that is taught, but fortunately we have a good education, rather good. The teacher may for sure teach certain parts from AI. The teacher is more source critical and can notice that the book to a certain extent is explained in a wrong way, but it was interesting anyway that they talk about the book in this way, since I hadn’t thought of this as a teacher. Then you may bring additional thoughts to the pupils, think, the theme was unrequited love, but you could also see it as she had something to gain from it, or you can find another perspective that you haven’t thought about. Education is often what the teacher he/she-self thinks, is opinion of and knows. And the history teacher talks about the Second World War based on what he/she knows. And in this case, I can think that the teacher, prior to the lesson, can add on even more knowledge. But the pupils should be close to the teacher. The teacher should be in between and help here. I don’t think one should connect a pupil with AI completely free, the teacher needs to be the one who through teacher-centered teaching needs to lead the group forward, know what the objectives are, what they need to know and be examined, this I believe in. I don’t believe that the pupils can go to a school where they can trust AI more than the teacher. (#2, #3)
Bodil:

It depends how you use it, but if the pupils are looking at a text and answer by themselves, that disappears to some extent, when you only can ask a robot about it. Sure, they get all the answers, and they can study it afterwards, but specifically finding information from a text and being able to produce it on your own, may be lost. One talks a lot about how writing is very important for learning. (#2, #3)

Cecilia:

The drawbacks are the things with source handling, chiefly, and the source criticism. That, one needs to know, where does this information come from? Is it truly reliable? Are there different angles to it? And to have this approach, will be totally lost, if one only accepts everything as correct.

Next question: Have you encountered a situation in which you need to explain to the pupil a particular AI answer?

Morgan: And this question is built on the fact that you have actively used AI in education in any way. You mentioned the book review, you have described in detail about the word. Did you tell the pupils, did you give the pupils feedback what in fact it was that made you understand that they were cheating? Or have you held it for yourself so to say?

Amanda:

No, I thought I would do that. But so far, I have kept it to myself. It has been a little bit sensitive since I know pupils that have written the assignment by themselves. So, if I enter a discussion “But I didn’t have anything of that in my text. I had quotes as a part of the text.” You had a perfect Swedish but had the word incompatible. Some were border line cases, they had processed the AI and did it well, which I saw after the next examination, that this good level of the Swedish language didn’t the pupil have. How could she submit a book-review of 1.000 words in perfect Swedish and have investigated the characters and message and everything. (#4, #5)

Morgan: You got confirmation of who had been cheating then?
Amanda:

For one pupil I got that, then I knew that she didn’t write this perfectly. She has an A in Swedish, but she is my weakest A. She makes errors but she is orally a star. She has an A in Swedish 2, and I hope for an A now again, but I think she can slide down to a B, but she is a very skillful rhetorician and orally, and has won a lot through that, but in writing she is making certain sloppy stuff and not always quite get it. And she didn’t manage to do that when we had the second examination. The first time, when she maybe had used AI, it was a totally perfect text, it was on college level in 1.000 words. And it was at this point, not even this text can I trust. I could see the ones who had lined up a lot of adjectives and did not have any quotes. But I could read aloud to them, an example, but it would be sensitive, since then there is sitting the individual in the classroom. (#4, #5, #6)

Both Bodil and Cecilia answered no.

Next question: Have you noticed differing understandings among the pupils of the answers given by the AI algorithms and language models?

The question was not relevant since neither Amanda, Bodil or Cecilia has worked with AI algorithms and language models in any way. Therefore the question does not contribute to the themes #1-6 in chapter 5. Semantic thematic analysis.

And then the final and last question: Is there anything you would like to add to the questionnaires?

Amanda:

I think that I sound a little bit anti-technology in the way you used to be when there is new technology. And that I happened to experience it in a very negative way. In 10 years, we may have found out what a big resource it could be. But it’s so very new so teachers have not been educated yet and it has not been implemented yet. But teachers have rather discovered, oh, here it comes cheating. Therefore, one is more hostile towards it. That’s the way it is. (#2, #3)

Bodil and Cecilia had nothing to add.
5. Semantic thematic analysis

This study includes three deep interviews conducted with language teachers at an upper secondary school in Sweden. The semantic thematic analysis guided by the research question provides some insights into the impact AI language models have on teacher’s ability to develop the pupil’s skills and knowledge.

