

AI for Engagement and Motivation in Academia
Investigating ChatGPT and its Fulfilment of Autonomy, Competence and Relatedness

Student Name: Nikolas Wierz

Student Number: 577296

Supervisor: dr. Serge Rijsdijk

Media & Business

Erasmus School of History, Culture and Communication

Erasmus University Rotterdam

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ABSTRACT

A central concern in academia is ensuring students to be motivated and engaged during work. Based on Ryan & Deci's (1985) Self-Determination Theory, students feel engaged and motivated when three fundamental psychological needs, namely autonomy, competence and relatedness are fulfilled. Responding to increasing diffusion of digital affordances, this study investigates whether ChatGPT's human like conversational and relational capabilities can fulfil students' needs and ensure motivation and engagement. A between-subject experimental design, in which participants reported their perceptions of different manipulated versions of ChatGPT assisting with academic work. A total of 126 students were recruited and four roughly equal groups were questioned on four variations of the relational and conversational capabilities. The data was analysed through Hayes PROCESS macro (Model 4), to investigate the multiple effects of both direct and indirect paths of the research design. Results first ascertained the assumption of SDT, positioning the three psychological needs as prerequisites for students' motivation and engagement. While the direct effects of ChatGPT's capabilities were insignificant, significant mediation paths were confirmed. Both students perceived autonomy and competence positively affected students' motivation and engagement. Though, this was not the case for perceived relatedness. Additionally, comparative analysis of the four conditional groups, while one heightened capability results in an increase in motivation and engagement, the combination of both sophisticated capabilities resulted in the strongest effect. Conclusively, ChatGPT's capabilities provide a effectively support for students to work both motivated and engaged. However, this does not apply to a perceived feeling of relatedness. ChatGPT struggles with creating meaningful bonds, and does not solve the common problem of feeling lonely and isolated during online work. AI tools, including ChatGPT, are pushing the boundaries of digital affordance capabilities, though they still lack effective mechanisms for interpersonal communication.

KEYWORDS: *AI, ChatGPT, Self-Determination Theory, Student Motivation, Student Engagement*

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Table of Contents

<i>Chapter 1: Introduction</i>	1
1.1 Research Question:	2
1.2 Scientific Relevance.....	2
1.3 Societal Relevance.....	3
1.4 Outline of Chapters.....	3
<i>Chapter 2: Theoretical Framework</i>	4
2.1 Motivation and Engagement in Academia	4
2.2 Technology for student motivation and engagement.....	5
2.3 Human Needs and Self-Determination Theory	6
2.3.1 The Need for Autonomy	7
2.3.2 The Need for Competence	8
2.3.3 The Need for Relatedness.....	9
<i>Chapter 3: Methodology</i>	11
3.1 Quantitative Research:.....	11
3.2 Experiment Design:	11
3.3 Operationalisation of measures.....	12
3.4 Sampling.....	13
3.5 Validity	13
<i>Chapter 4: Results</i>	15
4.1 Data Preparation.....	15
4.2 Sample Description.....	15
4.3 Reliability and Exploratory Factor Analysis.....	16
4.4 Test of normality	17
4.5 Correlation Analysis.....	17
4.6 Hypotheses testing	19
4.6.1 Direct Effects of PROCESS macro (Model 4)	19
4.7 Condition Group Differentiation.....	22
<i>Chapter 5: Discussion</i>	27
5.1 General mediation effects.....	27
5.4.3 Limitations.....	32
<i>References:</i>	34
<i>Appendix A</i>	37
<i>Appendix B.</i>	39
<i>Appendix C</i>	46

Chapter 1: Introduction

A central focus within educational institutions is ensuring that the students and pupils can work effectively and achieve their greatest potential within the classroom (Chiu, 2021, p. 1-2; Jang et al., 2016, p. 1-2). To do so, being both engaged and motivated is crucial. As such, an extensive body of research has focused on identifying what constitutes motivation and engagement during the working process, to understand how to more effectively support them (Jang et al., 2016, p. 1-2).

In the past, research has focused on understanding the different sources from which students draw their motivation, such as the environment, including interpersonal relationships with students and pupils and the curriculum within which students study (Chiu, 2021, p. 1-2; Jang et al., 2016, p. 1-2). Over time, many of these factors have changed. One such source of change is the increasingly infiltrating logic of technological affordances and digitalisation (Chiu, 2021, p. 1). Throughout the last decades, the popularity of digital teaching programs, such as MOOCs (Mass open online courses) has significantly risen (Salikhova et al., 2020, p. 4). As such, many researchers' focus has shifted from investigating solely the interpersonal and pedagogical aspects of education, and instead focusing on how technology impacts students' motivation and engagement and how to leverage it for the benefit of education (Chiu, 2021, p. 1-2; Luo et al., 2021, p. 1381). Mixed reactions have arisen within the discourse surrounding the integration of AI technology within education. While many have their reservations and concerns, such as decreasing quality of work and increasing over-reliance on said tools, many advocate for its integration, including the students themselves (Shoufan, 2023, p. 38817).

Throughout the last decades, the continuous development of technological innovation has birthed various novel digital affordances, which have since seamlessly integrated into society (Krause, 2020). Digital affordances have reached all domains of society, including the domain of education (Shoufan, 2023). Think of tools, such as the calculator, which completely changed the conduct of academic work for its time (Shoufan, 2023, p. 1). Similarly, in the 60s, IBM developed the digital statistics analysis program SPSS, which completely changed how social scientists conducted quantitative research and analysis (Alchemer, 2021). In recent years, algorithmic programs and artificial intelligence tools such as Grammarly or ChatGPT seem to have a similarly disruptive impact (Brem et al., 2021, p. 1-2; Gama & Magistretti, 2023, p. 2-3). Using algorithmic machine-based learning, these tools are capable of supporting their users during their academic work (Donotedit, 2023, para. 1-2). Talking specifically about ChatGPT, its natural language model capabilities allow for collaborative interaction, in which the student can consult it for assistance on a large variety of academic tasks (Shoufan, 2023, p. 38806)

Applications such as ChatGPT are not novel, as Chatbots date back to the sixties, however, their skill set was very limited at that time. Over time, Chatbots became more normalised and sophisticated, being employed on organisation websites, to answer business or service-related

inquiries. (Aggrawal et al., 2019, p. 77; Oberoi, 2024, para 5). However, with the rising popularity of artificial intelligence in the last decade, 2022 marked the year in which Chatbot development became a mainstream point of interest for larger companies such as OpenAI, Google and Microsoft (Oberoi, 2024, para 5; Rahaman et al., 2023, p. 2). These AI-based Chatbots, namely ChatGPT or Gemini largely exceed past Chatbots' abilities, leveraging sophisticated conversational and relational capabilities to mimic human interaction (Rahaman et al., 2023, p. 2; Shoufan, 2023, p. 38806). It allows ChatGPT to mimic both the linguistic level of its users, while also having a strong awareness of the conversational context to provide responses relevant to the context, containing helpful information (Shoufan, 2023; Shaengchart et al., 2023, p. 4; Tiwari et al., 2023; p. 14-15). Instead of pre-programmed answers, ChatGPT is highly flexible and draws upon the specific information provided within the users' request (Tiwari et al., 2023, p. 14-15).

Within the current body of research, various studies examine the effects of such digital technologies and their integration within academia, focusing on their implications for students' engagement and motivation. Shoufan (2023) reported on the effectiveness of ChatGPT to support students and what makes them gravitate towards ChatGPT. The results indicated that students feel comfortable working with ChatGPT, where the human-like interactions create a level of trust and perceived helpfulness (Shoufan, 2023). Allowing the assistance for various purposes such as interactive tutoring, adaptive to the student's specific needs and problems, was found to be beneficial to the quality of work (Baidoo-Anu & Owusu Ansah, 2023, p. 56).

