



UNIVERSITY OF
GOTHENBURG

DEPARTMENT OF EDUCATION, COMMUNICATION
AND LEARNING

“How did we live without it before?”

A case study on student usage of generative artificial intelligence to support group work activities in higher education

Daniel Johansson

Thesis:	30 credits
Program and/or course:	International Master's Programme in IT and Learning
Level:	Second Cycle
Term/year:	Spring term 2025
Supervisor:	Thomas Hillman
Examiner:	Sylvana Sofkova Hashemi

Abstract

Essay/Thesis:	30 credits
Program and/or course:	International Master's Programme in IT and Learning
Level:	Second Cycle
Term/year:	Spring term 2025
Supervisor:	Thomas Hillman
Examiner:	Sylvana Sofkova Hashemi
Keywords:	Generative artificial intelligence, higher education, student group work, activity theory

Purpose:

This study was aimed to better understand how higher education students use generative artificial intelligence in group work activities and what role it can have in those activities.

Theory:

Engeström's second generation Activity theory was used as the theoretical framework to interpret and analyse the findings.

Method:

This study followed a master programme's course over time with a case study approach. The data was collected through self-administered reflective group discussion at three different occasions during the course.

Results:

The findings showcased high levels of generative artificial intelligence tool usage in group activities by the students. Furthermore, their activities had started to transform together with their use of these tools. The students utilized them for task delegation within the group, and these tools also allowed the student groups to shift their attention and time to activities deemed more important or interesting. The findings also indicate that generative artificial intelligence tools could potentially take the role as an additional group member or as a guide, supporting the group work in diverse ways. Another insight of the results was that the students deemed the custom-trained CourseGuru highly effective since it could provide better support than general chatbots. Overall, the students viewed generative artificial intelligence tools as essential to their studies and expected these tools to play a central role in the future of higher education.

Foreword

First, I would like to thank the students and teachers in the programme I followed. For giving me their time, effort, and the opportunity to do this study.

I would also like to thank my supervisor, Thomas Hillman, for the tremendous support throughout the entire journey of writing this thesis, both in shaping its direction and offering help when challenges arose.

Lastly, I want to thank my family and classmates. They have been very supportive throughout the process and are the reason why I did not give up when the work felt overwhelming.

Table of contents

1. Introduction	1
2. Literature review	3
2.1 Literature review method	3
2.2 Generative artificial intelligence	3
2.3 GAI's impact on higher education	4
2.4 Students' usage of GAI	5
2.5 GAI and group work	6
2.6 Summarization of previous research and identified gaps	7
3. Theoretical framework	8
3.1 Research position	8
3.2 Activity Theory	8
4. Method	12
4.1 Case study	12
4.1.1 Participants	12
4.2 Empirical context	13
4.3 Data collection	13
4.4 Data analysis process	16
4.5 Ethical considerations	19
4.6 Trustworthiness of conducted research	19
5. Findings	21
5.1 Activities with GAI	21
5.2 GAI as more than a tool	24
5.2.1 GAI as a subject	24
5.2.2 GAI as a part of the community	26
5.2.3 GAI as part of the division of labour	27
5.3 Adapting to a world together with GAI	29
6. Discussion and conclusion	32
6.1 Conclusion of the findings	32
6.2 Implications for higher education	33
6.3 Limitations and strengths of the study	35
6.4 Further research	36
References	37
Appendix	40

1. Introduction

The pace of technological development never seems to slow down. With tools like OpenAI's ChatGPT now accessible to the public, the exciting journey of generative artificial intelligence (GAI) is in the spotlight. The avenue for many sectors holds uncertainty about just how big of an impact GAI could have. The educational sector is no different. Bozkurt (2023) believes it could become the most effective educational technology we have yet to see. Although GAI shows great promise, there are rising concerns about ethical matters and how misuse could negatively affect critical thinking skills, creativity and cause overreliance on GAI tools (Kooli, 2023; Labadze et al., 2023; Valova et al., 2024). On the other hand, in Ma et al. (2024), a systematic review of the usage of chatbots in education, the authors highlight their positive role in developing critical thinking and problem-solving skills because of the interactive nature of chatbots. Chatbots were reported to be able to provide personalized feedback, cultivate complex problem-solving and promote deeper understanding and knowledge construction for higher education students. Regardless of whether the GAI impact is seen as positive or negative, it is very probable that GAI is here to stay and will continue to affect higher education in many ways (Gruenhagen et al., 2024). With these premises, it is necessary to examine how GAI is being integrated and used and what it might mean for the development of higher education.

Recent research in the education field has focused on possible ways GAI tools can enhance matters such as personalized learning, academic writing, and improved accessibility for students (Fawaz et al., 2025; Ghimire et al., 2024; Labadze et al., 2023). There has also been a focus on the ethical challenges the educational landscape must consider with integrating GAI technologies into higher education effectively (Ekundayo et al., 2024; Elbanna & Armstrong, 2024). However, in Labadze et al. (2023) systematic literature review of the role of chatbots in education, the authors highlight the missing perspective of the student standpoint in the discussion of incorporating GAI into education. Nevertheless, there have been studies on students' voice, experience, and perception of GAI usage, indicating a mostly positive attitude towards these tools mixed with concerns of misuse, academic integrity, and policy ambiguity (Ait Baha et al., 2024). A rise in student usage has been identified, for example, in a recent report by Linköping University, 95% of students confirmed that they used GAI tools for their studies (Öhrn et al., 2025). While the body of research on the different ways students utilize GAI tools is building, the influence of widespread usage is still a question mark in the field. Ekundayo et al. (2024) suggest that further research on GAI should focus on practical examples to understand how to integrate it into the educational landscape. Furthermore, there are some cases where students deem GAI as a replacement for traditional learning opportunities and can be seen as a substitute for teachers and classmates (Ghimire et al., 2024).

Although previous research has emphasized the capabilities and challenges of GAI in education, less attention has been given to how its integration can change the everyday activities of students for their academic work. Both individual uses, but an even more significant gap was found in how the use of GAI tools could facilitate group work, which is a central approach to many learning activities in modern higher education (Hammar Chiriak, 2014; Luan et al., 2025). As students increasingly incorporate GAI into their study routines (Öhrn et al., 2025), it becomes important to explore not only the outcomes of GAI usage but also to understand how it could reshape learning activities, social dynamics, and division of labour within student groups. This study seeks to address this gap by examining the integration of GAI into students' study practices on a group level.

Against this background, the purpose of this thesis is to investigate how students use GAI tools in group work activities, and what role GAI could have in group work. By exploring a setting where GAI usage is actively encouraged and integrated into a course, this thesis aims to contribute to a deeper understanding of how GAI could reshape activities in group work. Furthermore, the study aims to contribute to the building of knowledge that informs what needs to be considered when integrating GAI into higher education.

To investigate this, the research questions guiding this study are:

RQ: How do students use GAI in group work activities in higher education?

RQ2: What role can GAI have in group work activities?

The study adopts a qualitative case study design with recorded group discussions as data collection to address this question. It follows a master's programme course where GAI usage is encouraged and integrated into the course. Engeström's second generation of Activity Theory is used as a theoretical framework to analyse the findings.

2. Literature review

This chapter will cover the literature and concepts important to the area of GAI usage by higher education students in group work. The first section of the chapter describes how the literature review was conducted by presenting how the previous literature was searched for. The second section describes what GAI and chatbots are, as these two are essential to understand for the context of the thesis. After that, the impact of GAI integration into higher education is described, as it has already been seen to affect the educational landscape in many ways. The section that follows goes deeper into the usage of GAI by students for their academic work, followed by a section that discusses GAI in group work. This literature review chapter ends with a summary of the current research in the field and identifies a gap that this study will attempt to address.

2.1 Literature review method

To identify relevant literature, the Supersearch engine (Library of Gothenburg University search engine with many databases) was mostly used, but the databases Google Scholar, Scopus and Education Research Complete was also utilized. The search terms used have been combinations of artificial intelligence, generative artificial intelligence, AI/GAI, ChatGPT, chatbots, higher education, students' perceptions, student experience, student usage, and different types of synonyms for group work. Many of the sources found were specifically on chatbots or ChatGPT, as these sources seemed to dominate the research field.

The search span used was from the latest 15 years (2010-2025), but most sources are between 2023 and 2025 as most studies done on GAI and education are only recently published. A few of the articles were also found by using either the snowball method, which is a method to look at cited sources in articles (Thomas, 2023), or by looking at the suggested articles based on other articles (a feature in Supersearch).

Most articles used are peer-reviewed, but a few are conference papers, review articles, reports or preprints. No blog posts or news articles have been used. The motivation behind not only using peer-reviewed articles was that multiple research sources on the topic are new, and several sources would have to be discarded if only peer-reviewed articles were included. A few exceptions were made to the search span, regarding sources for the theoretical framework and method. These sources were deemed highly relevant for the thesis.

2.2 Generative artificial intelligence

Artificial intelligence (AI) could be defined as machines' simulation of human intelligence (Shah, 2023). However, the discourse on AI today is mainly dominated by the discussion of GAI. The defining factor of GAI is the ability to produce new content, solutions, or designs based on the data it has been trained on (Shah, 2023). These could be text, images, or other forms of media through their utilization of different generative models (Sengar et al., 2024). Many various types of these generative models are used to create content in different ways. However, as the thesis is not focusing on the technical side of how GAI works, the most important aspect to understand is that it can produce content in many ways.

A significant milestone for GAI could be attributed to the launch of ChatGPT by the company OpenAI in late 2022, when they opened its usage to the public. Its usage surpassed over 100 million users within two months, marking it as one of the most significant consumer applications ever, becoming the fastest-growing application worldwide (Seco et al., 2025).

ChatGPT and other similar GAI tools stand out because of their ability to engage with users in human-like language (Shah, 2023). ChatGPT is commonly referred to as a chatbot or conversational agent and can simulate human dialogue (Stöhr et al., 2024). These chatbots are powered by large language models, meaning they have been trained on a massive amount of data from books, articles, and webpages (Stöhr et al., 2024). Another notable feature of large language models is their ability to be customized, enabling the creation of custom-based bots trained on specialized datasets. In education, a chatbot could be trained on course materials, class notes, scholarly articles, and other relevant resources (Alfirević et al., 2024). Inaccurate information, biases, and inability to handle complex queries are a few of the current complications research highlights as problematic for chatbots (Elbanna & Armstrong, 2024). A possible way to deflect some of these complications could be with the use of custom-trained chatbots. The area of custom-trained bots is still widely unexplored, but with the correct training of data, it could be helpful in delivering domain-specific educational content (Alfirević et al., 2024).

With the public access to ChatGPT, the possible impact of GAI on the educational landscape started to become one of the more prominent discussions in universities and research. This is because of the possible way it can transform how education is delivered and experienced (O’Dea, 2024; Wang et al., 2023).

2.3 GAI’s impact on higher education

In the book *AI and the future of education* (Shah, 2023), the school year of 2022-2023 is mentioned as the rise of GAI in the educational landscape. The concerns of plagiarism, cheating, and traditional assignments like essays being obsolete were in the spotlight. While these concerns still linger, the way forward would be to integrate and adopt these technological advancements responsibly (Shah, 2023). This is further emphasized in other previous research, where the potential benefits of GAI are considered far too significant not to integrate into education (Gruenhagen et al., 2024).

The possible benefits and challenges are many. Increased access to information, personalised learning, and a decrease in teacher workload are a few examples of benefits. Increased usage also opens up the door for a possible future where students lack higher-order cognitive thinking skills, have overreliance on GAI, and are likely to plagiarize (Farrokhnia et al., 2024).

This unpredictable future of the influence of GAI is emphasised as a significant concern to safeguard the educational sector from harming privacy concerns, academic integrity, and misuse (Bozkurt, 2023). However, students will use these technologies inevitably, therefore, it is crucial to adopt these technologies and explore how they can accompany and enhance pedagogical principles rather than deteriorate them (Chang et al., 2023). Similarly, Ekundayo et al. (2024) suggest that GAI tools should be closely ingrained with existing practices with the aim of enhancing the learning experience of higher education students. While the initial reaction to the rapid development of GAI was aimed at suppressing the negative effects, an emergent need to embed these developments into current practices is deemed critical (Kooli, 2023). Many factors must be considered to integrate GAI into higher education. The social and cultural aspects are no exceptions, as these factors are crucial for technology adoption (Essien et al., 2024). As these factors differ depending on the specific context, this study will investigate an environment where the GAI is both encouraged and integrated in the course, adding a nuanced perspective to the research field. To understand the integration of GAI into education, it is important to understand how students utilize it for their activities.