5.1. Theme #1: AI language models bring an ending to home assignments
Since the arrival of large language models, such as ChatGPT, the opportunities to cheat and plagiarize have multiplied and are not dependent upon a more knowledgeable or more skillful friend or relative who helps the pupil to cheat. Therefore Theme #1 states that AI algorithms and language models bring an ending to home assignments, or at least will strictly limit them ahead.

We do not have anything that everyone must follow, but everyone needs to be aware that we can no longer leave the pupils with home assignments, which are not locked to Exam, since an AI can even pass an exam test for a law school. All (teachers) must understand where we are in respect to it, but we do not have to work with it in any specific way.

Amanda

I interpret this as the school has no directions in place in how to use AI language models in their education but limit the use of home assignments because of the risk of cheating since the introduction of AI language models available.

We had a meeting in which the school manager talked little about it and he said that we must reflect on our examinations and that we may no longer have home assignments to the same extent. The pupils need to write the exams on sight. He also said that the teachers may use it as a part of the education, however, as mentioned, we may no longer have a lot of home assignments no more. Moreover, I feel, there is mostly a talk between colleagues, about the fear of how we can really know, and colleagues feel that this is not the pupil him/her-self, but we can’t find anything of it on the web, and at that point get hesitative over who has written this.

Bodil

I interpret this as the school has no directions in place in how to use AI language models in their education but limit the use of home assignments because of the risk of cheating since the introduction of language models available.

Mmm ... A little bit. I believe it has started off a little bit. It is not the way that they have grounded it or the way we properly should relate to it, like this is the regulations we are to follow in the future. But it has certainly been discussed that the assignments to a larger extent must be done during the lessons in school and collecting the cellphones. We work with Exam, which is a locked system, which in a way that it is impossible to enter external homepages. So (the pupils)
will, to a larger extent, work with “closed frames” and we really need to control it. That type of discussion has started about what way we should handle it, but not in a way that there are any decisions made, but the process is absolutely initiated.

Cecilia

I interpret this as the school has no directions in place in how to use AI language models in their education but limit the use of home assignments because of the risk of cheating since the introduction of AI language models available.

The answers from all three respondents indicate the same action forward which is putting an ending to home assignments that are to be assessed and therefore write exams on sight at the school in the future as a way of action to limit the cheating and plagiarizing.

5.2. Theme #2: The use of AI language models may have an impact on education

We will now investigate what this study reveals in what way the use of AI language models has an impact on education in the upper secondary school at focus.

I have mostly experienced drawbacks since I had an assignment regarding a book with questions that you cannot find on the internet. But they anyway used artificial intelligence to try to find the answers. And this I noticed immediately that it was. This was cheating.

Amanda

In this case the pupils cheated and were discovered, and it was a drawback for the pupils and the teacher.

The drawbacks are that I do not always trust that what I receive from the pupils is from the pupils themselves. Even if I let the pupils write in Exam, sometimes I want them to write not only in one lesson, but it also overlaps over several lessons, sometimes several weeks have I had an assignment in Civics 2. Of course, they can go and ask at home and from that get a lot of ideas. It has been an open assignment, but I also want them to search for sources. It is a part of the course to search for, collect and sift. So, of course, they could have asked a Chat Robot, I cannot be 100% sure. That is a drawback, I do not know, I cannot with complete certainty know that it is one of
my pupils. Then I have, a bit like that, I have tested it myself. I have noticed that I must raise follow-up questions to get detailed and nuanced answers and above all get concrete examples that I always request from the pupils, at least for the higher grades. So, I think that the pupils that use it, if it will be good, they cannot be completely stupid either, they need to be able to raise the correct follow-up questions. They must see in a specific answer that it is missing this and this. And ask the robot to develop this or can you give some concrete examples or something like this. And then it may feel a little bit more OK, if you understand? In this case, the pupil has, after all, processed and worked with it. And in this way, it could be an advantage that you can use it in education in this way. What is scary is that I don’t see, and the pupils don’t see, from where the robot has received the information. Since not everything is correct you can’t possibly know that everything the robot writes in fact is correct. If you Google something pupils also can cheat, can copy and write off and so forth, they at least can think critically over the source, what kind of source is this? They know where the information comes from. That they do not know with a chat robot, if it’s correct.