The purpose of this study is to test the effectiveness of ChatGPT's capabilities in facilitating students' motivation and engagement. Doing so, the research design investigates the fulfilment of students' psychological needs of autonomy, competence and relatedness as proposed by Deci and Ryan's (1985) *Self-Determination Theory*. Accordingly, the research question guiding this study is:

1.1 Research Question: *To what extent do conversational and relational capabilities influence students' engagement and motivation?*

1.2 Scientific Relevance

This study builds upon prior research such as that of Shoufan (2023) and Chiu (2021), who explored the impact of technology within academia. Firstly, with the novel nature of research on text-generative AI and its' implications for academia, this study intends to explore the facilitation of student motivation and engagement in a fully digitally-driven learning environment. While teachers' effectiveness in facilitating motivation and engagement, both in offline and technologically-blended teaching settings has been previously explored, the question of whether a fully digitally facilitated environment with ChatGPT as the supporting actor can do the same (Chiu, 2021, p. 2-3). Prior research indicated mixed results, which point towards both effectiveness and ineffectiveness,

depending on the format of the digital affordances. Focusing on ChatGPT intends to contribute to assessing the role that interactive text-generative AI tools can play in assisting students.

Moving beyond the research of Shoufan (2023), who focuses solely on ‘computer science’ students, who are generally more well-versed in the work with digital tools, this study intends to target a broader spectrum of students. As such, the more inclusive sampling, which includes students from various study orientations allows for result generalisation to be applicable to the student body as a whole. Consequently, a more comprehensive evaluation of ChatGPT’s effectiveness in facilitating motivation and engagement is sought here.

1.3 Societal Relevance

Investigating AI’s actual impact on students’ motivation and engagement is relevant for various societal actors. Firstly, academic institutions must stay aware of the continuous changes in the fast-paced tech industry. With the increasing popularity of AI and online learning programs, ensuring both the quality and relevance of academia for the future is crucial. This study aims to contribute to this understanding through the exploration of ChatGPT’s capabilities.

Secondly, unveiled implications may help AI developers to further refine ChatGPT’s conversational and relational sophistication. Through the numerical assessment of ChatGPT’s effectiveness in supporting students and fulfilling their needs would allow for a more in-depth understanding of the areas of AI that require special attention and improvement to increase the efficacy of such tools to facilitate students’ motivation and engagement.

1.4 Outline of Chapters

This study investigates the impact of ChatGPT’s relational capabilities on students’ engagement and motivation through fulfilling their need for autonomy, competence and relatedness. The first chapter contextualises the topic at hand and its relevance. The second chapter focuses on the theoretical framework for this study, in which ChatGPT and the Self-Determination Theory are discussed. Throughout the second chapter, the hypotheses are proposed and connected to the structure of the theoretical framework. The third chapter outlines the methodological choices taken. It explains how the study was constructed and executed. The fourth chapter reports the results of this research and answers the hypotheses. Finally, the fifth chapter discusses the results and the sixth chapter concludes based on the discussed results and provides the limitations of this research and suggestions for future research.

Chapter 2: Theoretical Framework

In order to conduct this study on the implications of conversational and relational capabilities' impact on student motivation and engagement, a thorough explanation and outlining of all relevant concepts and corresponding research is imperative. Within this chapter, all relevant topics are addressed and defined to build the theoretical fundament on which the conceptual framework and research design are based.

2.1 Motivation and Engagement in Academia

The elements of motivation and engagement have long been established as key aspects of a meaningful working process, both in professional work and academia. Ensuring that students are meaningfully involved in their learning environment is a central concern for academic institutions (Chiu, 2021, p. 1-2; Jang et al., 2016, p. 1-2).

In order to research students' motivation and engagement, a clear outline of what each concept entails is crucial. Firstly, in this context, *motivation* refers to the individuals' drive or desire to complete a task, or engage in particular behaviour towards said task (Howard et al., 2021, p. 1-2; Luo et al., 2021, p. 1382). Depending on the source of motivation, scholars differentiate between different types of motivation, ranging from more extrinsic incentives, such as rewards or to avoid negative consequences, to more internalised and intrinsically rooted motivation, such as personal satisfaction or interest in the task at hand (Luo et al., 2021, p. 1383). Within this research, motivation remains a more general concept, as deeper differentiation goes beyond the scope of this research.

Secondly, the concept of *engagement* is defined as an individual's level of attention, effort, participation and passion displayed during the working process (Reschly & Christenson, 2012, as cited by Chiu, 2021, p. 2). Making sure that students are meaningfully engaged is crucial, as previous research has indicated. Engaged students remain more focused and on track with their work, regardless of whether it is independent or collaborative. Student engagement relates to higher levels of productivity and mental well-being (Ryan & Deci, 2004, as cited by Jang et al., 2016, p. 27). Students perform better during classes, corresponding well to teachers' instructions and expectations (Jang et al., 2016, p. 28; van den Broeck et al., 2010, p. 984).

However, creating an *environment* where both motivation and engagement can flourish is difficult to ensure. The levels of motivation and engagement displayed by students are highly dependent and influenced by environmental factors, such as the instructor's teaching style and coordination success, the interaction with peers and the overall climate in the classroom (Chiu, 2021, p. 1). Depending on the style adopted and the corresponding reception of students, the environment can be both supportive and enabling, but also inhibiting and alienating (Jang et al., 2016, p. 28). In the past, extensive research by scholars such as Chiu (2021), Jang et al. (2016) or Shoufan (2023) has

sought to understand such central factors for influencing students' motivation and engagement, aiming at improving classroom efficiency and students' performance.

2.2 Technology for student motivation and engagement

Now in combination with the previously mentioned discourse around the integration of technological affordances within society and their impact, one must question the potential impact of AI, specifically that of ChatGPT within academia. The OpenAI-developed ChatGPT stands at the centre of this research. The application was released in 2021, marking a shift in the popularity of AI tools in academia. The software, building on a natural language model and drawing upon 1.78 billion data points is comparable to highly sophisticated chatbot systems, holding highly sophisticated conversational and relational capabilities (Ali, 2023; Bastian, 2023; Shaengchart et al, 2023, Shoufan, 2023). Instead of relying on pre-set answer options responding to specific keywords, ChatGPT is based on a text-prediction model, that generates tailored answers built from the vast number of data points. Building on these capabilities, which far exceed the capabilities of traditional Chatbots, it is an attractive tool for students to use for assistance when working on their academic assignments (Rahaman et al., 2023, p. 2-3; Shoufan, 2023, p. 38806).

When speaking of *conversational capabilities*, it refers to ChatGPT's ability to engage in human-like interactions, being able to converse on a level of sophistication previously not possible, and mimicking the users' level of language (Shoufan, 2023, p. 38806; Shaengchart et al., 2023, p. 4; Tiwari et al., 2023; p. 14-15). When asked, ChatGPT defined its conversational capabilities, as its ability to use its advanced language skills and broad knowledge base to formulate answers useful for problem-solving, customizable to the user's needs (OpenAI, 2024). This customizability refers to the topic focus through paradigm embracing, but also the ability to match the linguistic complexity, formality and tone (OpenAI, 2024). This flexibility of response production allows for more meaningful dialogue and interaction by accommodating users and their wishes. (Shoufan, 2023, p 38806).

On the other hand, ChatGPT's *relational capabilities* refer to its ability to showcase awareness of conversation-relevant information and context (Shaengchart et al., 2023, p.4; Tiwari et al., 2023; p. 14-15). Being capable of drawing upon previously held conversations and their information and context, ChatGPT is able to produce responses that far exceed the capabilities of common chatbots (Shoufan, 2023). When asking ChatGPT to define its relational capabilities, it specifically emphasised its interactive ability to engage with its users. Due to its ability to detect context-relevant information, it utilises said information to build a more interactive conversation style, that assists in building trust more consistently and encourages rapport-building interactions (OpenAI, 2024). Its ability to hold ongoing conversations with strong attention to detail allows conversations

about any particular topic as prompted by the user (Shaengchart et al., 2023, p.4; Tiwari et al., 2023; p. 14-15).