2.4 Students' usage of GAI

In a higher education context, students use GAI for different activities such as brainstorming, generating ideas and synthesizing vast amounts of text (Chan & Hu, 2023). Other uses of GAI are also highlighted in previous research such as explaining complex concepts, searching for information online and receiving personal feedback (Farrokhnia et al., 2024). These findings are in line with a recent Swedish report done by Linköping University (Öhrn et al., 2025) on how their university students use GAI. These students reported using GAI for summarizing text, translating texts, searching for information, explaining concepts, idea generation and inspiration, writing assistance, receiving feedback and for programming solutions (Öhrn et al., 2025). A particularly relevant finding was that the students in technology and computer science were the most positive toward using GAI (see also Stöhr et al., 2024), and that they use GAI to solve problems more than other student groups. This report was interesting in relation to this thesis as it focused on students at a major Swedish university, from a student perspective. It provides a recent and relevant overview of the current use of GAI in a higher education context, even if it is not peer-reviewed and published in a research journal.

In another Swedish context, a large-scale study with approximately 6000 university students were conducted to better understand their opinions and experience with GAI (Stöhr et al., 2024). Their attitude towards GAI use was reported to be mostly positive. The students believed GAI could potentially make them become better learners and even help them to improve their grades. However, the students also showed concerns about misuse and what is considered cheating when using GAI. A need for clearer guidelines from the universities was considered as important from the student's perspective (Stöhr et al., 2024).

Other studies report that the students view ChatGPT, A GAI tool, as a possible substitute for pre-existing alternatives (Ghimire et al., 2024). Replacing or complementing learning opportunities, search engines, classmates, and teachers. Their increased adoption rate was motivated by various factors, such as helping to get a basic understanding, improved writing, and initiating assignments. Concerns were also raised in the study due to the potential adverse effects, such as fostering laziness and dependency on GAI tools. For example, ChatGPT could be used to write an assignment due to time constraints, laziness, or lack of awareness.

Previous research investigating similar topics found that students valued GAI support in their learning process (Fawaz et al., 2025). Students highlight that GAI tools helped personalise their education by adapting it to their learning styles, providing tailored material, and offering timely feedback (Valova et al., 2024). Students perceived that GAI could foster greater autonomy by enabling self-paced learning (Seco et al., 2025). GAI was also found to support students in their writing and language skills, such as vocabulary development, sentence structure, and grammar refinement, with students using GAI for real-time feedback (Chan & Hu, 2023). Additionally, GAI could catalyze idea generation, helping students overcome creativity blocks and explore new perspectives (Fawaz et al., 2025). Another interesting finding is that it could support higher education students in creating presentations for their assignments by making them more engaging and reducing time-consuming work (Remoto, 2023).

In another study on chatbots, investigating the immediacy of the usage of chatbots was highlighted as something highly favourable by the students (Holland & Ciachir, 2025). The possibility of getting an answer to any question at any time, and getting help in situations of "brain freeze" when starting assignments were highlighted as two very effective features. Using ChatGPT to find inspiration and create an idea creation process with the bot was also deemed very useful. The students in this study expressed the feeling of being enabled by GAI but also empowered and in control. Whilst this was the case for individual usage of chatbots, in group work, students experienced fear and anxiety over the fact that other group members used it to cheat (Holland & Ciachir, 2025).

From the previously mentioned report (Öhrn et al., 2025), 95% of students used GAI in their studies. Likewise, a report made at the University of Gothenburg found that 80% of students confirmed that

they use GAI for their studies as well (Wackenhut et al., 2025). These high levels of adoption suggest that the use of GAI tools in higher education is becoming increasingly mainstream in Sweden.

Overall, these sources indicate a vast potential of GAI as a complement in higher education. The possibilities for how it could reshape and transform the educational landscape are plentiful. Conversely, very little is known about the usage of GAI in group work activities.

2.5 GAI and group work

As an introduction to this section about GAI and group work, a study that focuses on group work in higher education in general is presented. This is important because this thesis adopts a theoretical framework with a sociocultural perspective, where development is believed to happen in social interaction and in collective activities (Burner & Svendsen, 2020). The theoretical framework will be further developed in the next chapter.

In Hammar Chiriac's (2014) study, students described how group work supported their learning in several ways. This includes learning through discussion by questioning each other viewpoints and adding multiple perspectives. It also involves developing collaborative skills and understanding how groups function and how other group members behave within them. Beyond these benefits, group work also serves an important study-social function. It provides students with a sense of belonging to group. On the other hand, the study also points out that certain factors such as poor organization, unequal contributions, and a negative group climate can hinder learning and lead to negative experiences. Understanding these conditions is crucial for making group work effective (Hammar Chiriac, 2014).

As GAI and group work is the focus of this thesis, the rest of the section presents research specific for that area. Previous research has been conducted that investigates the potential impact of ChatGPT on group learning in collaborative projects in higher education (Luan et al., 2025). The author reports that the chatbot could simulate student-to-student conversations, support peer learning, and possibly even assist with task delegation in groups. Similarly, in Perifanou and Economides (2025) article investigating different ways student groups use collaborative prompting with ChatGPT for project work, they found that chatbots could provide a good platform for discussion and were reported to support the student groups' critical thinking (Perifanou & Economides, 2025).

Within group work, Atchley et al. (2024) discuss how the education landscape might respond to technological advancement with GAI. The authors suggest that GAI tools such as ChatGPT could be counted as an extra team member in group work (Atchley et al., 2024). The authors mention the possibility of GAI to provide groups with alternative views and provide new communication methods. This possibility is strengthened by previously stated findings, as ChatGPT can be seen as a substitute for classmates (Ghimire et al., 2024). These findings suggest that GAI could potentially be considered an extra teammate in group work.

Similarly, in a study comparing individual programming, human-human pair programming, and human-AI assisted programming, the AI-assisted programming was reported to enhance students' intrinsic motivation, reduce anxiety, and improve their performance (Fan et al., 2025). Even though it did not match human-human programming in terms of social presence and sense of collaboration, it was regarded as exceptional compared to individual programming, as it was perceived by the students to add a sense of collaboration and achieve a higher social presence. These findings suggest that GAI could partially replace human interaction (Fan et al., 2025).

Overall, previous research suggests potential benefits associated with the integration of GAI in group work. However, these findings likely represent only a fraction of the broader picture, especially when

compared to the more extensively documented use of GAI in individual student work, as outlined in the previous section. The following section will summarize the literature review and highlight the identified research gap that this thesis aims to address.

2.6 Summarization of previous research and identified gaps

To summarize this literature review chapter, previous findings have primarily focused on individual interactions with GAI by students, leaving important questions about shared learning practices and collective activities. While the previous research described has begun to demonstrate the ways in which GAI tools can facilitate collaboration and support group activities, the integration of GAI into group work remains an underexplored area within higher education research. Previous research also highlights the critical need to understand the integration of GAI into higher education. These two factors are the main reasons for choosing the research question and aim, as this study aims to gain a deeper understanding of how students use GAI in group work. The study will do this with a perspective of examining the students' activities during group work.

3. Theoretical framework

This chapter first introduces the interpretive approach taken in the study, followed by an explanation of the theoretical framework used in the thesis. The chapter reasons why the theory is relevant for this specific study, together with some limitations of the theory that are considered. The chapter ends with an explanation of how theory will be applied.

3.1 Research position

The thesis aims to investigate how student use GAI in group activities and what role GAI might have in those activities. Furthermore, the study will focus on a deeper understanding of how GAI usage is shaped by students and the study environment of higher education. This thesis, therefore, takes an interpretivist view, as it tries to understand the usage of GAI in group work activities from the student perspective. Social science often uses this view to reflect that individuals construct their own social world and that their subjective experiences are important to understand the world around us (Thomas, 2023).

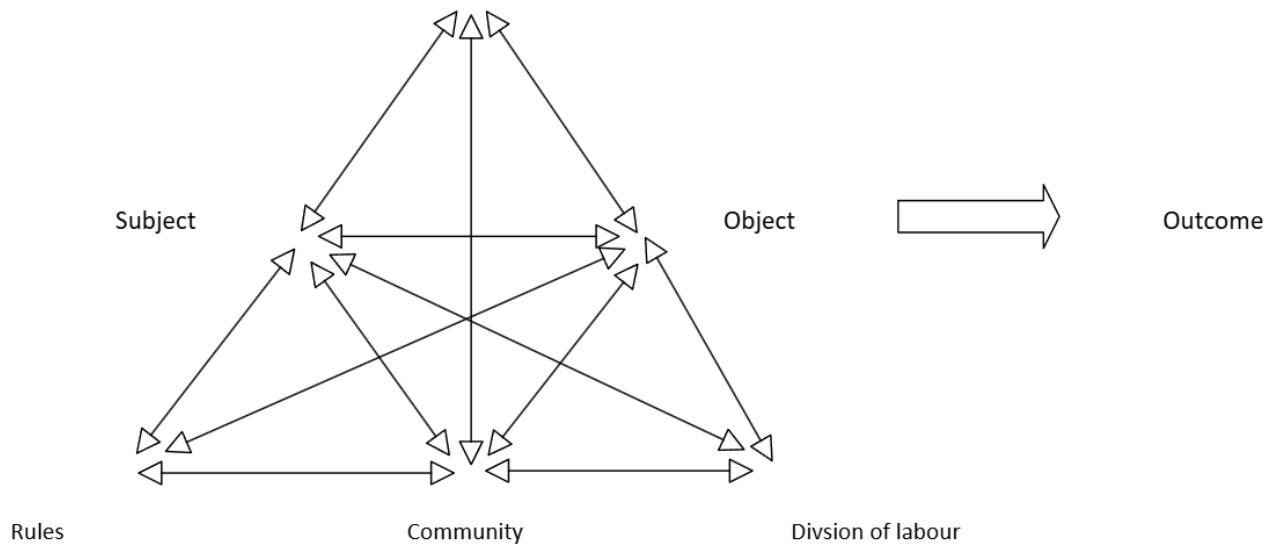
3.2 Activity Theory

The framework that will be used to guide and analyse the findings is Activity Theory (AT). AT is a framework to help researchers understand human activities and how tools are used in social and cultural contexts (Essien et al., 2024; Woo et al., 2025). Rooted in a sociocultural approach to learning and development, the situated nature of human activities is at the centre (Burner & Svendsen, 2020). This study adopts Engeström's second generation of AT, which offers a conceptual model to understand the social nature of human activities as something that develops in the collective. This is an extension of the first generation of AT, which focused on individual activities (Engeström, 2014; Zapata et al., 2024). The second generation adds perspectives such as rules and that other people are involved in the development of activities (Engeström, 2014) which are important in a higher education context and for the aim of this study. AT proposes that all human activity is intentional, structured, and oriented toward achieving goals, occurring within specific contexts that mediated by artifacts (McAvinia, 2016). It also acknowledges the dynamic and fluid nature of activities, where contradictions, disturbances, or innovations are catalysts for transformations in activities (McAvinia, 2016). This perspective is important for this study, as the integration of GAI potentially could transform, contradict, disrupt, or spark innovation in the activities of student groups.

One core principle of AT is that the whole activity is the unit of analysis called an activity system (Hashim & Jones, 2014). The activity can then be broken down into the six analytic components, referred to as elements. *The subject* is the person or group being studied, *the object* is the reason for the activity, and the *mediating artifact* is the tool that supports the activity. The fourth element is *rules*, which is a set of social conditions affecting the activity. The fifth is *division of labour*, which provides the distribution of actions amongst the people involved. The sixth is *community*, which is all the people involved in the common goal in the activity (Hashim & Jones, 2014), and lastly, the outcome is the intended goal of the activity system. The outcome is not considered an analytic component (Kamali et al., 2024). The activity under investigation can also be visualized with the help of a model, which reflects that every element of the activity could be affected by the others (Alsalem, 2024; Hashim & Jones, 2014). See Figure 1 below.

Figure 1

The activity system model



Adapted from *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research*, by Engeström (2014, p. 85)

In a review article (Bligh & Flood, 2017) investigating the theoretical application of AT in higher education, 59 papers examined how AT has been previously used in higher education. The authors found that a common reason for choosing AT was the contextual perspective it could provide. The authors further mention that AT was perceived as valuable because it provided a conceptual framework to make sense of complex situations. This is coherent with other prior research that underscores the strength of AT in providing a structured and holistic framework for understanding and analysing phenomena within sociocultural settings (Clemmensen et al., 2016; Hashim & Jones, 2014). In addition, previous empirical studies have also demonstrated that AT as a framework could be fitting for understanding technology adoption in higher education (Essien et al., 2024).