Bodil

In this answer Bodil reason that a pupil who tries to cheat by using an AI language model and put the correct follow-up questions in a process to get a complete and nuanced answer, the pupil has, after all, processed and worked with it and learned something along the way. The fact that it is impossible to use source criticism is also mentioned, since the sources of information are unknown.

On certain assignments, there are a few pupils that I suspect have used it. In assignments, where I acknowledge, this is not really your own voice. This has been produced little too fast and similar things, then I have observed it, and it is considered as cheating. I have tried to talk with them specifically, for instance in one case, there came very much text in a very short time. I said to the pupil, that it went very fast, and it is important that you have a process in the writing, that you have time to produce the text, and that it is possible to see the progression and similar things. It is not possible to approach the pupils with “you have cheated”, since there is no concrete proof. So, I have like, ask them to pay attention to the fact that I have noticed that something is dodgy in the text. So, it is mostly in this way.

Cecilia
In the answer of Cecilia, she offers a way forward with the pupils when she realizes that a pupil most certainly cheats. It is to talk to the pupil and explain that it is important that the pupil have a process in the writing, and not rush it.

As stated in Theme #2 the use of AI language models may have an impact on education. From the three answers we can see that it sure has an impact, but necessarily, according to Bodil, not always negative, depending upon how the pupil uses it in building the answer since there are some learning processes developed when stating good follow-up questions to get a final answer.

5.3. Theme #3: To use AI language models may offer a learning opportunity – both for pupils and teachers – but not always what was intended

In this theme, learning is the keyword, revealing using AI language models can offer a learning opportunity, both for pupils and teachers – but not always in the intended way.

Yes, they already knew in advance that they would cheat, so I couldn’t understand why they were so relaxed and reclined. And I said, you need the book since you will use quotes from the book, and they said, no it’s still going well anyway. So, I was cheated in four weeks. I was not able to put my finger on what it was that the book didn’t make them dedicated to. Have they not understood it? But it was that they never had the intention to understand it. It was a large betrayal.

Amanda

In this case several pupils tried to cheat through using an AI language model. Amanda learned that the pupils may cheat if they are having the possibility to interact with an AI language model as they work with a book analysis. The pupils developed their skills in handling an AI language model even if this was not the purpose with the exercise.

I have most tried because I would like to know a bit how the pupils can use it, but I have in fact let AI robot write some questions to an analysis of a short story e.g. I have also asked it to summarize the genre of horror novels because I didn’t find a schoolbook that did it in a good way. Since I know what’s correct, I can say that the text
was good, and I have even given it to my pupils. For one short-story
the questions to an analysis were very good, but then I tried to do the
same for some more recent short-stories, then the questions were not
relevant anymore. Then the AI robot even included characters and
things that are not part of these short stories. So, you really need to
be in control of the things (you work with). So, I absolutely check
what it says, but I don’t have the courage fully to … I have used it a
little bit, but, nevertheless, I must know my topic. I can’t believe it
will replace me and take all it says for granted. An advantage is if
they use it in the correct way. But they do need to be very critical to
what it writes since it is not always correct what it writes. But it's an
advantage if they can use it in the correct way. You may create
assignments, but I am not there yet … Then they possibly need to ask
the AI-robot something and then they need to support the found
information by finding the information in any other place also. The
drawback is if they only use it without critical thinking or asking to
follow up questions or only accept the answer straight off. On one
hand, it will not be good, it will be rather brief, and if I may say it,
they don’t learn anything.