Moving beyond studies such as Chiu (2021), who still involve the role of teachers within technologically blended learning environments, this study focuses its scope on autonomous work fully accommodated by digital affordances, in this case, ChatGPT. The research aligns itself more with a research strand arising in the last 3 years alongside the rise of ChatGPT itself. The work of scholars such as Abdullahi (2023) and Tiwari et al. (2023) explored the broader implications of generative AI integration within academia and the corresponding perceptions of students. Both an increase in productivity and confidence were reported. However, students also reported decreasing attention to detail and overreliance on AI (Tiwari et al., 2023, p. 16). Employing a more specific focus on ChatGPT, Shoufan (2023) reported an overarchingly positive perception by students, who felt meaningfully supported by ChatGPT in the context of computer science work. Based on the perceived context awareness and timely responses, Shoufan (2023) argues that ChatGPT meaningfully supports students leading to higher motivation.

Building on these capabilities held by ChatGPT and its ability to be used as a conversational partner for students during their working processes, this research will test the assumption that said capabilities do facilitate students' motivation and engagement. As such the first set of hypotheses is as follows:

Direct Effect Hypotheses:

H1: Relational Capabilities have a positive effect on student engagement

H2: Conversational Capabilities have a positive effect on student engagement

H3: Relational Capabilities have a positive effect on student motivation

H4: Conversational Capabilities have a positive effect on student motivation

2.3 Human Needs and Self-Determination Theory

When diving deeper into the intricacies of Self-Determination Theory regarding motivation and engagement in the context of work and productivity, previous research has established the need for certain contextual and environmental factors' necessity for individuals to experience such motivation and engagement (Chiu, 2021, p. 1). Specifically, scholars proposed the necessity for certain basic human needs fulfilment to function properly. However, the specific needs may vary depending on the context and student. The most well-known typology developed by Maslow proposes a five-level hierarchy of needs, ranging from basic survival needs, through innate psychological needs such as safety, to the need for self-actualisation (Maslow, 1943, as cited by van den Broeck et al., 2010, 983). However, Maslow's hierarchy is unsuitable for explaining students' motivation and

engagement, as it investigates individuals' basic functioning. It remains largely too broad, lacking specificity to investigate specific concepts, such as motivation and engagement.

Instead, scholars focus their efforts on Self-Determination Theory. Within this theoretical model, three psychological needs are proposed as essential conditions ensuring student engagement and motivation. These three needs are 1) for *autonomy*, 2) for *competence* and 3) *relatedness* (Jang et al., 2016, p. 27-28; van den Broeck et al., 2010, p. 981). Through fulfilment (or lack thereof), these needs become central predictors of students' performance and success, directly linked to student motivation and engagement (van den Broeck et al., p. 983).

Prior research on the fulfilment of student needs to ensure motivation and engagement according to SDT has outlined the important role of teachers. Within academia, professors, teachers and other teaching instructors hold a crucial role in fulfilling students' psychological needs (Chiu, 2021, p. 1; Jang et al., 2016, p. 27-28). Teachers play a crucial role in students' experiences, possibly nurturing and supporting their students to help them realise their full potential and increase their performance. However, the opposite, meaning *need frustration* and alienation can happen, too (Jang et al., 2016, p. 28-29).

The remainder of this section is dedicated to outlining the three psychological needs of self-determination theory and discussing the results of prior research. First, previous research investigating self-determination and the role of teachers in an offline/blended learning environment is discussed. Connecting these insights to the aim of this study, the implications of fully digital learning and autonomous environments are highlighted and their impact on students' needs, motivation and engagement is discussed.

2.3.1 The Need for Autonomy

The first need outlined within Self-Determination Theory, the *need for autonomy* is defined as the innate desire to make one's own decisions and perceive oneself as the one in control of their own actions (Chiu, 2021, p. 2). The need closely relates to volition, being able to direct one's work in a manner they perceive as desirable. Within this need, experiencing psychological freedom is crucial, and having the ability of free choice is directly linked to an increase in productivity (van den Broeck et al., 2010, p. 982). When ensured by teachers, but also in the professional work environment, an autonomous working environment results in higher academic and professional achievements, often linked with greater assimilation with the material at hand (Jeno et al., 2019, as cited by Salikhova et al., 2020, p. 4). Students driven by a strong desire for autonomy find their work more interesting and engaging, which when ensured organically translates into increased productivity (van den Broeck et al., 2021, p. 997). On the other hand, autonomy-inhibiting environments may lead to a feeling of compulsion, which reduces students' motivation and likelihood to engage over time (Jang et al., 2016, p. 37). Ensuring a certain degree of autonomy during working phases, whether in the classroom, but

also digitally, and having the ability to make choices of their own can be identified as a crucial influence for a meaningful working environment.

Focusing on the support of autonomy in the digital setting, specifically online learning tools that allow users to utilise them to their liking, promotes their autonomy (Salikhova et al., 2020, p. 5). Digital education tools help students leverage their potential for autonomous work, as they allow the users to use them at their own discretion concerning time and space, and also regarding the selection of learning materials and difficulty (Salikhova et al., 2020, p. 8). Within this research, investigating whether ChatGPT has a similar effect on student autonomy is central, as its relational capabilities could similarly support students. Seeing as how ChatGPT is capable of acting as a complementary support structure reading into the provided context, it allows students to make better-informed decisions about their work, without it being dictated to them (Klayklung et al., 2023, as cited by Shaengchart et al., 2023, p. 3-4). In other words, students remain in control over what to incorporate.

Building on this information, this study intends to test the impact of ChatGPT's conversational and relational capabilities on students' self-perceived autonomy and its effects on student motivation and engagement. As such, the following hypotheses were created.

H5: Perceived autonomy mediates the effect of ChatGPT's relational capabilities on students' engagement.

H6: Perceived autonomy mediates the effect of ChatGPT's conversational capabilities on students' motivation.

2.3.2 The Need for Competence

Secondly, the *need for competence*, too, is central to ensuring motivation and engagement. In the context of Self-Determination Theory, competence describes feeling capable and effective with one's tasks. Individuals desire the ability to explore and manipulate the working environments and conditions through their capabilities to their terms (Luo et al., 2021, p. 1386). Paralleling the concept of self-efficacy, competence is not regarded as a feeling of accomplishment post-task, but a conscious and active feeling including the task process. (Bandura, 1997, as cited by van den Broeck et al., 2010, p. 982). When students recognise themselves as confident as a result of their own competence, a direct increase in motivation and the internalisation of tasks is evident. Teachers who encourage competence organically, clearly communicating with their students through constructive feedback, set more realistic expectations that support students to realise their tasks (Juno et al., 2019, as cited by Salikhova et al., 2020, p. 4). Consequently, students are more likely to actively participate, feel positive about their own achievements, and more connected to course activities and optimistic about the challenges they face throughout.

This also applies for students interaction with digital learning apps, where students reported higher perceived competence and achievements. This consequently translated into stronger intrinsic motivation and interest in the course content (Jeno et al., 2017, as cited by Salikhova et al., 2017; p. 5). This bears the question of whether ChatGPT is able to facilitate a similar level of competence aid. ChatGPT's capabilities can closely mimic human interaction styles, which combined with the flexibility of digital learning, suggests that students could leverage this to work more effectively, perceiving themselves as competent (Shaengchart et al., 2023, p. 4).

Drawing upon these prior research results, this study intends to test the impact of ChatGPT's conversational and relational capabilities on students' self-perceived competence and its effects on student motivation and engagement. As such, the following hypotheses were created:

H7: Perceived competence mediates the effect of ChatGPT's relational capabilities on students' engagement.

H8: Perceived competence mediates the effect of ChatGPT's conversational capabilities on students' motivation.

2.3.3 The Need for Relatedness

Lastly, the third need necessary for students to be meaningfully engaged and motivated is the need for relatedness. Strongly paralleling the previously mentioned environmental factors of teaching and academic working, students desire connections within the work setting. Being able to connect to others and display a level of care for them, while also being cared for by both individuals and the group itself strongly fuels individuals' drive (Luo et al., 2021, p.1383). The emotional connection fuels cognitive processes, creating closer and more intimate relationships. Resulting from these connections, individuals display stronger work ethics, leading to higher task fulfilment, which is also true for tasks perceived as undesirable or unenjoyable (Baumeister & Leary, 1995, as cited by Salikhova et al., 2020, p. 5). In order to fit in and be viewed favourably, individuals may compromise some degree of their autonomy, showing how important these relations are. For example, students are more likely to perform tasks perceived as unenjoyable, if the completion is valued by others (Luo et al., 2021). Students displaying high levels of relatedness build stronger and reciprocal relationships with students and teachers, leading to more autonomous work and value internalisation throughout the semester. However, when relationship building and emotional connections are inhibited, the opposite may also be true, leading to need frustration in the form of amotivation and plummeting productivity levels (Jang et al., 2016, p. 28-29).