One criticism of AT in higher education research is that its application is often vaguely described, making it difficult to determine whether it functions as a paradigm (a worldview), a methodological guide, or an analytical lens (Colasante, 2024). For this study, AT is used strictly as an analytical lens, which is the most common application in higher education research (Bligh & Flood, 2017). Another criticism of AT is the complexity of an activity system, which can easily result in oversimplification or misinterpretation of the phenomena being studied (Colasante, 2024). Despite these limitations, using AT remains appropriate for guiding this research.

As this study aims to gain a deeper understanding of GAI integration into the environment of higher education, AT fits as an appropriate framework to support and guide the data analysis. The framework provides multiple perspectives to analyse the data in how GAI as an emerging technology potentially

can transform the activities of group work. Furthermore, it provides a structure to consider multiple aspects of their activities and look at the holistic picture rather than as isolated events. Below follows a table that places this study in correlation to the different elements of AT.

Table 1

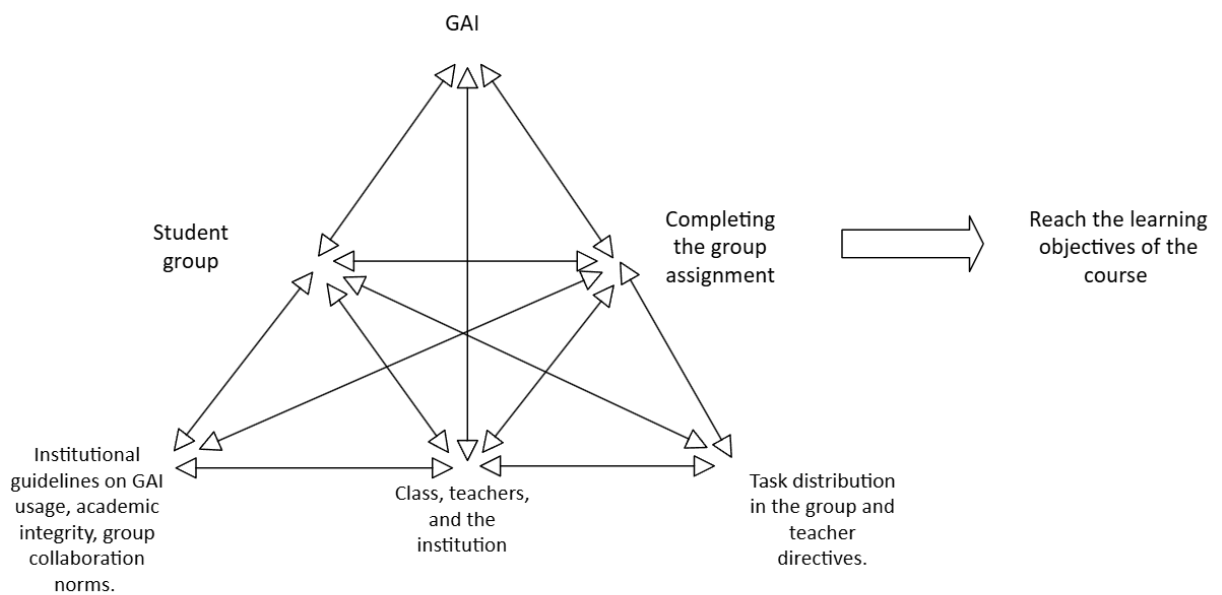
Elements from Activity Theory in the context of the thesis

Elements	Context of thesis
Subject	Student group
Object	Completing the group project
Tools (Mediating Artifacts)	Different GAI tools used in the course
Rules	Institutional guidelines on GAI usage, academic integrity, and group collaboration norms
Community	Class, teachers, and the institution
Division of Labour	Task distribution in the group and teacher directives
Outcome	Reach the learning objectives of the course

The table is then followed by a figure of an adopted version of the activity system model, which visualizes the activities under analysis.

Figure 2

Adapted activity system model



To clarify, the model above describing the activity system should not be seen as a rigid or locked structure. An important concept of AT is the dynamic nature of human activities, and they can constantly be transformed (Alsalem, 2024). While the model provides a visualization of the activity system under analysis, it could be reshaped depending on how the elements interact.

4. Method

This chapter explains how the study was conducted, the specific empirical context, the data collection and analysis process. First, it introduces the case study approach and how the participants were chosen for the study, followed by the course's empirical context. After that, the data collection process is described with the method of self-administered reflective group discussion. Lastly, the data analysis is presented with the use of thematic analysis as a structure to be understood through the lens of AT.

4.1 Case study

This thesis takes a case study design approach. It is a design aimed towards an intensive analysis of a single case, for example, a single community, family, or person (Clark et al., 2021). The current study investigates the activities of a student group of a master's programme in the technical field as its case. More specifically, one course in a programme was chosen to focus on where the main course objective was a group work assignment. This case seemed particularly interesting as the research aim focuses on investigating GAI in group work.

Furthermore, another interesting feature of this case is the programme's liberal approach to the usage of GAI. After conversations with the program's teachers, it was noted that their approach was to encourage and integrate GAI into their curriculum, as they saw it as a big part of the future development of higher education. These characteristics are considered important when choosing a specific case study, as the uniqueness of a specific case is often why it is interesting to study (Clark et al., 2021).

A common critique of single case studies is that they cannot produce findings that can be applied to other cases and cannot represent a wider population (Clark et al., 2021). The case chosen for this thesis was not chosen to try and generalize the findings, but was chosen to investigate a specific case with characteristics that could contribute to an interesting perspective to the research field. This case was chosen due to the course's high level of adoption of GAI, which enabled an opportunity to examine its extensive and unfettered use within an educational context. This study aims to achieve transferability, by describing the study in a detailed way to allow the reader to make their own judgement as to whether the findings could be applicable to other contexts (Lincoln & Guba, 1985).

4.1.1 Participants

The participants chosen for the research were limited to students in a master's course, which was the context for the case study. They study at a Swedish university and are a mix of Swedish and international students. The number of active students in the course was around 30, where group work was divided into five student groups of five to seven people each.

Access to the course and permission to collect data were granted through established contact with the institution. Following discussions and email correspondence with the programme's teaching staff, informed consent was obtained to observe and participate in the course activities for data collection. Informed consent was obtained from the students in the study. This will be described more thoroughly in the section Ethical considerations.

The selection of participants can be characterized as opportunistic sampling, as it involved taking advantage of an information-rich case that became accessible through existing institutional connections and timely course availability (Clark et al., 2021).

4.2 Empirical context

Data collection spanned over four weeks following the entire length of the master's level course. The course focused on digitalization and is offered at the information technology institution. The course consisted of one week of lectures, followed by three weeks of student group work as the main objective of the course.

The student group work was based on the 'Scrum' method. Scrum is a method for working in groups that helps organize group work into smaller pieces and focuses on continuous feedback loops to learn and improve the group's work (Scrum.org, n.d.). The main component of Scrum is called a sprint. A sprint is a fixed period (usually between 1-4 weeks) where the team focuses on specific goal tasks set up at the beginning of the sprint. In the course, these sprints were one week long. At the end of each sprint, the group has a retrospective recall. During these retrospective recalls, they discuss what went well, what could be improved, and what should be focused for the next sprint. This loop is then repeated multiple times as an iterative process to finish the project (Scrum.org, n.d.). This was repeated three times for the course at the end of each week. The primary assignment of the course was a project-based assignment where the students had to create a solution for a public sector issue. Five student groups of five to seven people worked for these three weeks to create a solution and a couple of other criteria, like method documentation and a presentation of their solution.

All lectures, seminars, and student project presentations were attended as part of the case study. Notes were taken during these sessions. These will not be directly presented in the findings but have contributed to the overall understanding and interpretation of the collected data. Furthermore, the continuous presence throughout the course enabled closer observation of the integration of GAI into the students' activities within the course. It also provided valuable insights into how the course was structured and conducted, helping to identify what data would be relevant to collect at the different stages of the course.

In the course, the students had access to a custom-built chatbot called CourseGuru through their learning management system that is based on one of the Open AI developed large language model. It was set up by one of the teachers before the course started. CourseGuru was trained on the data for the current course. It was filled with articles, course material, lecture notes, and other training materials that were relevant for the course. It was created to support the students in their study activities. The students could use this chatbot for various tasks, such as support their understanding of course objective or discussing complex concepts in the course literature.

As mentioned in the previous section, the overall approach in the program was to embrace GAI and learn to adopt it. In this course, the students were given a high degree of freedom in using GAI and were encouraged to use it fully.

4.3 Data collection

The data collection process began with participation in the first lecture of the course, during which the purpose and scope of this study were introduced to the students. This included a brief explanation of the aim of the master's thesis and how the collected data would be used. Following this introduction, an informed consent was emailed to the students using Microsoft Forms (see Appendix 2). When the students had provided approval to be a part of the study, the data collection process could start.

As a voluntary activity, independent of their course requirements, the student groups were asked to record and submit audio-recorded discussions and reflect on their use of GAI tools during the group project work. These will be called self-administered reflective discussions for the context of this study. These recordings were submitted through the university's learning management system. Over the span

of three weeks, students were asked to record 5–15-minute self-administered reflective discussions once per week, responding to a set of guiding questions provided in advance. For each individual data collection occasion, between two and seven of the members attended the data collection as it was completely voluntary. In total, 14 audio recordings were sent by the student groups. This means that one recording by one group (group number 1) was not sent in during one of the sprints.

The data collection procedure was explained in further detail to the students during one of the lectures, where students were encouraged to follow the provided questions but were also free to explore other topics related to GAI as they emerged. This is often done in qualitative research to emphasize that the participant's thoughts are central and relevant to the research (Clark et al., 2021).

These self-administered reflective discussions were chosen as a method for the data collection process as it aligns with the research aim of giving the perspective of the students. Furthermore, it allows for a deeper understanding of how they use GAI in their work to complete the course objective together. As the research question focuses on group work, the self-administered reflective discussions provide a fitting environment for the students to discuss their GAI usage for their group activities.

This approach is not without limitations. The participants' answers could be influenced by group norms or expectations, answering in line with what they believe that other group members would like to hear (Clark et al., 2021). Another criticism is that it is probable that there would be one dominant speaker or that the students feel uncomfortable speaking in a group context (Clark et al., 2021). A third limitation is that the researcher cannot steer the conversations if they go off-topic or ask further questions if something is unclear.

However, the limitation of the data collection method also trades off with benefits. A potential benefit is that the students feel more comfortable without the researcher present, and this could lead to a discussion with more nuanced and richer data (Canipe, 2020). Moreover, the chosen data collection method of self-administered reflective discussions gave the students the flexibility to conduct these discussions in their preferred format (online or on campus), minimizing the intrusion of the research process into their natural workflow of the course. Another strong argument for the chosen method was how it allows for following the students throughout the whole span of the course, with the possibility to ask and refine the questions based on early observations from previous sprints. It enabled questions to be changed between the weeks, considering where the students were in the process of the project.

The questions were revised weekly to align with the progression of the students' project work and to ask further about interesting findings from early observations in the data collected.

The first week of group work, the questions focused on how the students planned to use GAI and what their approach would be when using it in their group project. See the questions below.

Figure 2

Sprint question 1

During your retrospective in the group, I'd like you to record and discuss your AI-adoption and AI-usage in the project group for 5-15 minutes. It's totally fine if the discussion strides away from these questions as long as it's still about AI. It's a group assignment so only one person from the group needs to upload.

1. Start the recording (please make sure you can hear everyone in the group).
 2. Discuss the following questions in the group:
 - A. How did the possible usages of AI-tools change the way your group approached the assignment?
 - B. Can you describe how your group used AI tools (like ChatGPT, CourseGuru, Notion AI or others) during this sprint?
 - C. Did you discuss the usage of AI for the assignment within the group?
 - D. Are planning to use AI differently in the next sprint? Why or why not?
 3. Stop the recording and upload it here.
- Thanks!

The first figure of questions also has the description given to the students together with the questions provided in sprint one. The following two figures will only have the questions.

In the second week of the groups, the questions shifted to ask more about chatbots as the data indicated that was what the students utilized mostly. The questions were framed to allow for discussion about how they utilized chatbots in their group work and what role they saw that chatbots could take. See the questions below.

Figure 3

Sprint questions 2

The focus of this session will be on chatbots and learning together in a group.