Bodil

In this quote Bodil let us know her experience in using AI language models.
She expresses that it is an advantage if the pupils know how to use it in a
correct way. At the same time the need to be very critical to what it writes
since it is not always correct what it writes, it is hallucinating. Therefore, as
Bodil says, you really need to be in control of the things you work with.

In the cases that it is used I believe it is used by laziness, so far. That
one sees it as a shortcut, and therefore has worsened their learning. I
do not think it necessarily needs to be that way but the more mature
the technology becomes, then maybe one more and more may use it
and it may be a way you in fact can learn things instead.

Then I know that there are a few colleagues that use it to create
questions for examinations for example. And then they have found
very good questions. Much more effective. So, it is not only negative
things, I think. I believe it will be used more and more by teachers
also ahead. Specifically, questions for examinations and likewise.

Cecilia
When both pupils and teachers use AI language models, they both can use it for different purposes. The pupils as a way of learning new things and teachers to create questions for examinations.

In this theme the interviewees reveal challenges in the learning process, but if you use it wisely and to a large extent of critical thinking and not take the answers for granted since the AI language models hallucinate, that is come up with answers far from the truth, when it can’t present correct facts, it may offer a learning opportunity.

5.4. Theme #4: AI language models may have an impact on examinations

In this theme we will encounter in what way the interviewees react or already has adapted to the introduction of AI language models.

Yes, I did, with another book. Luckily, I had the time to do it, since this was around Christmas, and then I could introduce a new book.

Amanda

Amanda let us know that she had to redo an assignment due to cheating through the clearly suspected use of AI language models.

I have already, prior to all this, had everything on Exam anyway. So, for me this hasn’t had any impact or meant a big change. My pupils have not had assignments in several years, since I noticed that they have been cheating. They plagiarize. So therefore, for my part, it hasn’t changed a lot yet.

Bodil

Since Bodil noticed that pupils cheated and plagiarized even before the introduction of AI language models, it didn’t change her way to implement examinations since she already used Exam, which is an examination system offering a secure and controlled environment.

So far, it has not led to me changing my examinations. And the reason is that I already use Exam then where it already is controlled and likewise. It is the best tool that exists, now, it feels like. But, nevertheless, I believe I will use it, so it is more closed more often. So, they cannot enter other webpages and that they will hand over
their cellphones more in the future. So, the assignments will certainly be more closed ahead.

Cecilia

For Cecilia AI language models didn’t change her way to implement examinations since she already used Exam, which is an examination system offering a secure and controlled environment.

In this theme we can see that Amanda had to redo an analysis of a book, with a new book because of suspected cheating. Bodil and Cecilia, they had already adapted the examinations because of cheating and plagiarizing in other forms than through AI language models.

5.5. Theme #5: AI language models may have an impact on teachers’ assessment of the pupils’ skills and knowledge

In this theme, theme #5, we will be introduced to the respondents view on in what way AI algorithms and language models have an impact on teachers’ assessment of the pupils’ skills and knowledge.

No, I know their abilities since I have had the pupils in two years. There will not be lowered grades in the end, because of this. It was more of a betrayal. I will not penalize them with lowered grades. This, I believe, would be wrong. You can’t lower grades for anyone because they are cheating.

Amanda

Amanda let us know that she will not penalize the pupils for cheating with lower grades, but she gave them a new book to analyze, that we already know since theme #4.

It is difficult sometimes on certain assignments. I have one assignment that I have corrected. I cannot see that the sources are correct. I have controlled the sources. I reacted since I thought it was a little too good to be the pupil’s own work. It is often that way we react. It was a far better language than this pupil normally has e.g. This was in civics, but one noticed the language anyway. Then I started to check the sources and I asked why the pupil didn’t use the sources I recommended to the assignment, like that. And then I don’t get it right. The text can’t possibly be from the mentioned sources. And then I think a little that the pupil has used a robot and then the
pupil has added sources that are approximately about the topic in the text. And I have searched in the source mentioned, on words and likewise, and I do not find what is referred to the source. And then at the same time, now I can state, now I want that the pupil will change this and use correct sources. But the pupil still states that the sources are correct. We will meet and look at it. So, it becomes difficult.