Previous research laid out the necessity for fulfilling the three innate needs, citing them as predictors of student engagement and motivation (Chiu, 2021 p. 1-2; Salikhova et al., 2021). Ensuring a supportive environment, and promoting the desired qualities of all three needs is crucial for effective

academic working. However, with the increased diffusion of technological affordances and the logic of digitalisation, the realm of academia is changing significantly. Increasingly, technologically blended or mediated working environments are gaining popularity, impacting the importance of teachers (Chiu, 2021, p. 1; Salikhova et al., 2021, p. 2).

In this study, the focus moves beyond blended environments onto fully digitalised/online learning environments, utilising the affordances of artificial intelligence tools. With its significant rise in popularity, ChatGPT has moved into the focus, with large amounts of students citing their use on a regular basis (Shewale, 2024; Sier, 2022, as cited by Niloy et al., 2024, p. 2). Henceforth, the question of its impact on students’ motivation and engagement is imperative and investigation is necessary. As such, the following hypotheses were created:

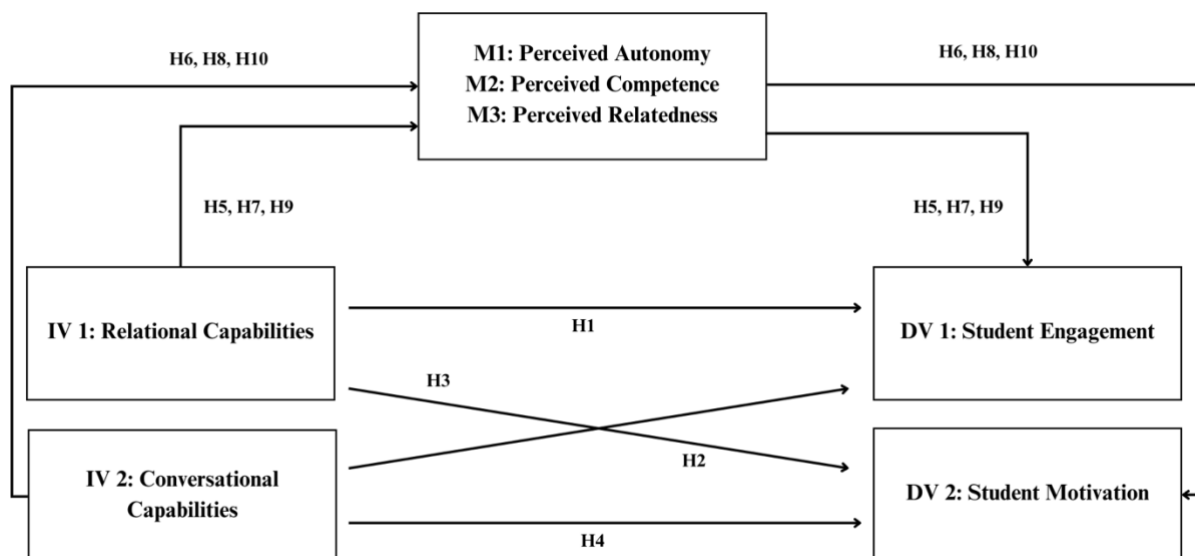
H9: Perceived relatedness mediates the effect of ChatGPT’s relational capabilities on students’ engagement.

H10: Perceived relatedness mediates the effect of ChatGPT’s conversational capabilities on students’ motivation.

For a full overview of all variables and their relationships, please refer to the conceptual framework in Figure 1.

Figure 2.1

Conceptual Model



Chapter 3: Methodology

3.1 Quantitative Research:

To test both the research question and the subsequent assumptions proposed through hypotheses, a quantitative approach was employed, as it was deemed to be most suitable. Within quantitative research, experiments are among the most famous approaches, and for this research the most suitable choice. According to Babbie (2017), experiments are most appropriate for hypothesis testing which involves different concepts, which require well-defined and isolated differentiation. This applies within this research, as a total of 10 hypotheses, incorporating 7 different concepts are tested. More specifically, as these experiments are not contained within a laboratory setting, they can be classified as field experiments even though the experiments were conducted in an online environment. One disadvantage of quantitative experiments, however, is the lack of nuance captured within the participants' answers (Babbie, 2017). However, as this study is more exploratory in nature, this should not pose a threat to the produced results.

3.2 Experiment Design:

This section is intended to inform the reader about the experimental design employed in this study, and the reasoning for the choices made. To study the effects of ChatGPT's conversational and relational capabilities on the facilitation of students' engagement and motivation levels, ChatGPT was manipulated to exhibit varying levels of its capabilities when used by participants. This manipulation was constructed by the researcher in collaboration with ChatGPT, asking ChatGPT to explain its capabilities and conceptualise them on a scale of sophistication in a binary manner of low and high. Consequently, four combination options were created (Low-Low; Low-High; High-Low and High-High), which also acted as the output creation conditions for the actual exposure material (See Appendix B). This followed the logic of a between-subject approach, in which each participant group received different material based on the combination of capability sophistication, allowing for comparison of the reported levels of engagement and motivation among the different groups (Babbie, 2017).

During the experiment, each participant was asked to thoroughly read a text, which contained a conversation between a user and ChatGPT itself. Within this conversation, the user is asking ChatGPT for help on an academic assignment, specifically to improve a written text the user produced for an academic writing class. Throughout the conversation, the user asked for more specific advice on how to improve the formality of their text, as well as match the academic writing style expected in university. Through the users' prompts, ChatGPT gives answers to each question, providing guidance and an example of how the feedback could be implemented.

Based on the manipulations applied to ChatGPT, the interactions between participants and ChatGPT will vary in effectiveness, and length of answers, all according to the manipulation corresponding with their group. As such, participants may encounter short and informal answers or long and well-phrased answers, which correspond well to the prompts and context, or respond in a clueless manner, constantly asking for more input or reminders on what text to improve. Based on these variations, participants are expected to perceive the interactions differently based on the four groups. The manipulated material each group was exposed to can be found in Appendix B. This experiment intends to investigate the actual impact the manipulations have on student motivation and engagement. To ensure all groups are covered equally, the randomisation logic of Qualtrics was employed, which allowed for equal distribution of participants onto the four designs.

3.3 Operationalisation of measures

To measure the implications and effects of the aforementioned manipulation of ChatGPT's capability attributes, the necessary measurement instruments, or questionnaire scales need further explanation. In the following section all measurement items used for the questionnaire all participants had to answer and their origins are explained. All concepts are measured through established scales, which were derived from existing research. The retained items' wording for each scale was adjusted to fit the scope of this research more appropriately. Each scale was based on or adjusted to a 5-point Likert format.

The first independent variable, namely ChatGPT's *conversational capabilities* was derived from the scale developed by Borsci et al. (2021). The scale is intended to investigate the usability of Chatbots and is therefore appropriate for the investigation of ChatGPT. A total of 5 items were retained. Similarly, for the second variable, *relational capabilities*, Borsci et al.'s (2021) Chatbot usability scale was used. Specifically, the items corresponding to ChatGPT's relational capabilities were adopted. Here, five items were retained.

To measure the first dependent variable, *student motivation*, the BRPEQ scale (Behaviour Regulation of Physical Education Questionnaire) developed by Aelterman et al. (2012) was used. Of a total of 16 items related to student motivation, 5 items were suitable for this study. To measure the second variable, *student engagement*, the student engagement scale developed by Reeves' (2013) was chosen. Of the 21 items investigating different types of engagement, 6 items from the sections on behavioural, agentic and emotional engagement were used.

Lastly, the three innate needs of self-determination, namely the '*need for autonomy*', '*need for relatedness*' and '*need for competence*' are all measured as mediator variables, as they are prerequisites for the fulfilment of engagement and motivation according to SDT (Chiu, 2021, p. 1-2). Accordingly, the three needs will be measured using van den Broeck's (2010) 'Basic Need

Satisfaction' Scale. From the 12 picked items of the original 21-item scale, 9 items (3 for each concept) were retained.