1. Start the recording.
2. Discuss the following questions in the group:
 - A. What words would you use to describe the role of chatbots when working with them?
 - B. Describe a situation where you learned something from others in the group. How were chatbots involved in that situation?
 - C. Thinking back to previous experiences of group work, did you work more individually or collectively during this project, given that you had access to a chatbot?
 - D. Can you describe a moment when your group used a chatbot to solve a problem or make a decision?
(What was the problem, and how did you use the chatbot to help? How did your team discuss or build on what the chatbot provided?)

The last data collection occasion was on the last day of group work in sprint week three. The questions asked were aimed to open up the discussion in the student group to reflect on their usage of GAI throughout the course. Ending with a question about their views on the future of GAI integration into higher education. See the questions below.

Figure 4

Sprint question 3

The focus of this session will be on your overall reflection on AI.

1. Start the recording.

2. Discuss the following questions in the group:

A. While in the final sprint, how has your use of AI changed compared to the previous sprint?

(Have you used it in new ways, explored different tools, or adjusted how it supports your work?)

B. If you had to give advice to a new group of students on how to use AI effectively in this course, what would you tell them?

C. Looking back at your project work, what is the biggest takeaway from using AI in this course?

D. After working with AI in this and previous courses, do you see AI as an integral part of your future studies and work?

By asking questions at different stages of the project, the study was able to follow the students throughout their process of using GAI in their group work and see how it evolved over the period of the course.

4.4 Data analysis process

The data analysis process started with the use of thematic analysis to structure and unpack the data. Thematic analysis is a process where the researcher produces categories by iteratively going through the data and coding it into different themes. This is done to provide the researcher with a theoretical basis to understand the data and to be able to relate it to the research focus (Bryman, 2016). The approach is common in social research for qualitative analysis (Clark et al., 2021). This study has taken its inspiration from the authors Braun and Clarke (2006, p. 87), who describe the process in six phases. The different phases are:

1. Familiarizing yourself with your data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

The first phase of the data analysis involved compiling all audio-recordings from the self-administered reflective group discussions. These recordings were then automatically transcribed using Microsoft Clipchamp, a tool provided by the University of Gothenburg. In total, the transcribed material were

around 11 000 words. The transcriptions were reviewed and cross-checked against the audio multiple times to ensure accuracy. To protect participants' privacy, all data was anonymized during this stage.

After reading through the data multiple times, phase two was started by drafting initial codes. The process of coding identifies and labels data in a systematic way to analyse it further (Braun & Clarke, 2006). These codes identified in the data were aimed to capturing the latent meaning, focusing on the describing the implicit content conveyed by the participant (Braun & Clarke, 2006). Segments in the data were colour coded into 22 different codes, where sentences were grouped to form units of meaning. Table 2 shows examples of four codes together with the description, colour code, and examples of student quotes. All 22 codes can be found in the Appendix (see Appendix 1).

Table 2

Examples of initial codes

Code	Description	Color code	Example quotes	
A way forward	GAI usage to progress and advance with the group project.	Yellow with red text	Student group 3: Especially when we get stuck in our discussions the AI chatbot is a way to go forward.	Student group 1: Helped to track down all the readings and told me how to start with the portfolio management process.
Adapting to AI	Adjusting practices and workflows to integrate GAI.	Purple text	Student group 2: You have to understand when AI is good and how to use it and combine it with our own thoughts and ideas.	Student group 5: Yes, of course, it feels like there is no going back when you have learned it and started using it.
A second opinion, another person	Using GAI as an additional perspective or consultative tool.	Light red	Student group 5: I felt that we needed an outside source of some sort because we were confused.	
Group dynamics	The impact of GAI on group dynamics.	Cursive	Student group 5: Maybe we worked less as a group because if I had a question, I would have to ask you. But now if I have a question, I can ask the chat.	

After the work with the 22 initial codes, the focus shifted to creating themes, as suggested in phase three (Braun & Clarke, 2006). At this stage, the theoretical framework was added as an analytical lens to interpret and understand the data further. The last three phases of thematic analysis have inspired the approach taken in the rest of the data analysis but are not defined in specific phases as they intertwine with each other.

The thematic analysis provided an initial structure for organizing the data. However, the analysis was further developed through the lens of AT (see chapter Theoretical framework). Using AT as a conceptual framework supported the analysis of how students' integration of GAI could transform their activities in a higher education context.

The transcribed data were revisited multiple times in relation to the core components of AT, enabling an iterative process in which emerging themes were reinterpreted and refined within the theoretical framework. The elements of *the subject* (student group) and *the mediating artifact* (GAI) were central in this process. Given that the research aim focuses on how the student group engages with GAI in their activities, this relationship was placed at the core of the analysis. Although it is not presented as a separate theme, the interaction between the student group and GAI is embedded throughout all themes and informs the overall interpretation of the data.

In addition to the central focus on the interaction between the subject (student group) and the mediating artifact (GAI), other activity system components significantly informed the analysis. The element of division of labour emerged as particularly relevant, as the integration of GAI into group activities appeared to alter how responsibilities were shared and negotiated among group members. Similarly, the community element provided valuable insights. GAI was sometimes described as supporting the students' decisions on how to proceed with their projects, suggesting its role as a guide that supported the student groups in how to proceed with the project. Furthermore, the *subject* element, representing the student group itself, was re-examined in the light of AT. GAI was occasionally referred to in ways that suggested it had taken on the role of an additional group member or teammate, actively contributing to the group's activities. These three elements, division of labour, community, and subjects, were prominent in the data and therefore formed the basis for a theme, offering a nuanced perspective on the data through the framework of AT.

The element of *rules* was also considered during the analysis. However, as the data provided limited insight into how formal or informal rules shaped students' interactions with GAI, this component did not form the basis of a distinct theme. Nonetheless, its potential influence is acknowledged and is discussed through the findings as well.

Throughout the entire analysis process, the full activity system was treated as the unit of analysis. Rather than isolating as individual components, the analysis focused on how different elements interact with one another and how their connections contribute to both tensions and opportunities within the group work activities.

To ensure that the analysis remained aligned with the research aim and to present the findings coherently and logically, the findings chapter is structured to reflect the study's focus on understanding students' activities with their usage of GAI. The findings chapter, therefore, begins by introducing the group's activities in the project, then contextualizing these practices through elements of AT that emerged as prominent in the data. The last theme goes deeper into how students' views of the integration of GAI in higher education. The final thematic categories derived from the analysis are outlined at the beginning of the findings chapter.

4.5 Ethical considerations

The research ethics approach taken in this study followed the guidelines established by the Swedish Research Council for good research practice (Vetenskapsrådet, 2017). The following ethical aspects were considered relevant to the research process:

The students were informed about the purpose of the study, the data collection procedures, and the intended reporting of findings, both orally and in writing. The researcher was present during all lectures throughout the course and, on several occasions, explained the study and the questions provided for the self-administered reflective group discussion used for data collection. Students had the opportunity to ask questions and seek clarification. Written information about the study (see Appendix 2) was also provided to the students' university email addresses through Microsoft Forms. 24 students answered the form. Not everyone enrolled in the course answered the informed consent form, but as the participation in the group discussion was completely voluntary, the students who did not answer were probably not present during the discussions.

This written information outlined the aim of the study, stressed the voluntary nature of participation, and clarified that personal integrity would be protected in all data, including transcripts of audio recordings. It was also made clear that the students could withdraw their consent to participate in the study at any point. Further information mentioned that no names or identifying details would be included in any published material. Students were asked to provide informed consent before participating.

Due to the study's design, the researcher did not have access to information identifying which student made specific comments in the group discussions. The transcription and selection of material for inclusion in the report were carried out with great care. Where necessary, though infrequently, students' spoken language was edited for clarity and readability in written English. This included removing repeated words or filler expressions, while ensuring that the original meaning of the statements was preserved.

Since this study investigates students' use of GAI, it is also reasonable to report how I have used it during the process of conducting this research. I have used GAI to generate suggestions and explore ideas related to topics. Furthermore, it was used to support my understanding of complex concepts and as a writing coach.

4.6 Trustworthiness of conducted research

In all research, it is reasonable to relate to quality criteria for the conduct and reporting of studies. This is often referred to the concepts of reliability, replicability, validity. Another concept that is often related to qualitative research is trustworthiness (Clark et al., 2021) In this context, the term trustworthiness is chosen as the point of departure, as it is more applicable to the type of qualitative study that has been conducted. Trustworthiness concerns whether the results can be trusted in relation to the study's methodological choices and limitations (Clark et al., 2021). Put differently, the question is: Can the results of this study be trusted? The following section describes what has been done to ensure that the findings of the study are trustworthy, even though the results are not intended to be generalizable.

This study has taken a case study approach, and the selection of the case is therefore specific. Without disclosing which course or which students participated in the study, an effort has been made to describe the context as thoroughly as possible without violating ethical guidelines. The data collection process has been described, and the questions the students discussed are clearly specified in the thesis.

All recorded data has been carefully transcribed, and the initial, more descriptive 22 codes are included in the appendix (see Appendix 1). The stages of the analysis process are described in a step-by-step manner.

In the presenting of the findings, the aim is to make the students' voices visible. For this reason, a large number of the transcribed data has been included in the findings chapter as quotes, allowing the reader to engage directly with what the students expressed during the self-administered reflective group discussions.

5. Findings

This chapter presents the findings in three key themes that emerged from the thematic analysis and further interpreted with the theoretical framework of AT. First, the different activities in which the students use GAI are presented, followed by a theme with three subthemes of how GAI's role might change within the activity system. Finally, the last theme expresses the students' thoughts on adopting GAI into higher education. The themes are presented in short below as an overview, followed by each theme. The findings are also discussed in relation to previous research.

Following the rest of this thesis, the term GAI will be used consistently in the findings, discussion, and conclusion, even though the students sometimes used words as AI or chatbots. These results still refer to tools that are examples of GAI.

Theme 1: Activities with GAI

The first theme encompasses the different activities the students use GAI for, their thoughts about them, and how it supported them in their group work activities as a tool. This theme emerged primarily from the research focus on a deeper understanding of group study activities with the integration of GAI. This theme mainly analyses the connection between the *subject* (student group) and the *mediating artifact* (GAI) as the elements from AT.

Theme 2: GAI as more than a tool

The second theme presents the findings by identifying how GAI's role might change because of the different ways the students utilize it. With the different ways it is used within the activity system, it can potentially be seen as more than just a tool. This theme is divided into three subthemes, with three of the elements from AT used as lens to analyse the findings. The subthemes are:

Subtheme 1: GAI as a subject

Subtheme 2: GAI as division of labour

Subtheme 3: GAI as part of the community

Theme 3: Students adapting to a world of GAI

The third and final theme encompasses the findings of how the students describe and think about integrating GAI into higher education.

5.1 Activities with GAI

Throughout the findings, students consistently and overall framed GAI as a powerful and influential tool supporting their group activities. The students mentioned the usage of many different GAI tools. In total, the students mentioned around 14 different tools during the project. GAI usage was present during many activities and utilized by the student group to support their activities in multiple stages of the group work. Both individually and as a group. This aligns with previous findings, as GAI is believed to influence higher education students' activities significantly (Öhrn et al., 2025).

The following part of this theme gives examples of GAI usage from the self-administered reflective group discussion, highlighting its role in their group work. Firstly, their opinion towards its use in the initial stage of the project is described, followed by multiple examples of how GAI was used in their group work.

From the beginning of the project, the students encouraged each other to use GAI for different activities. When questioned how they discuss GAI usage in the group, students from two different groups advocated the usage in this way:

Student group 1:

We recommend everyone to use it.

Yeah, we wanted everyone to use it. It makes our task at hand much easier.

Student group 4:

I feel like at this point it is almost stupid to not use some type of tool. It is kind of obvious that you would like to use something. I almost feel like you don't even need to talk about it in a sense.

These quotes state that the students highly advise each other to use GAI in their group work and that it has already become an ingrained practice in their activities.

In the student's goal of finishing the group project, multiple GAI tools were utilized throughout the project for different tasks and activities. For example, students specifically mention using Notebook LM, ChatGPT, ChatPDF, and CourseGuru to support with their readings. In the beginning stages of the project, the students were tasked with over 30 articles to read and process to understand the problem area of the project. Instead of reading all the articles in their entirety, they turned to GAI tools for summarizing, extracting insights, and clarifying complex texts. These student quotes below characterize the approach that most of the groups took:

Student group 1:

It has made it a bit easier for us. There has been a lot of information, many papers to read in a short time, and a lot of information and golden nuggets to find and analyse. I think GAI for example, Notebook LM really helped us to speed up the process and make it easier for us to gather a lot of information in a short time and make sense of it.