Bodil

Bodil expresses that the assessment can be tricky, but she as a teacher normally reacts when the text is far better than the pupil normally produces. In this case the pupil didn’t use the sources recommended for the assignment and the text couldn’t possibly be from the mentioned sources. In this case, it becomes difficult with the assessment, when the pupil still states that the sources are correct.

Absolutely! Specifically for the pupil that I return to, I will focus much more on the examinations we have had on oral things and that the others will, in fact, become more of a complement.

Cecilia

In theme #2 Cecilia let us know a case where a pupil most certainly was cheating. Here Cecilia let us know that she will focus much more on oral examinations and the other examinations become more of a complement. In this theme, theme #5, we got a view of the complexity of assessment and in cases of suspected cheating it becomes even harder. Both Bodil and Cecilia let us know that they already had adapted to cheating and plagiarizing when using the secure and controlled examination system, Exam, according to theme #4.

In this theme, theme #5, the respondents in the study reveal that assessment can be a tricky part of a teacher’s job. If you for some reason suspect a pupil to cheat, we in this theme got an understanding of how a teacher can handle a suspected cheating situation. You can trust the assessment you have made over time since before for the pupils. You can raise your questions with the pupil concerning the missing sources and ask the pupil to change the sources and use the correct sources. And finally, you can weighing the different examinations differently, and not put the same weight for the examinations you suspect the pupils cheated in.

5.6. Theme #6: AI language models may have an impact on the pupils’ grades
In this, and final, theme, theme #6, we will see what the interviewees express when it comes to AI language models and in what way it may have an impact on the pupils’ grades.

The unpleasant part of it could be if the pupils succeed in rephrasing what AI presents so I get the impression it is the words of the pupils. Then a pupil could submit a perfect text. And it’s impossible to find it in Urkund or Google. And then this pupil can get an A. And then it would be negative. On the other hand, can I see that it is possible to use it to give the pupils more perspectives on things, what other people in the world have thought of the main character. In this situation you could look at it as a support and you are open with it in education, now we are looking into AI. But as a teacher you usually want to receive the pupil’s own thoughts. What they have understood and what they know.

Amanda

When the pupils more skillfully use an AI language model, if the pupils succeed in rephrasing what AI presents, the pupil could submit a perfect text. In this way, Amanda, means the pupils could receive higher grades than otherwise. Amanda, finalize with stating as a teacher you usually want to receive the pupil’s own thoughts. What they have understood and what they know.

It relates to that I do not know. But at the same time. If I can’t prove that they have been using it, I will need to proceed with what I have at hand. But if they use it for a positive purpose, in order to learn e.g., then I could possibly give them a better grade than otherwise. But I do not believe that the pupils are there yet.

Bodil

Bodil expresses there is a risk that pupils may be given a higher grade, when using AI language models, than otherwise. When she can’t prove that anyone has been cheating, she must assess what she has in hand. She ends by stating that she doesn’t think that pupils are there yet that they use it for a positive purpose and to improve their learning.

It is the weighting in that case. It may depend. If the specific individual happens to be very bad at examinations but in fact is better at written assignments, then it can be worsened.

Cecilia
When it comes to grades, Cecilia, finalize by stating that for a pupil, that is most certainly cheating, she as a teacher will focus more to oral examinations, as mentioned in previous theme #5, and will potentially result in better grades if the pupil is excellent in oral examinations and less in written assignments. The opposite can also occur if the pupil in fact is less skillful in oral examinations and better in written examinations, which is downweighed because of suspected cheating.

If the pupils get to the point that they skillfully interact and use an AI language model it can present a perfect text which in an open examination’s environment will potentially lead to a higher grade for the pupil than otherwise. Therefore, to stop the cheating, in the best possible way, the written examinations are held in a secure and closed environment as mentioned in Exam, but there are others such as Trelson, offering the same type of solution.