3.4 Sampling

For this study, all age groups are of interest to participate. Though, as indicated by Shewale (2023), younger generations are the dominant user group, their results may hold more value, due to higher usage in everyday life, which may indicate more effective use and familiarity with the capabilities of digital technology and hence AI (Babbie, 2017; Williams & Page, 2011, p. 11-12). Participants below 18 are excluded, to ensure general ethical research standards (Babbie, 2017). Secondly, participants of all gender spectrums were welcome to take part in this research. Thirdly, participants were expected to have experience with ChatGPT, to ensure they possess the necessary capabilities and understand of ChatGPT to navigate through the posed tasks in the experiment. To control this, a filter question asking about previous ChatGPT experience for academic work was implemented.

To collect the needed respondents, multiple recruitment methods were utilised, which all relied on either convenience sampling or snowball sampling. This means that the researchers, firstly collected the sample based on participants conveniently located around them, and secondly, drew upon the networks of collected participants to extend the experiments reach (Babbie, 2017). In the first round of recruitment, the experiment was distributed through the researchers' social circles. Drawing on relevant social connections helped find the majority of suitable candidates. Additionally, participants were asked to further distribute the survey within their circles. Secondly, some participants were recruited on campus, by presenting them with a QR code or allowing them to partake in the experiment on the researcher's computer.

After the initial data cleaning process, additional respondents were needed to fulfil the participant quota set by the university (120 total participants with 30 per group). These participants were recruited through *Prolific*, a paid survey participant recruitment website. In a purposive sampling manner, the website allowed for the selection of relevant characteristics the participants needed to fulfil to be eligible to fill out the survey (Prolific, 2024, para 1-3). These characteristics were as follows: 1) Student, 2) English speaking (minimum B2) & 3) have had previous experience with ChatGPT for academic work. After the Prolific recruitment process, a total of 126 participants were collected.

3.5 Validity

Within the boundaries of social science research, the adherence to standards of validity and reliability was considered, to ensure the produced results apply to the research population and therefore contribute to the existing body of research. Firstly, validity here refers to the successful

reflection of a concept and what it is attempting to measure (Babbie, 2017). Specifically, the internal validity is believed to be achieved, based on each scale being derived from existing and validated scales from authors such as Altemann et al., (2012), Borsci et al. (2021) and Reeve's (2013).

However, it must be acknowledged, that all scales have been altered to fit the context of this study.

To address external validity, referring to whether the results of this study are applicable to another group with the above-mentioned characteristics, this study is believed to achieve external validity (Beechy, 2022, p. 1396-1397). However, the ephemeral nature of AI development needs to be acknowledged. As the current decade has been labelled as the Big Data period, substantial progress around AI is happening (DeeperInsights, 2023, para. 4). As such, it is crucial to acknowledge this development and that this study is only applicable to the capabilities of ChatGPT 3.5 before June 2024, and its' impact may change with newer and more sophisticated versions. Lastly, as the sampling is based on non-probabilistic convenience sampling, the limitations of convenience sampling need to be acknowledged, as it opens the results up for potential selection bias by the researcher (Babbie, 2017). This will be done in the conclusion.

3.6 Ethics

To ensure ethical standards of social science research and fair treatment of participants, this study follows several measures. Firstly, participant harm and potential consequence avoidance were priorities. All participants' participation was voluntary. Participants were informed about the content and purpose of the study, allowing each individual to have a choice of participation, also including withdrawal at any stage of the experiment. Secondly, all data was collected anonymously. No information allowing for participant identification was collected. Therefore, no negative consequences may stem from participation.

Chapter 4: Results

4.1 Data Preparation

To have reliable and valid results, cleaning the data of potential disturbances is crucial (Babbie, 2017). This section will outline all alterations made to the data set. The data-cleaning process started with a total of 229 respondents. Firstly, all unfinished answers were excluded from the data file. Secondly, the answers recorded in a response time under 4 minutes (240 seconds) were excluded. This was done to ensure that all respondents dedicated an appropriate amount of time and read all components of the experiment thoroughly. The estimated completion time given by Qualtrics amounted to roughly 5-6 minutes, therefore 4 minutes was deemed the baseline time. Thirdly, all responses that were straight-lined, meaning giving the same answer within each scale, were removed. Additionally, responses looking similar to straight-lined answers, meaning participants giving the identical answer for each item were removed too. The final data set consisted of a sample size of 126 participants, who according to the researcher's judgement, partook in the experiment in an appropriate manner.

4.2 Sample Description

The characteristics of the sample collected can be found in Table 1. Of the total 126 participants, 67 were female (53.2%) and 45 male (35.7%). Eight respondents indicated preferring to *not disclose their gender* and six respondents (4.8%) indicated being of a *gender outside the binary spectrum*. The participants were randomly assigned to one of the four conditional groups. Out of the 126 participants, 31 were assigned to *Group 1* (Low-Low) (24.8%), 36 were assigned to *Group 2* (Low-High) (28.6%), 28 were assigned to *Group 3* (High-Low) (22.2%) and 31 were assigned to *Group 4* (High-High) (24.6%).

Table 4.1*Sample Characteristics*

Characteristics	Frequency in sample	Percentage of sample
Gender		
Female	67	53.2
Male	45	35.7
Would rather not say	8	6.3
Other	6	4.8
Manipulation Group		
Low-High	36	28.6
Low-Low	31	24.6
High-High	31	24.6
High-Low	28	22.2

4.3 Reliability and Exploratory Factor Analysis

Starting the analysis section, firstly all scales were checked for their appropriateness for this research through exploratory factor analyses and reliability tests. A full overview of all variables, their items (including those deleted) and corresponding factor loadings, as well as the Cronbach's α can be found in Appendix A.

Firstly, regarding '*Conversational Capabilities*', one component with an eigenvalue above 1 was identified, comprised of 5 items, explaining 58.81% of the variance. The scale was confirmed to be reliable with a Cronbach's α of .82. Secondly, regarding '*Relational Capabilities*', one component with an eigenvalue above 1 was identified. This component was comprised of 5 items, explaining 55.38 % of the variance. The scale was confirmed to be reliable with a Cronbach's α of .80.

For *student motivation*, the analysis proposed one component with an eigenvalue above 1, comprised of 5 items, which explain 68,01% of the variance. The scale was confirmed to be reliable with a Cronbach's α of .87. For *student engagement*, the factor analysis showed one component with an eigenvalue above 1, which consisted of 6 items in total. This component explained a total variance of 60.13%. The scale was confirmed to be reliable with a Cronbach's α of .86.

Next, for the mediator variables, firstly, *perceived autonomy* showed one component with an eigenvalue above one, which includes 3 final items. The component explains a total variance of 64,70 %. The scale was confirmed to be reliable with a Cronbach's α of .73. Secondly, the *perceived competence* showed one component with an eigenvalue above 1, consisting of 3 final items. The component explains a total variance of 72.98 %. The scale was confirmed to be reliable with a

Cronbach's α of .81. Lastly, the *perceived relatedness* displayed one component with an eigenvalue above 1, consisting of 3 items. The component explains a total variance of 48.97 %. The scale's reliability was classified as poor or unreliable, with a Cronbach's α of .44, however, since the scale only consisted of 3 items, no alterations were possible and consequently, the scale was adopted regardless.

4.4 Test of normality

To assess the distribution of the data collected, tests of normality, specifically the *skewness* and *kurtosis* were conducted. Overall the data shows an appropriately normal distribution, with the skewness being between -.74 and -.38. the only exception here is the variable perceived autonomy, which displayed a skewness of -1.11 (Bryne, 2010; Hair et al., 2010). Similarly, the kurtosis values were mostly normally distributed, ranging from -.40 to 1.13, except for perceived autonomy with 2.25. While George & Mallery (2010) argue that a kurtosis of this level may indicate a potential influence on the results of the data analysis, as the kurtosis values remain within a threshold of -7 and +7, they should not pose a significant threat to the validity of the results presented in the following sections (Bryne, 2010; Hair et al., 2010). For a full overview of both skewness and kurtosis values for each variable, please see Table 2.