Student group 2:

You can also interact with the paper in a different way. You can ask a specific question and get explanations in detail. You can ask about certain areas and get a deeper explanation. That is very hard if you read the paper in a normal way.

A shift in the activity system is identified, as the students now have the possibility to use GAI to accomplish the task in a different way. Instead of reading articles and understanding the content themselves, they can partly replace it with summarizing and prompting with the help of GAI. The activities for completing the assignment are transforming when students notice the possible way to achieve a similar outcome in a different way. The reason behind this transition could be the short amount of time for the project, but also as opportunity to make it in an alternative way with the support of GAI. This is one of the main concepts of AT, as the cause of contradictions, tension, or opportunities is a driver of change in the activity system. One student group problematises this aspect, as they discuss the implications of using GAI for these tasks.

Student group 4:

I want to see it as something that I can use to help my reading comprehension, and not something that is supposed to understand everything for me. I feel like that's a really important distinction.

As raised in previous literature, these concerns are noted as a threat with the integration of GAI into the education landscape (Farrokhnia et al., 2024; Ghimire et al., 2024).

GAI also enabled students to engage in tasks outside their prior experience or skill sets. They created mock-ups of websites and visual representations without extensive knowledge of programming or graphic design.

Student group 1:

We can now create mock-ups of websites and visual representations without extensive programming or graphic design knowledge.

The students also mentioned the support of GAI in drafting different components for their group work, such as user manuals, requirements specification for their solution, and another important design aspect of their group project.

Student group 3:

To create user journeys and everything we had help with formulating through the chat. Yeah, and deciding what to do, and also like the requirements specification. Yeah, and the user manual.

These examples demonstrate how GAI enabled students to move beyond their own skill boundaries and produce outputs they might not have had time for or didn't have knowledge about. With GAI, a door was opened to do the tasks differently. In both cases, GAI contributed to the production of content and the collaborative process of shaping and refining ideas within the group. These findings are supported in previous research, as students felt empowered using GAI, and that it supported their idea creation process (Holland & Ciachir, 2025; Remoto, 2023).

Students described GAI as particularly helpful in making sense of the project assignment, especially during the early stages of the group work. Several groups mentioned that they initially experienced confusion about the assignment, and that interacting with GAI helped them clarify expectations and align their own ideas with the project assignment.

Student group 3:

CourseGuru gave us important insights from the papers and helped us align our assignments with the correct expectations.

Student group 4:

-I uploaded the project description and asked questions like: Could you please summarize? Could you help me understand? What needs to be done? Can you give an example? And stuff similar to that.

-I felt that we needed an outside source of some sort because we were confused. It helped us understand it better.

To summarize, the findings in this theme exemplify that the *student groups* (subject) can use *mediating artifact* (GAI) as a tool in many ways to support their group work to reach the goal of *completing the assignment* (object). From an AT perspective, these examples may point to a shift in how the students approach the objective (the assignment in this case), where GAI functioned as a mediating artifact that helped students to bridge the gap between the project description and their understanding of how to get started with the assignment. Students turned to GAI tools like CourseGuru and ChatGPT to support the interpretation of the project assignment, generate content drafts, and get started with the project work. These findings align with previous research, as GAI was considered a great support to get started with assignments (Holland & Ciachir, 2025). However, GAI was also seen by the students as something more than just a tool, with the possibility of taking on different roles in the activity system.

5.2 GAI as more than a tool

When the students discussed how they perceived GAI's role in their group work, they gave varied answers. A couple of the different descriptions were that GAI could be seen as a ball plank, an expert, a teacher, a slave, a guide, a specialist, a tool, a smart extra person/teammate, an advanced Google search, an eye opener, or an outside source. Two of the student's quotes capture this well:

Student group 2:

It can be pretty much anything, basically it depends on how you interact with them, right? Sometimes it's a teammate, it gives ideas, sometimes it evaluates your work, sometimes it is a tool and sometimes it gives you a road map on how to do it as a guide. So, it's like an extra person, a smart extra person.

Student group 5:

*-Yeah, I feel it's more like an assistant maybe, but also, kind of a study buddy because it can work as an eye opener at times.
-It can show the direction that I didn't think about.*

One student even joked about that role of GAI, and that it could be considered a "slave", doing the work instead of the student themselves:

Student group 5:

I see it as slave, almost as my own worker, doing the work for me.

These comments can be interpreted as the lines between GAI as a tool being partly blurred. GAI could take on many roles within the activity system and group work. The three coming subthemes will exemplify and analyse GAI in the light of three elements from AT. First it presents the subject, followed by community and lastly division of labour.

5.2.1 GAI as a subject

As mentioned above, the students describe that GAI could take on many different roles. One particularly interesting finding is that they could see it as an extra group member. As two student groups described:

Student group 4:

For me, it is more like a creative and collaborative teammate always full of new ideas and can guide me and help me learn.

Student group 1:

Sometimes it can almost be a teammate, and help you work on tasks you need to do. It's awesome.

In contrast, one student did not perceive GAI in a personified way, instead approaching it as more of a neutral technological resource:

Student group 5:

In my personal experience, it would be more of a tool because it's helpful to translate languages or things like that. It's also good to summarize concepts from papers. I don't see it in a very personified way, like a teammate.

While GAI was often referred to as a tool, the findings above also indicate its potential role as part of the student group rather than just a tool. Another interesting finding in relation to this is that GAI had become an initial starting point for asking questions instead of asking other teammates.

Student group 3:

Maybe we worked less as a group because if I had a question, I would have to ask you. But now if I have a question, I can ask the chat.

Student group 4:

-The only thing I can think about is when I have a question, instead of first going to the group, I will go to chat.

-That's true because it does go faster.

-Yeah, for sure.

These findings suggest that GAI could provide support in group work environments that allow students to work more independently. The students further reflected on the topic that it potentially gives them more confidence and that it is easier to chat with a bot rather than asking questions to other group members.

Student group 3:

-It gives everybody more confidence. Because you're not totally alone working.

-Yeah, exactly. Great thought!

However, despite these findings, most students did not believe that GAI affected their teamwork or group dynamics to a high degree. They believe that the work would have looked similar without access to GAI. The amount of individual work might have shifted a little bit compared to collective work, but their decisions and the work would have looked similar without it.

Student group 4:

I think we would do the same even if we didn't have the chatbot.

Another group pointed out that there was indeed more individual work, but it did not matter much, as they still took collective decisions.

Student group 5:

-I don't think we worked a lot individually. I think we've made collective decisions. I mean, sure, we have had our individual part of work done with AI, but then I would say we have moved more collectively.

-Decisions are made in the collective.

These findings are interesting compared to previous research, as GAI has shown signs to amplify students' perceptions of collaboration compared to individual work, but not to a degree compared to working with others (Fan et al., 2025). The student's quotes indicate that GAI could potentially shift group work to more individual work by partly replacing the human-human interaction with GAI. As the student highlights, it provides a faster and more comfortable way to gain insights. Nevertheless, this also has the potential to miss the importance of social interactions. The positive side of the findings is highlighted in previous research, as chatbots provide a convenient and fast way to get answers rather than asking other group members (Holland & Ciachir, 2025). However, as it partly replaces social interaction, previous research reports that GAI does not provide the same sense of social presence and collaboration as you get between humans (Fan et al., 2025). When GAI is being used to partly replace human to human interaction between students as the findings from this thesis highlights, the benefits of social interactions might be lost.

Another particularly prominent finding when looking at GAI as a subject is that the students use GAI as a thinking partner.

Student group 1:

*Most of the time I use them for like diffusion of my ideas together with the articles.
Basically, referencing my ideas to the articles or trying to find correlations.*

Student group 2:

*Sometimes when things are not clear in my head, when I cannot put my ideas into words.
Then I can put half of the words, and it completes the other half and makes a good,
standardized text that is understandable.*

These two examples demonstrate how the students use GAI as an individual thinking partner to make sense of their own ideas in relation to the course. GAI was also utilized within the groups to discuss and reflect on their ideas.

Student group 4:

*-I love that we shared the response of our own chats and compare them together.
-Yeah! (said collectively)*

The usage of GAI as a thinking partner provides individual students with new possible way to work with the course material and understand it. In a group context, GAI could further support the discussion within the group on how to proceed with the project together. This aligns with previous research, as GAI could provide good opportunities for discussion and development in group projects and was perceived by students to increase their ability to think critically about their work (Perifanou & Economides, 2025).

To summarize this subtheme with a deeper analysis from AT, the way students position GAI as a teammate or thinking partner, suggests a potential shift in the subject-role within the activity system. The previous theme described how students used GAI as a tool to achieve a shared objective.

However, when GAI is described as “*a creative and collaborative teammate*” or “*a smart extra person,*” it begins to blur the line between tools and subject, indicating a possible shift of roles within the group and activity system. In these examples above, GAI appears to take on a more supportive position, contributing to ideas, supporting understanding, or even becoming the first point of contact for answering questions. While the student groups still emphasized that key decisions for the project group were made collectively by the group, the data indicates that GAI may have functioned as an additional subject that could influence how ideas are formed, understood, and shared. This reconfiguration introduces tensions within the activity system, particularly around the value of human-to-human interaction and the role of social interaction in collaborative learning.

The analysis of these findings points to the fact that GAI’s presence in group work may challenge established notions of agency within collaboration. When viewed through the lens of AT, the data opens possible interpretations of how GAI could subtly shift group dynamics, how interaction unfolds, and how group decisions are made. This perspective invites further reflection on both the opportunities and the limitations of integrating GAI into group-based educational settings.

5.2.2 GAI as a part of the community

From the terminology of AT, the community could be described as everyone who is involved in the process of reaching the outcome within the activity system. For example, the teacher or the institution

of the programme. As previously stated, the students described GAI in many ways. As one group of students talked about it:

Student group 3:

-I feel like they have been a tool and like a ball plank, to bounce off ideas.

-Or a teacher.

-An expert, I would say almost. Sometimes it is our expert opinion.

This emphasizes that GAI could be seen as more than just a tool or a subject, as described in the previous theme and subtheme. The students further exemplify how GAI could support them in steering the project in line with the objective of the course.

Student group 1:

It can help by making a step-by-step plan on how to develop our solution.

Student group 4:

It helps on align the assignment with the correct expectations of the course and helps us focus on the right things.

The student also highlights and mentions their strong appreciation for CourseGuru. As mentioned earlier, CourseGuru is a trained ChatGPT model that the teacher created for this specific course, which has been trained on data from the course. The student gave it credibility because it was aware of the course context and could answer questions related to the course.

Student group 5:

-I like CourseGuru that our teacher created that is built on what he said in class and our assignments.

-Yeah, I use that one primarily as well, because it feels like you can ask from a different perspective specifically linked to this course.

Student group 3:

Especially the one Teacher X created. The CourseGuru is based on the material. It feels like an expert.

To summarize this theme with a deeper analysis from AT, these examples suggest that GAI, particularly CourseGuru, could be interpreted not only as a tool but also as part of the community within the activity system. It is integrated into the student group workflow, and together with its contextual data it has been trained on, it could potentially be positioned alongside teachers and others as a contributor to the shared learning environment. The way the students spoke about CourseGuru, as something they could trust to align their group project with, points towards something with more cognitive and social presence than just a tool. It may be that in this specific context, where CourseGuru had been tailored and trained on the course content, it was easier for students to attribute more legitimacy to it. While custom-trained chatbots are still a widely unexplored area, previous findings state that custom-trained bots could be very useful for delivering specific educational content (Alfirević et al., 2024). The highlighted examples invite further reflections on the opportunities and implications of what GAI as part of the community could mean, and how it could be further integrated into higher education.

5.2.3 GAI as part of the division of labour

In relation to the element of division of labour, which refers to how responsibilities and tasks are distributed within the activity system, the findings indicate several compelling aspects that are worth expanding on in detail. Two of the student groups described using GAI to support the organisation of their group work:

Student group 5:

We divided articles between us because we could not read them all. We did not know how to choose who should read what, so we used ChatGPT to divide them between us.

Student group 1:

We had it create sprint task for us, based on information we feed it. It was a great and easy way to get going with the project.

These examples suggest that GAI could function as a tool for structuring group workflow, supporting task distribution, and reducing the initial planning effort often required in collaborative work.