These are the number of times each theme was mentioned in the empirics:

![Bar chart showing the number of mentions for each theme.]

#1: 8, #2: 44, #3: 29, #4: 20, #5: 35 and #6: 10, totally 146.

### 6. Discussion, Conclusions & Future directions in research

The purpose of this thesis is to create an understanding on how teachers could integrate AI in education and as such develop the pupils’ skills and knowledge.
ChatGPT is a large language model based on AI algorithms and as such it’s a new technology. In the future we will know if this technology brings about, as explained by Geels (2001), a technological transition (TT). TT is defined as major, long-term technological changes is the way societal functions are fulfilled. TT does not only involve changes in technology, but also changes in elements such as user practices, regulation, industrial networks, infrastructure, and symbolic meaning or culture.

6.1. Discussion

Theme #1 reveals an ending of home assignments, at least for those which are to be assessed, in upper secondary school since the arrival of large language models such as ChatGPT. The answers from all three respondents indicate the same action forward. Therefore, the pupils need to write exams on sight at school in the future as a way of action to limit cheating and plagiarizing. Home assignments, which are just for practice, the pupils can with advantage use an AI language model in a way to develop their knowledge and critical thinking.

As stated in theme #2 the use of AI language models may have an impact on education. From the three answers we can see that it sure has an impact, but not necessarily, according to Bodil, always negative, depending upon how the pupil uses it in building the answer since there are some learning processes developed when stating good follow-up questions to get a final answer.

In theme #3 the interviewees reveal challenges in the learning process, but if you use a AI language model wisely and use a large extent of critical thinking and not take the answers for granted since the AI language models may hallucinate, come up with answers far from the truth, when it can’t present correct facts, it may offer a learning opportunity.

In theme #4 we can see that Amanda had to redo an analysis of a book, with a new book because of suspected cheating. Bodil and Cecilia, they had already adapted the examinations because of cheating and plagiarizing in other forms than through AI language models.

In theme #5, the respondents in the study reveal that assessment can be a tricky part of a teacher’s job. If you for some reason suspect a pupil to cheat, we in this theme got an understanding of how a teacher can handle a suspected cheating situation. You can trust the assessment you have made over time since before for the pupils. You can raise your questions with the pupil concerning the missing sources and ask the pupil to change the sources in order to use the correct sources. And finally, you can weigh the different examinations differently, and not put the same weight for the examinations you suspect the pupils cheated in.

If the pupils get to the point that they skillfully interact and use an AI language model it can, according to theme 6, present a perfect text which in
an open examination’s environment will potentially lead to a higher grade for the pupil than otherwise. Therefore, to stop the cheating, in the best possible way, the written examinations are held in a secure and closed environment in the examination system Exam, but there are others such as Trelson, offering the same type of solution.

Even if the weighting is only 5.5% (8/146) the message is clear from this research, the introduction of AI language models such as ChatGPT brings a stop for home assignments which are to be assessed. Even if the weighting is 30.1% (44/146) for #2, 19.9% (29/146) for #3, 13.7% (20/146) for #4, 24.0% (35/146) for #5 and finally 6.8% (10/146) for #6 it is only theme #1 that gives a clear and uniform answer from the respondents. Theme #2-6 need further research in order to give reliable answers and conclusions. The reasons for this, I would say, is connected with the fact that none of the respondents had been working with AI language models in their education.

The limitation of this study is, intentionally, to one upper secondary school in Sweden. There are a limited number of questions in the questionnaire and the study only includes three interviewees. To get a more in-depth understanding of the research area in this study you may include more than one upper secondary school and include a quantitative part in the research to include more data.