Table 4.2

Normality test results (N = 126)

Variables	Skewness	SE-Skewness	Kurtosis	SE-Kurtosis
Conversational Capabilities	-.60	.22	.08	.43
Relational Capabilities	-.74	.22	.69	.43
Student Motivation	-.50	.22	.11	.43
Student Engagement	-.70	.22	.38	.43
Perceived Autonomy	-1.11	.22	2.25	.43
Perceived Competence	-.58	.22	-.40	.43
Perceived Relatedness	-.38	.22	1.13	.43

Note: SE-skewness = Standard error of skewness ; SE-Kurtosis = Standard error of kurtosis

4.5 Correlation Analysis

Table 3 depicts the results of the correlation analyses of all variables used for this research, their correlational values, corresponding p-values, as well as descriptive statistics including minimum,

maximum, mean and standard deviation values. *Conversational capabilities* significantly correlated with student motivation ($r = .65, p < .001$), Student Engagement ($r = .60, p < .001$) and Perceived Competence ($r = .60, p < .001$). *Relational Capabilities* positively correlated with Student Motivation ($r = .59, p < .001$), Student Engagement ($r = .59, p < .001$). *Student motivation* significantly correlated with Perceived Autonomy ($r = .55, p < .001$) and Perceived Competence ($r = .70, p < .001$). *Student Engagement* significantly correlated with Perceived Autonomy ($r = .62, p < .001$) and Perceived Competence ($r = .72, p < .001$). *Perceived Autonomy* is significantly correlated with Perceived Competence ($r = .53, p < .001$).

The remaining correlations were either not significant, being rejected for a p -value above .05, or having a correlation value below $r = .50$. Based on Cohen's (1988) correlation conventions, a correlation coefficient of above .49 is considered a large correlation, which is appropriate for this study (Schober et al., 2018). All other remaining correlations were rejected, either for not being significant ($p > .05$) or for having a correlation coefficient below (r) of .50. This decision was based on Cohen's (1988) correlation conventions, which indicate a correlation above .49 to be considered a large correlation. This parallels the requirements presented in the ESHCC methodological thesis guideline guide, in which correlation values above .51 indicate a strong association. Adhering to this standard ensures all variables considered for this study display an appropriately large correlation.

Table 4.3:

Bivariate correlations and descriptive statistics (N = 126)

	1	2	3	4	5	6	7	8	9	Min	Max	Mean	SD
1 Conversation_Dummy	-									0.00	1.00	0.47	0.50
2 Relation_Dummy	-.01	-								0.00	1.00	0.53	0.50
3 Conversational Capa.	.29	.20*	-							1.80	5.00	3.85	0.71
	**												
4 Relational Capa.	.06	.24**	.71**	-						2.00	5.00	3.94	0.66
5 Student Motivation	.10	.17	.65**	.59**	-					1.00	5.00	3.59	0.88
6 Student Engagement	.17	.24**	.60**	.59**	.84**	-				1.00	5.00	3.61	0.79
7 Perceived Autonomy	.18	.20*	.42**	.46**	.55**	.62**	-			2.00	5.00	3.75	0.74
	*												
8 Perceived Competence	.27	.25**	.60**	.49**	.70*	.72**	.53**	-		1.00	5.00	3.43	0.92
	**												
9 Perceived Relatedness	.05	-.09	.15	.08	.16	.21*	.11	.12	-	2.00	5.00	3.87	0.51

** correlation is significant at $p \leq .01$, (2-tailed)

* correlation is significant at $p \leq .05$, (2-tailed).

4.6 Hypotheses testing

Simple mediation analyses using Process Macro (Model 4) with 5000 bootstrapping were conducted to test both the direct and indirect effects as stated in the research hypotheses. Through these analyses, the results for the H1-H10 were ascertained. Table 3 & Table 4 depict the results of the simple mediation models.

4.6.1 Direct Effects of PROCESS macro (Model 4)

The first effect model investigated the influence of relational capabilities and conversational capabilities on student engagement (Table 4). While the overall model is significant ($R^2 = .61$, $F(5, 120) = 38.27$, $p < .001$), the direct effect of relational capabilities on student engagement is not significant ($b = .08$, $t = .90$, $p = .37$). Hence hypothesis 1 was rejected. Secondly, the direct effect of conversational capabilities on student engagement is not significant either ($b = -.07$, $t = -.69$, $p = .49$). Hence, hypothesis 2 was rejected.

The second effect model investigated the influence of relational capabilities and conversational capabilities on student motivation (Table 5). The overall model is significant ($R^2 = .74$, $F(5, 120) = 29.47$, $p < .001$), however, the direct effect of relational capabilities on student motivation is not significant ($b = -.05$, $t = -.44$, $p = .66$). Hence hypothesis 3 was rejected. Lastly, the direct effect of conversational capabilities on student motivation is not significant ($b = -.19$, $t = -1.74$, $p = .09$). Hence, hypothesis 4 was rejected. Overall no independent variable had a direct effect on any dependent variable. However, looking at the mediating effects of the three mediators, indirect effects were visible and significant.

4.6.2 Indirect (Mediation) Effects

Within the first effect model, significant mediation paths were found. The results support the mediation paths which checked for the perceived autonomy as the mediator of the first effect model. The result indicated that *perceived autonomy* mediates the relationship between *relational capabilities* and *student engagement* ($b = .10$, $LLCI = .02$, $ULCI = .22$). Hence, hypothesis H5 was accepted. Similarly, the results supported the mediation path for perceived competence as a mediator for the first effect model. The results indicated that the *perceived competence* significantly mediated the relationship between *relational capabilities* and *student engagement* ($b = .22$, $LLCI = .07$, $ULCI = .38$). Hence, hypothesis 6 was accepted. However, the result indicated no significant mediation of *perceived relatedness* in the first effect model ($LLCI = -.06$, $ULCI = .02$). Therefore, hypothesis 7 was rejected.

Within the fourth effect model, significant mediation paths were found. The results support the mediation paths which check for perceived autonomy as the mediator of the fourth effect model. Results indicated that *perceived autonomy* significantly mediates the relationships between

conversational capabilities and *student motivation* ($b = .08$, $LLCI = .00$, $ULCI = .17$). Hence, hypothesis 8 was accepted. Similarly, the results supported the mediation path which checked for perceived competence as a mediator for the fourth effect model. The results indicated that *perceived competence* significantly mediated the relationship between *conversational capabilities* and *student motivation* ($b = .29$, $LLCI = .12$, $ULCI = .47$). Hence, hypothesis 9 was accepted. However, the results indicated no significant mediation of the fourth effect model through *perceived relatedness* ($b = .01$, $LLCI = -.02$, $ULCI = .05$). Hence, hypothesis 10 was rejected.

To ascertain the significance of the indirect effects, the boundaries of confidence intervals were checked for the presence of zero, meaning that the lower limit confidence interval ($LLCI$) and the support limit confidence interval ($ULCI$) were different from zero. Based on this, mediation was established and hypotheses were accepted or rejected.