One of the more prominent findings throughout the self-administered reflective group discussion was how GAI could support the student groups by saving time, reducing workload, and allowing them to focus on other tasks of the group work. One student exemplifies this clearly:

Student group 2:

Always think like, OK, how can I use GAI to lower the workloads? How can I use it to help me?

Many students also described how the use of GAI helped to reduce their cognitive and practical workload, allowing them to dedicate more time and energy to other parts of the assignment:

Student group 4:

-It would not be possible without AI that we are going to be able to summarize 32 articles in such a short time. And then analysis between the articles... GAI was really helpful here.

-We need that time for other things like generating ideas and discussion.

Student group 2:

Instead of starting from scratch, we used GAI to generate initial drafts, summarize sources, and refine arguments. This saved time.

The examples in this theme illustrate how GAI played a role in reshaping the division of labour within the activity system. Instead of group members assigning tasks manually to each other, GAI could provide guidance and ideas on the process. These examples further show that GAI can be used to automate or simplify this process, for example, by dividing readings among group members or generating structured sprint tasks based on provided input. This suggests that GAI supported the students in determining what tasks to perform and who should do them.

This is in line with previous research, as GAI was perceived as supportive in group work to help with decision making and with assignment of tasks within groups (Luan et al., 2025). Furthermore, by reducing the cognitive and practical workload associated with certain tasks, GAI allowed students to redirect their focus toward task such as analysis, ideation, and collaborative discussion. From an AT perspective, this points to a reconfiguration of the division of labour, where GAI temporarily could take on roles such as a planner or coordinator. While the students still made all the decisions, GAI appears to have mediated and enabled a more efficient group work environment where students could focus more on activities they deemed more important.

This shift raises interesting questions about the longer-term implications of having GAI partly take over roles traditionally held by students or teachers in collaborative work. While the students clearly emphasized the efficiency benefits of using GAI, their discussions also highlighted how the redistribution of labour mediated by GAI contributed to a faster and more streamlined workflow.

However, if tasks such as planning, organizing, and task distribution are increasingly offloaded to GAI, there is a risk that students may become less engaged in developing these essential collaborative skills. Skills that group work is often intended to promote (Hammar Chiriac, 2014).

To summarize the theme GAI as more than a tool with the three subthemes, it highlights the dynamic nature of students' activities and emphasizes the extent to which the use of GAI is embedded within a broader activity system and can be seen as more than just a tool by the students.

5.3 Adapting to a world together with GAI

As highlighted in the previous themes and subthemes, students actively sought to utilize GAI to its full potential across different stages of their group work. They did so with the aim of supporting the completion of their group project. The students discuss and talk about how GAI is starting to become deeply ingrained in their workflows:

Student group 5:

- *It feels like there is no going back when you have learned it and started using it. It saves time, and it's so efficient. I can't see how I would just disregard it in the future.*
- *No, it is like phones. Or like the internet.*

Student group 4:

- *I almost feel like you don't even need to talk how you would use it in the group because it's so ingrained.*
- *Yeah, specifically in our education right now.*

These examples indicate that the students see the usage of GAI as almost non-negotiable, as it has become a big part of their studies. The students also highlight the importance of learning how to use GAI:

Student group 5:

- *We should almost use them habitually because we need to learn how to interact with them. We need to practice using these tools rather than just avoid using them.*

Student group 2:

- *If I would not use AI, I would be so far behind of my peers.*

These reflections suggest that students almost perceive the knowledge of how to use GAI as a necessary skill for keeping up with the course requirements.

The students further mentioned how they cater their usage to the task and stage they are in the project. In the first sprint, GAI supported the students in clarifying concepts, summarizing articles, and understanding the project. In the second sprint, the students used it more for task planning, brainstorming, and creating drafts of early designs. In the last sprint, they used it to refine their ideas and support them in presenting their final product of the group assignment. The students mention the different ways they incorporate GAI into their workflow at different stages of the project:

Student group 1:

- *First week we generally talked about all the theoretical parts with AI, but now we are doing very practical things.*

Student group 5:

I think before I was using a lot AI to understand stuff. So, I would use Notebook LM. But now I was more like working with ChatGPT.

The students also discussed how GAI usage in as part of the planning of project, suggestion that it's an integrated practice in their approach in the planning of the project work:

Student group 4:

I feel like this next week is kind of when we try to really hone in our ideas about how our solution should work, so that's how we will use GAI.

These findings suggest that the student group constantly are trying to adopt their usage of GAI to support where they currently are in the project. The students' groups further mentioned the importance the knowledge on how to utilize GAI:

Student group 1:

The more details you give it, like what you want to know, the better the answer will be.

Student group 3:

You have to feed it information too. You cannot just ask it to do this project for me... You also have to give it something.

These examples indicate that the students have an awareness of how to use GAI to make it useful for their project. As previously mentioned in this thesis under the empirical context, in the Method chapter, the student was encouraged to use GAI within the course and within their programme. This institutional support may have contributed to their confidence and familiarity with different tools, enabling more strategic and purposeful use.

These are interesting findings in comparison to previous research of students' voices on GAI use, where students asked for clear guidelines and support on how to utilize GAI and how to do it responsibly (Öhrn et al., 2025). In contrast, the students in this study operated in an environment that embraced a more exploratory mindset. This open approach may have reduced uncertainty and allowed students to focus more on discovering how GAI could best support activities within the group project. However, the open approach and usage of GAI also raised concerns within the students' groups. The students discuss the potential drawbacks and negative effects of their usage.

Student group 4:

There are many benefits actually to using AI in education. Nevertheless, at the same time relying on it might have a negative consequence... maybe we're going to lose our ability to analyse more and more.

Student group 5:

It is like a double-edged sword. I feel it is not completely a good thing, but then it was a good thing for this course. We would not have read all papers in two weeks if we had to deal with them personally.

Another concern that one of the student groups raised was that sometimes the data provided by GAI is misleading, and that it is important to understand the limitations of its usage:

Student group 2:

Sometimes it is just making things up and you should always take it with a grain of salt and really look at the sources again, if it is something important.

These examples showcase how the students are aware of potential drawbacks, such as inaccurate information and hallucinations, provided by GAI. This issue has been highlighted in previous research as one of the more problematic aspects of the usage of these tools (Elbanna & Armstrong, 2024). Despite the potential negative aspects, the findings indicate an overall positive mindset towards GAI usage by the student groups.

This positive approach is in line with previous research, as students in technical subjects often have a more positive approach towards GAI and believe that it supports their learning more than other students from subjects like social sciences or humanities (Stöhr et al., 2024). However, the students express that GAI feels essential for them in managing their studies.

Student group 5:

How did we live without it before?

Student group 2:

At least for me, I also work full time, and without AI, I would not be able to do work 100% and study 100%.

Across the examples within this theme, many of the students viewed GAI as an essential part of their studies. Several groups described it as something they could not imagine studying without, even comparing it to everyday technologies like phones or the internet. For some, it was not just helpful but deemed necessary to manage their workload.

In the light of AT, this points to a significant shift in the activity system, where GAI is becoming central to how students work both individually and in groups. As GAI becomes increasingly embedded in students' workflows in higher education, it challenges traditional assumptions about how group work can and should be carried out. The students' beliefs about GAI as essential and ingrained in their academic life indicate an evolving nature of whole activity systems and highlight the importance of carefully navigating this transformation in higher education.

6. Discussion and conclusion

The final chapter is divided into four parts. The first section expands on the discussion from the findings chapter and highlights the contribution of this thesis by answering the research questions in relation to previous research. The second section discusses implications for higher education followed by a section on limitations and strengths of this study. Finally, some recommendations for future research are outlined.

6.1 Conclusion of the findings

This study aimed to investigate how students in higher education use GAI in group work activities and what role it can have in those activities.

The first research question was aimed to investigate how students use GAI in group work activities in higher education. In the first theme of the findings chapter, multiple ways on how student groups utilized GAI for different activities are presented. As their course progressed, students' activities evolved in tandem with their use of GAI, and they catered its usage to fit their different tasks during the group project. For example, they used it for summarizing articles, structuring group work, drafting and generating different content for the project, for task delegation and discussion between group members. This different usage of GAI was mostly highlighted from the positive side in this thesis, by for example how GAI could support the groups understanding of complex concepts and as a time saver during the project.

Similar benefits of GAI are also highlighted in previous literature, as GAI was reported to, for example, be able to support students in idea creation (Holland & Ciachir, 2025), offering timely feedback (Valova et al., 2024), or foster greater autonomy for higher education students (Seco et al., 2025) and reducing time consuming work (Remoto, 2023). The found use of GAI in this study are consistent with previous findings and highlights the diverse way in which GAI can support group work activities, similarly to how it can be support individual activities. However, the possible pitfall of using GAI also have to be equally considered. The findings of this study also highlight this perspective, where the students mentioned that GAI is a double-edged sword and that there are dangers of, for example, losing their analytic abilities and that content that GAI creates isn't always reliable. Previous research sheds more light on the possible adverse effects, where GAI could foster laziness and dependency on GAI tool (Ghimire et al., 2024) and negatively affect development of critical thinking and problem solving skills (Farrokhnia et al., 2024). Whilst this study doesn't investigate the effects of GAI, it contributes with an overview of all the activities that students could utilize GAI for in group work activities.

The second research question aimed to gain a deeper understanding of what role GAI could have in group work activities and is answered in the second theme of the findings. The result suggest that GAI could be utilized and seen as more than just a technical tool by the students. GAI could support their group work by taking the role as extra teammate. The students mention that GAI could be an initial contact point instead of teammates and shifting group work activities into more individual tasks. Similar findings are presented in previous research, where GAI could be seen as substitutes for group members (Atchley et al., 2024; Ghimire et al., 2024) and partly replace the human-human interaction (Fan et al., 2025). The students in this study also mention that GAI could support with the division of labour. It could assist them in how to divide tasks between group members and allow them to focus on other parts of the project which were deemed more important. The students in this study also mention that GAI could take the role as expert, teacher or a guide during the project. GAI supported students with decisions on how to move forward with the project, providing step by step plans and helping students align their project with the expectations of the course. In particular, the participants valued

the custom-trained chatbot CourseGuru highly, as it could provide them with tailored support in context for their course. As mentioned previously, prior research found on the topic of group work and GAI were scarce, but some similarities were found. GAI has been reported to be able to assist group with task delegation (Luan et al., 2025) which is in line with students practice found in this study. It also highlighted in previous research that GAI provides students with opportunities to critically discuss their choices during group work (Perifanou & Economides, 2025), which the students also use it for in this study. The findings from the second theme highlights the diverse roles GAI could have in group work, and that it can be more than just a technical tool in group work activities.

The third theme presented in the findings chapter relates to both research questions and highlights how integrated GAI already is in their group activities. In this study, the students show high levels of adaptation of GAI and already see it as an integral part of their academic work. The participants also highlighted the importance of keeping up with the rapid development of these tools be able to handle their studies and can't imagine a future where GAI is absent. This shift is captured well by one of the student's own words:

“How did we live without it before?”

Earlier research points to the importance of understanding the integration of GAI into higher education and is underlined as critical (Chang et al., 2023). Practical examples of its integration is also highlighted as vital to further understand how it can change the educational landscape (Ekundayo et al., 2024). The result from this study contributes to this gap of research on how GAI are used in group work practices. It also provides insight into the student's perspective and their view of the emerging development of GAI tools and its integration into higher education. The implication of the findings for higher education will be further discussed in the following section.

6.2 Implications for higher education

Although this is a case study, where both the course context and the students' prior knowledge are of great importance for the study result, there are still important implications for higher education that merit further discussion.

The findings particularly point to what may be interesting to consider when use of GAI is implemented more systematically in a course. Some students will undoubtedly use GAI regardless of whether it is included in the course planning or not, but this discussion focuses on implementation that is initiated, allowed and encouraged by the course leader and teachers. With that said, the study results show that the planning and implementation of this specific course and the students' use of GAI did not take place ad hoc. It has been a long process which was built within the environment of their programme. Without the knowledge and experience that the course leader and teachers had when planning the course, for example their set up of CourseGuru, the outcome of this study might have been completely different. As the student in this study showed high appreciation of CourseGuru during their course, it might be something to consider implementing for other courses in higher education as well. At the same time, it is important to emphasize that the student group in this study had a specific interests and knowledge in the area that drives their usage of GAI. In another course with different teachers and students, a similar course structure probably would not have been possible to implement in a similar way. The implementation requires previous knowledge from both teachers and students, and an availability of time and resources that does not seem to exist in higher education today.