6.2. Conclusions

The only clear outcome from this study is the ending of home assignments which are to be assessed. Home assignments, which are just for practice, the pupils can with advantage use an AI language model in a way to develop their knowledge and critical thinking. This study enlightens the areas within AIEd and its implications on education, pupils’ learning, impact on examinations, assessment of pupils’ skills and knowledge and impact on the pupils’ grades but need more in-depth results to make any secure conclusions within these areas of research at an upper secondary school.

Therefore this research only gives limited insight and reliable answers to the research question of this thesis: RQ1: How do artificial intelligence (AI) language models, such as ChatGPT, impact teachers’ ability to develop the pupils’ skills and knowledge?

6.3. Future directions in research

Future directions in research within AIEd at upper secondary school would benefit of a focus on more in-depth research within the implications on education, pupils’ learning, assessment of pupils’ skills and knowledge and impact on the pupils’ grades.
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Appendices
Interview protocol for language teachers at Upper Secondary School

The following questions are all focused on the professional educational context at Upper Secondary School and not the interviewee as a private person or in contexts outside the school.

1. Could you please tell me about your academic and professional background?

2. How long have you been part of the Upper Secondary School?

3. What is your attitude towards artificial intelligence (AI) algorithms and language models, such as ChatGPT? Please, choose the choice that best corresponds to you.
   - Innovator
   - Early adopter
   - Early majority
   - Late majority
   - Laggard

4. How do you describe AI’s, in the form of algorithms and language models, relation to you? Please, choose the choice that best corresponds to you.
   - Substitution
   - Supplementary
   - Complementary
   - Symbiotic
   - Independence
   - (Technological) singularity, an unprecedented technological development

5. How would you, in your own words, describe how your Upper Secondary School has onboarding this new type of resource and technology?

6. Is there any specific onboarding process in place which all teachers are to follow, if not, would this be preferable, according to your point of view and in that case why?
7. What are your experiences in using AI algorithms and language models in your classrooms?

8. Could you please describe in what way, pros and cons, AI algorithms and language models
   a. have had/have an impact on your education?
   b. have had/have an impact on the pupils’ learning?
   c. have had/have an impact on your examinations?
   d. have had/have an impact on your assessment of the pupils’ skills and knowledge?
   e. have had/have an impact on the pupils’ grades?
   f. have had/have an impact on the ability for a pupil to achieve his/her objectives?

9. Do you recognize any shift in your role as a teacher towards and/or socially with the pupils since the arrival of AI algorithms and language models?

10. In your own words, and through your own experience and knowledge, could you please explain …
    a. what is the quality of the output the AI algorithms and language models provide?
    b. in what ways may AI algorithms and language models improve your education?
    c. what types of assignments or activities are specifically appropriate to use in AI-supported education?
    d. what are the major challenges you have encountered working with AI algorithms and language models in your education? How have you handled these challenges?
    e. how well do you understand how the AI algorithms and language models work?
    f. what education and competence does the teacher need, according to your view, so that he/she uses AI algorithms and language models in education in an effective way?
    g. if you see opportunities to improve and expand the use of AI algorithms and language models in your education?
    h. how do you believe AI algorithms and language models can have an impact on the future of education and learning?
i. what pros and cons do you see in the use of AI algorithms and language models in education compared to traditional education methods?

11. Have you encountered a situation in which you need to explain to the pupil a particular AI answer?

12. Have you noticed differing understandings among the pupils of the answers given by the AI algorithms and language models?

13. Is there anything you would like to add to the questionnaires?

Thank you so much for your contribution and time. I am so grateful.

List of abbreviations and terms
AI: Artificial Intelligence.
AIEd: Artificial Intelligence in Education.
ChatGPT: Chat Generative Pre-trained Transformer.
CK: Content Knowledge.
Cobot: Robot co-worker.
EC: The European Commission.
Educational cobot: Robot designed to support human teachers.
HMC: Human-Machine Communication.
ITS: Intelligent Tutoring Systems.
LA: Learning Analytics.
PK: Pedagogical Knowledge.
RQ: Research Question.
TK: Technological Knowledge.
TT: Technological Transition.
TPACK: Technological Pedagogical Content Knowledge.
UN: United Nations.