Table 4.4:*Simple mediation analysis of PA, PC and PR on RC, CC and SE*

Direct Effect Model						
Outcome = Student Engagement (Y1)						
Predictors	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>LLCI</i>	<i>ULCI</i>
Relational Capabilities (X1)	.08	.09	.90	.37	-.10	.27
Conversational Capabilities (X2)	-.07	.09	-.69	.49	-.25	.12
Perceived Autonomy (M1)	.33	.07	4.62	.00	.05	.56
Perceived Competence (M2)	.47	.06	7.79	.00	.15	.77
Perceived Relatedness (M3)	.18	.09	1.98	.50	-.26	.10
Indirect Effect of Relational Capabilities (X1) on Student Engagement (Y1)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Perceived Autonomy (M1)	.10	.05	.02	.22		
Perceived Competence (M2)	.22	.08	.07	.38		
Perceived Relatedness (M3)	-.01	.02	-.06	.02		
Indirect Effect of Conversational Capabilities (X2) on Student Engagement (Y1)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Perceived Autonomy (M1)	.09	.05	.00	.20		
Perceived Competence (M2)	.24	.07	.09	.39		
Perceived Relatedness (M3)	.01	.02	-.02	.06		

Note: LLCI = lower limit confidence interval; ULCI = upper limit confidence interval

Table 4.5:*Simple mediation analysis of NA, NC and NR on RC, CC and SM*

Direct Effect Model						
outcome = Student Motivation (Y2)						
Predictors	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>LLCI</i>	<i>ULCI</i>
Relational Capabilities (X1)	-.05	.11	-.44	.66	-.27	.17
Conversational Capabilities (X2)	.19	.11	-1.74	.09	-.42	.03
Perceived Autonomy (M1)	.30	.09	3.47	.00	.13	.47
Perceived Competence (M2)	.57	.07	7.91	.00	.43	.71
Perceived Relatedness (M3)	.12	.11	1.08	.28	-.10	.33
Indirect Effect of Relational Capabilities (X1) on Student Motivation (Y2)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Perceived Autonomy (M1)	.09	.05	.01	.20		
Perceived Competence (M2)	.26	.10	.09	.47		
Perceived Relatedness (M3)	.01	.02	-.05	.02		
Indirect Effect of Conversational Capabilities (X2) on Student Motivation (Y2)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Perceived Autonomy (M1)	.08	.04	.00	.17		
Perceived Competence (M2)	.29	.09	.12	.47		
Perceived Relatedness (M3)	.01	.12	-.02	.05		

Note: LLCI = lower limit confidence interval; ULCI = upper limit confidence interval

4.7 Condition Group Differentiation

Beyond the general analysis of the conversational and relational capabilities' influence on student engagement and motivation, mediated through the three psychological needs of autonomy,

competence and relatedness, a more specific analysis for differentiating said effects for the 4 conditional manipulation groups was conducted. To do so, again Hayes PROCESS macro (Model 4) was utilised, using the indicator comparison for the multi-categorical variable option. Doing so, the analysis used Group 1 (Low/Low) as the baseline for comparison, checking for statistical differences between the other three groups. This is done with the assumption, that an increase in capabilities will increase motivation, engagement and need satisfaction.

Similar to the result of previous direct effects, all but one direct effect were found to be insignificant for student engagement and student motivation. However, when including the mediator variables, significant indirect paths emerge, which again support the assumptions of SDT, which posits the three needs of autonomy, competence and relatedness as prerequisites for motivation and engagement (Chiu, 2021, p. 1). In the following section, all direct and indirect effects are reported.

Looking at the analysis of the conditional groups' effect comparison on *student engagement* (Table 6), the overall model was found to be significant ($R^2 = .62, F = 31.98, p = .00$). Though, comparing the direct effects, in comparison to Group 1, none of the groups were significantly different: Group 2 ($b = -.01, t = .06, p = .95$), Group 3 ($b = -.15, t = -1.13, p = .26$) and Group 4 ($b = .02, t = .15, p = .88$). However, results for the indirect effect through the three mediator variables displayed significant mediation effects.

Firstly, the paths for indirect effects mediated through *perceived autonomy* were all found to be significant. The strong effect difference was displayed by Group 4 ($b = .19, LLCI = .04, ULCI = .41$). Group 2 showed the second strongest effect difference ($b = .16, LLCI = .11, ULCI = .34$). Group 3 displayed the lowest effect difference ($b = .15, LLCI = .01, ULCI = .34$). As such, the result indicated that groups exposed to high relational capability manipulation perceived themselves as more autonomous and as a result felt more engaged during the working process.

Secondly, of the paths for indirect effects mediated through *perceived competence*, only the effect difference between Group 1 and Group 4 ($b = .45, LLCI = .22, ULCI = .71$) was significant. Comparison between the effect difference of Group 2 ($b = .20, LLCI = -.02, ULCI = .43$) and Group 3 ($b = .22, LLCI = -.01, ULCI = .46$) were found to be insignificant. Here, the result indicates that only the combination of high relational and high conversational capabilities significantly increases the engagement students experience.

Lastly, of the paths for indirect effects mediated through *perceived relatedness*, none of the effect differences were found to be significant between Group 1 and Group 2 ($b = .01, LLCI = -.04, ULCI = .08$), Group 3 ($b = .04, LLCI = .01, ULCI = .13$) or Group 4 ($b = -.01, LLCI = -.07, ULCI = .06$).

Looking at the overall model of the conditional groups' effects on *student motivation* (Table 7), the model was found to be statistically significant ($R^2 = .56, F = 24.83, p = .00$). Of the direct effects, only the effect difference between Group 1 and Group 3 ($R^2 = .56, F = 24.83, p = .00$) were found to be significant. The direct effects of Group 2 ($b = -.17, t = -1.09, p = .28$) and Group 4 ($b = -$

.24, $t = -1.47$, $p = .14$) were not significant. However, similar to the previous comparison results, when looking at the results for indirect effects, significant mediation effects can be found.

Firstly, the paths for the indirect effects mediating through *perceived autonomy* were all found to be significant. Group 4 showed the strongest effect difference ($b = .18$, $LLCI = .00$, $ULCI = .36$). After that, in comparison to Group 1, both Group 2 ($b = .14$, $LLCI = .01$, $ULCI = .32$) and Group 3 ($b = .14$, $LLCI = .00$, $ULCI = .30$) were found to be significant, with equal effect differences.

Secondly, regarding the indirect effects mediated through *perceived competence*, only the comparison between Group 1 and Group 4 ($b = .54$, $LLCI = -.22$, $ULCI = .52$) was significant. In comparison to Group 1, both Group 2 ($b = .24$, $LLCI = .22$, $ULCI = .52$) and Group 3 ($b = .26$, $LLCI = -.02$, $ULCI = .53$) differed significantly, however only by a small margin. Only the combination of both high relational and high conversational capabilities significantly increases the motivation experience.

Thirdly, regarding the mediating effects of *perceived relatedness*, no significant differences were found between Group 1, and Group 2 ($b = .01$, $LLCI = -.03$, $ULCI = .07$), Group 3 ($b = .03$, $LLCI = -.02$, $ULCI = .11$) or Group 4 ($b = -.00$, $LLCI = -.06$, $ULCI = .05$).

Table 4.6:

Simple mediation analysis with multi-categorical independent variable (Manipulation Groups) on PA, PC, PR and SE (Group 1 for comparison)

Direct Effect Model						
Outcome = Student Engagement (Y1)						
Predictors	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>LLCI</i>	<i>ULCI</i>
Group 1 on Group 2	.01	.13	.06	.95	-.24	.26
Group 1 on Group 3	-.15	.14	-1.13	.26	-.42	.12
Group 1 on Group 4	.02	.14	.15	.88	-.25	.30
Perceived Autonomy (M1)	.34	.07	4.70	.00	.20	.49
Perceived Competence (M2)	.46	.06	7.66	.00	.34	.58
Perceived Relatedness (M3)	.19	.09	2.08	.04	.01	.37
Relative Indirect Effect of Group 2, 3 and 4 on Student Engagement (Y1) through Perceived Autonomy (M1)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Group 1 on Group 2	.14	.08	.11	.34		
Group 1 on Group 3	.15	.09	.01	.34		
Group 1 on Group 4	.19	.09	.04	.41		
Relative Indirect Effect of Group 2, 3 and 4 on Student Engagement (Y1) through Perceived Competence (M2)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Group 1 on Group 2	.20	.12	-.02	.43		
Group 1 on Group 3	.22	.12	-.01	.46		
Group 1 on Group 4	.45	.12	.22	.71		
Relative Indirect Effect of Group 2, 3 and 4 on Student Engagement (Y1) through Perceived Relatedness (M3)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Group 1 on Group 2	.01	.03	-.04	.08		
Group 1 on Group 3	.04	.04	-.01	.13		
Group 1 on Group 4	-.01	.30	-.07	.06		

Table 4.7:

Simple mediation analysis with multi-categorical independent variable (Manipulation Groups) on PA, PC, PR and SM (Group 1 for comparison)