As the use of GAI seems to continue to expand across many areas in higher education, it is essential that both staff and students in higher education possess at least a basic understanding of these tools (O'Dea, 2024; Wang et al., 2023). This study identifies that students' extensively use GAI in their

group work activities in diverse ways. Since the integration of GAI in academic contexts can no longer be reasonably overlooked, it is important to consider its consequences (see for example Gruenhagen et al., 2024). This section will further discuss the results of this study and its possible broader implications in higher education.

A critical concern in previous research is what kind of knowledge and skills that may be diminished or lost when GAI becomes a central part of their studies (see for example Kooli, 2023; Valova et al., 2024). This study indicates that GAI has already become an integral part of students' course work. In relation to this, the time pressure many students face in higher education is important to consider (Remoto, 2023). The result of this study clearly emphasizes this aspect as well, as the workload was seen as unmanageable without the usage of GAI by some students.

As an example from this study, when the student groups were faced with the tasks of understanding and drawing on literature for their project work, they turned to tools such as ChatGPT and Notebook LM to be able to manage the workload in time. It is important to ask what happens to students' reading comprehension and analytical skills when GAI can efficiently generate summaries of academic articles, which can then be consumed in podcast format through tools such as Notebook LM. While these tools offer convenience and efficiency, they may also reduce opportunities for critical engagement with the original texts, potentially affecting students' ability to interpret, compare, and evaluate complex academic arguments (Ghimire et al., 2024). A challenge for higher education will be to make sure that students still develop these crucial academic skills that GAI might reduce. As the students in this study already have integrated GAI in their workflow, a pressing need to understand the underlying effects of this usage is vital. However, these effects were not the focus of this thesis but are instead recommended for further research in the field of higher education.

The results of this thesis suggest that GAI is already playing a transformative role in how students collaborate and approach tasks within group settings in higher education. As the students in this study showcase high levels of integration of GAI tools into their workflows and perceive benefits in terms of more efficient task management, problem-solving, and decision-making. GAI allowed the students to streamline tasks such as summarizing readings, organizing group activities and generating ideas. Furthermore, GAI were viewed by the students as something more than just a technical tool. It was seen as an integral part of group work, similar to an extra group member. Its role extends beyond simply assisting with tasks to guiding discussions and offering alternative decisions. This shift highlights how GAI is increasingly seen as an active collaborator rather than just a passive resource by the students in this study. Nevertheless, it's important to note that the high level of GAI usage doesn't transfer into a crucial mindset towards its use. Even if the students in this study showed some levels of awareness of the possible pitfalls of GAI, their view of the possible benefits the tools provide could potentially cause usage despite the awareness of the probable negative aspects. This implication is important to consider for higher education, as the rapid development of these tools coupled together with high level of usage, risks integration without caution to the possible pitfalls (See for example Chiu, 2024; Elbanna & Armstrong, 2024).

Furthermore, the use of GAI in group work also raises important concerns about the potential diminishing development of essential collaborative skills for students. As exemplified in this study, the collaboration opportunities between group members were reduced by for example using chatbots instead of reaching out to other teammates. GAI was used by students in this study for a diversity of group work activities such as supporting the planning phase, task delegation and decision-making. These activities could harm the opportunities for students to engage in social interactions between members and the development of skills that are associated with it (Hammar Chiriak, 2014). As GAI becomes integrated into education (Komba, 2024), it is important to think about how it affects group dynamics and social interactions between students. Moving forward, the development of group work in higher education will need to find a balance, using GAI to help with group tasks while keeping social interactions at the heart of group activities. How this balance unfolds will depend on how GAI

is further integrated into education and how educators intentionally design environments where GAI and group work can complement each other instead of conflicting.

6.3 Limitations and strengths of the study

Although the study's limitations have been mentioned in earlier chapters, this section revisits and expands with a deeper reflection by examining the chosen methods, theoretical approach, and the overall design of the thesis.

The purpose and the research question guided the study from its beginning to its end, but it is important to stress that this was not a straightforward process. For example, the title and the research question were slightly different formulate in the beginning but were refined by the research process.

The decision to conduct a qualitative case study within a course where GAI usage is actively encouraged and integrated comes with advantages and limitations. A case study allows for in-depth exploration of a specific setting and offers insights into the environment and contextual factors influencing the study (Clark et al., 2021). In this study, the chosen case also allowed to understand the usage of GAI over time during their whole course process. However, as the thesis only investigated one case, the findings are difficult to transfer to other contexts.

Another important consideration is the specific context of this study. It was conducted within a higher education environment where the institution, educators, and students already possessed substantial collective knowledge and experience regarding GAI usage. Had the case study been carried out in a different institutional context, particularly with less exposure to GAI, the findings might have differed (Stöhr et al., 2024; Öhrn et al., 2025).

It is also important to acknowledge that I, as the researcher, approached this study with my own positive values and interests in GAI (Clark et al., 2021). While the aim was to maintain an objective view of the integration of GAI into higher education, my starting perspective may have shaped the analysis, presentation of the findings and the overall design of thesis to put GAI in a favourable light.

A strength of the chosen method of self-administered group reflective discussions were how it allowed students to decide when to record and submit their discussions during each sprint. This flexibility contributed to a high response rate because it removed the need to coordinate schedules between students and the researcher. Only one recording from one group was missing. All other student groups submitted audio recording during all three rounds of data collection. Achieving this high level of participation would likely have been more difficult with a more structured or time-dependent method.

Furthermore, the self-administered reflective group discussion allowed the student group to be relatively free to discuss their usage of GAI. However, the sessions were recorded, and students knew the material would be used in a master's thesis. Since the recordings were also uploaded to their learning platform, which their teachers could access, they may not have spoken completely openly. This might have limited their discussion. The choice of method also made it hard to follow up on their answers. One way to address this limitation could have been to conduct a final round of structured group interviews after the last sprint.

Choosing AT as the theoretical framework for analysing the findings also comes with strengths and limitations. The use of AT and the understanding of the theory have been a process over time. One challenge in applying AT was the existence of multiple interpretations and versions of the theory, which made it more difficult to apply. As reading literature related to the theory, it was sometimes hard to understand if it was related to the specific version I chose to use, which was Engeström's second generation (Zapata et al., 2024).

Ultimately, the theory provided a dynamic and holistic way to interpret the data from multiple perspectives on how students' activities are transforming together with their usage of GAI. With this

theory as an analytical base, GAI's potential to be seen as more than just a technical tool is an important finding. However, AT is a broad theory with many parts and could have been used in multiple other ways. In this study, it gave a structure to interpretate and analysis the students usage of GAI as a part of their development process throughout their course and context.

One other key strengths of this study is that it provides the perspective of the students' voices in their usage of GAI in higher education, as this was a missing perspective in previous research (Labadze et al., 2023).

6.4 Further research

These findings of this qualitative case study raise many questions that can be further studied. One direction for future research could be to expand and refine the research questions to capture a broader range of perspectives on how students' use GAI in group activities. As already mentioned in the implications for higher education, another recommendation for future research would be to investigate the effects that integration of GAI have on students critical thinking skills or collaborative skills. It may also be interesting to explore how similar tools as CourseGuru are implemented across different courses, programs, and disciplinary contexts. Additionally, further studies could examine how students' practices are influenced by GAI in non-technical fields, where the nature of tasks and learning objectives are different than the ones in this study. Furthermore, it would be interesting to investigate how the integration of GAI affects teachers or programme leaders work in higher education, to gain different perspective of the parties involved in the integration of GAI.

References

- Ait Baha, T., El Hajji, M., Es-Saady, Y., & Fadili, H. (2024). The impact of educational chatbot on student learning experience. *Education and information technologies*, 29(8), 10153-10176. <https://doi.org/10.1007/s10639-023-12166-w>
- Alfirević, N., Praničević, D. G., & Mabić, M. (2024). Custom-Trained Large Language Models as Open Educational Resources: An Exploratory Research of a Business Management Educational Chatbot in Croatia and Bosnia and Herzegovina. *Sustainability*, 16(12), 4929. <https://doi.org/10.3390/su16124929>
- Alsalem, M. S. (2024). EFL teachers' perceptions of the use of an AI grading tool (CoGrader) in English writing assessment at Saudi universities: an Activity Theory Perspective. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186x.2024.2430865>
- Atchley, P., Pannell, H., Wofford, K., Hopkins, M., & Atchley, R. A. (2024). Human and AI collaboration in the higher education environment: opportunities and concerns. *Cognitive Research: Principles and Implications*, 9(1). <https://doi.org/10.1186/s41235-024-00547-9>
- Bligh, B., & Flood, M. (2017). Activity theory in empirical higher education research: choices, uses and values. *Tertiary Education and Management*, 23(2), 125-152. <https://doi.org/10.1080/13583883.2017.1284258>
- Bozkurt, A. (2023). Unleashing the Potential of Generative AI, Conversational Agents and Chatbots in Educational Praxis: A Systematic Review and Bibliometric Analysis of GenAI in Education. *Open Praxis*, 15(4), 261-270. <https://doi.org/10.55982/openpraxis.15.4.609>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Bryman, A. (2016). *Social research methods* (Fifth edition ed.). Oxford : Oxford University Press.
- Burner, T., & Svendsen, B. (2020). Activity Theory—Lev Vygotsky, Aleksei Leont'ev, Yrjö Engeström. In (pp. 311-322). Springer International Publishing. https://doi.org/10.1007/978-3-030-43620-9_21
- Canipe, M. (2020). Unmoderated Focus Groups as a Tool for Inquiry. *Qualitative Report*, 25, 3361-3368. <https://doi.org/10.46743/2160-3715/2020.4604>
- Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, 20(1), 43-18. <https://doi.org/10.1186/s41239-023-00411-8>
- Chang, D. H., Lin, M. P.-C., Hajian, S., & Wang, Q. Q. (2023). Educational Design Principles of Using AI Chatbot That Supports Self-Regulated Learning in Education: Goal Setting, Feedback, and Personalization. *Sustainability*, 15(17), 12921. <https://doi.org/10.3390/su151712921>
- Chiu, T. K. F. (2024). The impact of Generative AI (GenAI) on practices, policies and research direction in education: a case of ChatGPT and Midjourney. *Interactive Learning Environments*, 32(10), 6187-6203. <https://doi.org/10.1080/10494820.2023.2253861>
- Clark, T., Foster, L., Sloan, L., & Bryman, A. (2021). *Bryman's social research methods* (Sixth edition ed.). Oxford : Oxford University Press.
- Clemmensen, T., Kaptelinin, V., & Nardi, B. (2016). Making HCI theory work: an analysis of the use of activity theory in HCI research. *Behaviour & Information Technology*, 35(8), 608-627. <https://doi.org/10.1080/0144929x.2016.1175507>
- Colasante, M. (2024). Five methodological dilemmas when implementing an activity theory transformative intervention in higher education. *Teaching in Higher Education*, 29(7), 1736-1756. <https://doi.org/10.1080/13562517.2024.2367655>
- Ekundayo, T., Khan, Z., & Chaudhry, S. A. (2024). ChatGPT's Integration in GCC Higher Education: Bibliometric Analysis of Trends. *Educational Process International Journal*, 13(3). <https://doi.org/10.22521/edupij.2024.133.4>
- Elbanna, S., & Armstrong, L. (2024). Exploring the integration of ChatGPT in education: adapting for the future. *Management & Sustainability: An Arab Review*, 3(1), 16-29. <https://doi.org/10.1108/msar-03-2023-0016>
- Engeström, Y. (2014). *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research* (2 ed.). Cambridge University Press. <https://doi.org/DOI:10.1017/CBO9781139814744>

- Essien, A., Salami, A., Ajala, O., Adebisi, B., Shodiya, A., & Essien, G. (2024). Exploring socio-cultural influences on generative AI engagement in Nigerian higher education: an activity theory analysis. *Smart Learning Environments*, 11(1). <https://doi.org/10.1186/s40561-024-00352-3>
- Fan, G., Liu, D., Zhang, R., & Pan, L. (2025). The impact of AI-assisted pair programming on student motivation, programming anxiety, collaborative learning, and programming performance: a comparative study with traditional pair programming and individual approaches. *International Journal of STEM Education*, 12(1). <https://doi.org/10.1186/s40594-025-00537-3>
- Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. (2024). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International*, 61(3), 460-474. <https://doi.org/10.1080/14703297.2023.2195846>
- Fawaz, M., El-Malti, W., Alreshidi, S. M., & Kavuran, E. (2025). Exploring Health Sciences Students' Perspectives on Using Generative Artificial Intelligence in Higher Education: A Qualitative Study. *Nursing & health sciences*, 27(1), e70030. <https://doi.org/10.1111/nhs.70030>
- Ghimire, S. N., Bhattarai, U., & Baral, R. K. (2024). Implications of ChatGPT for higher education institutions: exploring Nepali university students' perspectives. *Higher Education Research & Development*, 43(8), 1769-1783. <https://doi.org/10.1080/07294360.2024.2366323>
- Gruenhagen, J. H., Sinclair, P. M., Carroll, J.-A., Baker, P. R. A., Wilson, A., & Demant, D. (2024). The rapid rise of generative AI and its implications for academic integrity: Students' perceptions and use of chatbots for assistance with assessments. *Computers and education. Artificial intelligence*, 7, 100273. <https://doi.org/10.1016/j.caeai.2024.100273>
- Hammar Chiriac, E. (2014). Group work as an incentive for learning - students' experiences of group work. *Frontiers in Psychology*, 5. <https://doi.org/10.3389/fpsyg.2014.00558>
- Hashim, N., & Jones, M. (2014). Activity Theory: A framework for qualitative analysis. *Faculty of Commerce - Papers*.
- Holland, A., & Ciachir, C. (2025). A qualitative study of students' lived experience and perceptions of using ChatGPT: immediacy, equity and integrity. *Interactive Learning Environments*, 33(1), 483-494. <https://doi.org/10.1080/10494820.2024.2350655>
- Kamali, J., Alpat, M. F., & Bozkurt, A. (2024). AI ethics as a complex and multifaceted challenge: decoding educators' AI ethics alignment through the lens of activity theory. *International Journal of Educational Technology in Higher Education*, 21(1). <https://doi.org/10.1186/s41239-024-00496-9>
- Komba, M. M. (2024). The influence of ChatGPT on digital learning: experience among university students. *Global Knowledge, Memory and Communication*. <https://doi.org/10.1108/gkmc-10-2023-0390>
- Kooli, C. (2023). Chatbots in Education and Research: A Critical Examination of Ethical Implications and Solutions. *Sustainability*, 15(7), 5614. <https://doi.org/10.3390/su15075614>
- Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: systematic literature review. *International Journal of Educational Technology in Higher Education*, 20(1), 56-17. <https://doi.org/10.1186/s41239-023-00426-1>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, Calif. Sage.
- Luan, L., Lin, X., & Dai, Y. (2025). Bridging the Gap: ChatGPT's Role in Enhancing STEM Education. *Open Praxis*. <https://doi.org/10.55982/openpraxis.17.1.685>
- Ma, W., Ma, W., Hu, Y., & Bi, X. (2024). The who, why, and how of ai-based chatbots for learning and teaching in higher education: A systematic review. *Education and information technologies*. <https://doi.org/10.1007/s10639-024-13128-6>
- McAvinia, C. (2016). Chapter 3 - Activity Theory. In C. McAvinia (Ed.), *Online Learning and its Users* (pp. 59-100). Chandos Publishing. <https://doi.org/10.1016/B978-0-08-100626-9.00003-4>
- O'Dea, X. (2024). Generative AI: is it a paradigm shift for higher education? *Studies in Higher Education*, 49(5), 811-816. <https://doi.org/10.1080/03075079.2024.2332944>
- Perifanou, M., & Economides, A. A. (2025). Students Collaboratively Prompting ChatGPT. *Computers*, 14(5), 156. <https://doi.org/10.3390/computers14050156>
- Remoto, J. (2023). ChatGPT and other AIs: Personal relief and limitations among mathematics-oriented learners. *Environment and Social Psychology*, 9. <https://doi.org/10.54517/esp.v9i1.1911>
- Scrum.org. (n.d.). *What is Scrum?* <https://www.scrum.org/learning-series/what-is-scrum/>

- Seco, D., Grösser, S., & Pedrosa, A. M. (2025). Use of Generative Artificial Intelligence tools in higher education environments. *Multidisciplinary Journal for Education, Social and Technological Sciences*, 12(1), 156-175. <https://doi.org/10.4995/muse.2025.23623>
- Sengar, S. S., Hasan, A. B., Kumar, S., & Carroll, F. (2024). Generative artificial intelligence: a systematic review and applications. *Multimedia Tools and Applications*. <https://doi.org/10.1007/s11042-024-20016-1>
- Shah, P. (2023). *AI and the future of education teaching in the age of artificial intelligence* (First edition. ed.). Hoboken, New Jersey : John Wiley & Sons, Inc.
- Stöhr, C., Ou, A. W., & Malmström, H. (2024). Perceptions and usage of AI chatbots among students in higher education across genders, academic levels and fields of study. *Computers and education. Artificial intelligence*, 7, 100259. <https://doi.org/10.1016/j.caeai.2024.100259>
- Thomas, G. (2023). *How to do your research project : a guide for students* (4th edition. ed.). London
Thousand Oaks, California : SAGE.
- Valova, I., Mladenova, T., & Kanev, G. (2024). Students' Perception of ChatGPT Usage in Education. *International journal of advanced computer science & applications*, 15(1), 466-473. <https://doi.org/10.14569/IJACSA.2024.0150143>
- Vetenskapsrådet. (2017). *God Forskningssed*. Vetenskapsrådet.
- Wackenhut, A. F., Gillette, M., & Olsson, E. (2025). *Exploring the use of generative Artificial Intelligence applications in higher education*.
- Wang, T., Lund, B. D., Marengo, A., Pagano, A., Mannuru, N. R., Teel, Z. A., & Pange, J. (2023). Exploring the Potential Impact of Artificial Intelligence (AI) on International Students in Higher Education: Generative AI, Chatbots, Analytics, and International Student Success. *Applied Sciences*, 13(11), 6716. <https://doi.org/10.3390/app13116716>
- Woo, D. J., Guo, K., & Susanto, H. (2025). Exploring EFL students' prompt engineering in human–AI story writing: an activity theory perspective. *Interactive Learning Environments*, 33(1), 863-882. <https://doi.org/10.1080/10494820.2024.2361381>
- Zapata, G. C., Saini, A., Anastasia-Olga, T., Cope, W., & Kalantzis, M. (2024). The Role of AI Feedback in University Students' Learning Experiences: An Exploration Grounded in Activity Theory. *Ubiquitous Learning*, 18(2), 1-30. <https://doi.org/https://doi.org/10.18848/1835-9795/CGP/v18i02/1-30>
- Öhrn, R., Rosell, M., Liljeström, T., & Hagberg, N. (2025). *Studenters användning av generativ AI i samband med studier*. Linköpings universitetsbibliotek, Linköpings universitet. <https://www.diva-portal.org/smash/get/diva2:1948910/FULLTEXT02.pdf>

Appendix

Appendix 1

Initial 22 codes

Codes	Description	Color code	Example quotes from students
Simplify, more effective	Using AI to make processes more streamlined or efficient.	Yellow	<p>Student group 1:</p> <p>It speeds up the process and makes it easier.</p> <p>It makes our task at hand much easier.</p>
Could not be done without AI	The reliance on AI for tasks that were previously unmanageable.	Underscore	<p>Student group 4:</p> <p>How would we even divide them without it?</p>
Custom-based bots' advantages	Benefits of using tailored AI solutions.	Light blue	<p>Student group 3:</p> <p>The CourseGuru is based on the material. It feels like an expert.</p>
Enjoyment/Strength of AI	Positive experiences and strengths associated with AI usage.	Light blue text	<p>Student group 5:</p> <p>I think it was very efficient, dividing it with AI.</p>
AI should be used	The necessity and reasons for using AI.	Red text	<p>Student group 1:</p> <p>AI will give them the opportunity to learn more skills</p>
Trust in AI/Drawbacks of AI/Ethics	Issues related to the reliability, drawbacks, and ethical	Orange text	<p>Student group 4:</p> <p>Do not just copy the information AI gives you. don't trust AI too much.</p>

	considerations of AI.		
Better starting point	Using AI as a foundation to start working.	Dark Purple	Student group 5: Then I had that as a basis when I did the writing of what was important
A way forward	GAI as a means to progress and advance with the group project	Yellow with red text	Student group 3: When we get stuck in our discussions the AI chatbot is a way to go forward.
New ways of working/studying	Activities introduced by GAI.	Green	Student group 2: Describe what you want, and it creates a website, or a solution based on what you described.
Thinking partner	AI as a tool for thought refinement.	Green with blue text	Student group 2: It can also help you put things into words, what you are already thinking
Knowledge of AI use/AI literacy	Understanding and proficiency in using AI.	Green text	Student group 1: The more details you give it, like what you want to know, the better the answer will be.
First contact instead of teammates	Using AI as the initial point of contact or consultation.	Bold	Student group 3: However, now if I have a question, I can ask the chat.
Adapting to AI	Adjusting practices and	Purple text	Student group 4: You have to understand when

	workflows to integrate GAI.		AI is good and how to use it and combine it with our own thoughts and ideas
Tools	Various AI used.	Dark Blue	Student group 3: CourseGuru
Learn tools from others	Acquiring knowledge of AI tools through classmates.	Darkblue with blue text	Student group 1: learned from others in the group on how to use AI tools for designing projects
Replacement to understand/learn make decisions	Using AI to replace traditional methods for understanding, learning, and making decisions.	Red	Student group 5: It can come up with multiple decisions and then we can decide which one is most suitable for us.
Understand/learn/take decision better	Enhancing decision-making through AI.	Red with blue text	Student group 5: Sometimes when we do not have a clear understanding of the processes it can provide insights into numbers, statistics and information
Knowledge sharing	Sharing information in group of GAI	Red with yellow text	Student group 4: I love that we shared the response of our own chats and compare them together.
What can GAI be seen as?	Perceptions and potential roles of bots.	Light purple	Student group 3: I feel like they have been a tool and like a ball

			plank, to bounce off ideas.
A second opinion, another person	Using GAI as an additional perspective or consultative tool.	Light red	Student group 5: I felt that we needed an outside source of some sort because we were confused.
Group dynamics	The impact of GAI on group dynamics.	Cursive	Student group 5: Maybe we worked less as a group because if I had a question, I would have to ask you. But now if I have a question, I can ask the chat.
UD, special needs etc.	AI's role in addressing universal design and special needs.	Dark blue text	Student group 5: Explain me in Spanish what we need to do. It was very effective.

Appendix 2

Informed consent emailed to students

What is the study and why do you want me to participate? This research is conducted as part of a master's thesis in the International Master's Programme in Information Technology and Learning at the University of Gothenburg. The purpose of the study is to investigate how generative AI (GAI) adoption in courses impacts students' learning journeys. Your participation is important because you are a student in the course [Introduction to AI](#), which is part of the [International Master's Programme](#). Your experiences with AI tools during the course will help us to better understand how students use AI in different parts of their assignments and how adoption evolves over time.

How will the study be conducted? The study involves analyzing group and full-class discussions held during the course and your participation will involve taking part in those discussions. This will provide insights into how students have integrated AI into their learning processes and how their usage develops over multiple sprints in the course.

What will happen with my personal data? Data collected for the study will include written field notes and audio-recordings. All collected data will be handled in accordance with the General Data Protection Regulation (EU 2016/679). All data, including texts and audio-recordings will be stored on University of Gothenburg provided systems in such a way that no unauthorized persons can gain access to them. The personal integrity of all participants will be protected in all written data including transcripts of audio-recordings with all names changed to fictitious ones in text to be published.

In accordance with the General Data Protection Regulation, you have the right to request access to the data collected about you in the study and to request its deletion. If you would like to access your data, contact the researcher or their supervisor. If you have any concerns about how your data is handled, you can contact the University of Gothenburg's Data Protection Officer (dataskydd@gu.se). If you are dissatisfied with how your data is managed, you also have the right to report concerns to the Swedish Data Protection Authority, which is the relevant regulatory body.

How can I get information about the results of the study? You are not required to engage with the results of the study, but you are welcome to contact the researcher for information about the findings. The final thesis will be publicly available upon completion.

Participation is voluntary Your participation in this study is completely voluntary. You may choose to withdraw from the study at any time, without providing a reason. If you withdraw, any data related to you will not be used in the research.

Contact information For any questions, please contact the researcher, [\[redacted\]](#).

Consent to participate in the study I have received written information about the study and have had the opportunity to ask questions. The information provided can be kept by printing this page to paper or pdf.



* Obligatoriskt

1. Please check the boxes that apply:

*

I consent to participate in the study, GAI as a Study Buddy in Higher Education.

I consent to collection and handling of my personal data as described in the information to study participants.