Direct Effect Model						
Outcome = Student Motivation (Y2)						
Predictors	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	<i>LLCI</i>	<i>ULCI</i>
Group 1 on Group 2	-.17	.15	-1.09	.28	-.47	.13
Group 1 on Group 3	-.33	.16	-2.02	.05	-.66	-.01
Group 1 on Group 4	-.24	.17	-1.47	.14	-.57	.08
Perceived Autonomy (M1)	.31	.09	3.60	.00	.14	.44
Perceived Competence (M2)	.56	.07	7.78	.00	.42	.70
Perceived Relatedness (M3)	.13	.11	1.22	.22	-.08	.35
Relative Indirect Effect of Group 2, 3 and 4 on Student Motivation (Y2) through Perceived Autonomy (M1)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Group 1 on Group 2	.14	.08	.01	.32		
Group 1 on Group 3	.14	.08	.00	.30		
Group 1 on Group 4	.18	.09	.03	.36		
Relative Indirect Effect of Group 2, 3 and 4 on Student Motivation (Y2) through Perceived Competence (M2)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Group 1 on Group 2	.24	.14	-.22	.52		
Group 1 on Group 3	.26	.14	-.02	.53		
Group 1 on Group 4	.54	.15	.27	.84		
Relative Indirect Effect of Group 2, 3 and 4 on Student Motivation (Y2) through Perceived Relatedness (M3)						
	<i>b</i>	<i>Boot standard error</i>	<i>LLCI</i>	<i>ULCI</i>		
Group 1 on Group 2	.01	.02	-.03	.07		
Group 1 on Group 3	.03	.03	-.02	.11		
Group 1 on Group 4	-.00	.03	-.06	.05		

Chapter 5: Discussion

5.1 General mediation effects

The results of the regression analyses indicated that both capabilities of ChatGPT had no significant effect that ensured students' engagement and motivation (H1-H4). However, when considering the fulfilment of students' need for autonomy, competence and relatedness, mediating effects were discovered. This parallels the assumptions of the Self-Determination Theory, which frames the three needs as necessary conditions for students to be both motivated and engaged during the working process (Chiu, 2021, p. 1-2). Within the following chapter, the implications of H5-H10 are addressed and discussed.

Firstly, the autonomy perceived by students enhances their engagement. This parallels the research of Jang et al. (2016), who reported that students are more engaged when their autonomy is supported through teachers. In a fully digital setting, i.e. with MOOCs, the research of Jang et al. (2016) reported that students' psychological engagement was found to increase when they were capable of making autonomous decisions (Salikhova et al., 2020, p. 4). The relational capabilities of ChatGPT seem to create a supportive environment, in which students work autonomously, being free to choose how to approach their tasks, without ChatGPT inhibiting or dictating their performance.

Secondly, the competence perceived by students enhanced their engagement, too. Students seem to perceive ChatGPT's ability to interact with students to be meaningful. ChatGPT's context-sensitive and responsive capabilities act as a support structure that allows them to utilise their skill to solve tasks at hand to their preferred standards. This increased engagement through perceived competence parallels the results of Salikhova et al.'s (2020) research, which reported that an increase in task interest is connected to online learning tools' options for receiving feedback, as it allows students to work more competently. This ultimately led to an increase in students' achievements.

Thirdly, however, relatedness facilitated by ChatGPT did not affect the students' engagement. The original intent of utilising ChatGPT's relational capabilities was to test whether improving the clarity of communication between ChatGPT and students would lead to a more genuine and reactive conversation. However, contrary to expectations, ChatGPT was not able to create an interpersonal bond similar to human interaction. Similar to offline interactions in the classroom, lacking relational bonds leaves students feeling alone (van den Broeck et al., 2010). As such, ChatGPT seemingly does not move beyond traditional Chatbots, which respond in monotone and superficial conversation styles through pre-scripted answer schemes.

ChatGPT's relational capabilities indicate that a greater level of sophistication does indeed allow students to be more involved with the working process at hand. Students display both increased levels of autonomy and competence, allowing them to work more engaged and focused. However, considering the social aspect of academic work, similar to MOOCs or other online-based learning resources, interpersonal relations seem to be missing, which results in a lack of engagement. Without

engagement with people that one cares for, or is cared for by, students feel disconnected (Luo et al., 2021, p. 1383). As ChatGPT continues to lack the ability to build emotionally satisfying relationships, students do not meaningfully relate to ChatGPT.

Moving to the conversational capabilities of ChatGPT, a similar pattern becomes visible in ensuring students' motivation. As the conversational complexity of ChatGPT's answer increases, students seem to feel more autonomous during their work. These capabilities allow ChatGPT to embrace a more human-like and academic writing style, which enables the students to gain a better understanding of how to work out tasks independently. Therefore, this increased independence results in students feeling more motivated. This matches the findings of Salikhova et al. (2020), who reported a direct link between satisfaction of the need for autonomy and higher motivation for independent work. Being solely responsible for their output, individuals are fuelled by self-regulatory motivation, which in return leads to a greater drive to achieve their learning (Salikhova et al., 2020). Related specifically to online learning, Luo et al. (2021) reported that students who work in an autonomy-supportive environment are more likely to find enjoyment in the learning activities and as such are more motivated to work with online learning resources such as ChatGPT (p. 1392).

Secondly, as the conversational capabilities of ChatGPT become more sophisticated, human-like and academic, students perceive themselves as more competent. As they feel more competent during their work, they display higher levels of motivation to fulfil their work successfully. On a more general level, these results parallel Salikhova et al. (2020) findings, as students who perceive themselves competent, display higher levels of motivation. Whether this is facilitated independently, or through a support structure provided by teachers, students' performance benefits from this support structure (Chiu, 2021). Luo et al. (2021) reported that within an online learning environment, students who perceive themselves as competent, experience enhanced levels of motivation. Additionally, the observations of Salikhova et al. (2020) indicated that students using learning mobile apps that provide feedback functions throughout the learning experience enhance this perceived competence, as it helps students improve their skills. Receiving instantaneous feedback in a constructive manner, allows students to improve specific areas, empowering them to be motivated and reach their full potential. Feeling more confident in their skills increases their intrinsic motivation, which leads to higher work drive and consequently better achievements (Salikhova et al., 2020).

The results again validate the actual impact of the conversational capabilities of ChatGPT on students' motivation through the satisfaction of their needs. Fostering a strong sense of autonomy and competence not only helps students to attain a deeper understanding of the task at hand but supports them in finding a working path that supports their vision of the task solution. As such, students are more motivated to solve the task at hand.

However, the analysis results indicated no meaningful impact of the role of perceived relatedness between conversational capabilities and student motivation. Similar to its role between relational capabilities and engagement, the conversational sophistication displayed by ChatGPT, did

not allow for students to feel motivated with the working environment. While offline learning, as well as digitally mediated learning still involves social interaction with peers and students, this fully digital working environment, though imitating human interaction, cannot do the same (Chiu, 2021). The results of Luo et al. (2020) proposed that students who perceive an appropriate level of relatedness, feeling like an integral part of the environment, will even engage in tasks they perceive as undesirable. However, in the case of ChatGPT's conversational capabilities, there seems to be no such impact, which is also cited in the reporting of Salikhova et al. (2020), indicating online work to limit the social exposure of users, which is crucial for students development and success.

Moving beyond the confirmation and discussion of H1-H10, during the analysis, ChatGPT's relational capabilities' impact on motivation as well as conversational capabilities' impact on engagement with the mediators' effects were investigated too. Firstly, addressing the impact of relational capabilities on student motivation through the perceived needs as mediators, results similar to H5-H7 were found. The reporting of the participants indicated significantly positive mediation effects for the perceived autonomy and perceived competence. When students perceived higher levels of ChatGPT's awareness of the context of the conversation reflected in the output which corresponded to the users' prompts, they perceived themselves as more autonomous and competent. Being able to utilise the answers given by ChatGPT allowed students to drive the conversations towards the direction they intended, as ChatGPT was able to draw upon the requests and context the user provided effectively. Similarly, with ChatGPT answering in such a manner, students also perceived themselves as more competent, as the answer given by ChatGPT allowed students to properly use their skill repertoire, as ChatGPT can understand the intention of the user and give them pointers towards a solution that matches satisfies their expectations.

5.2 Condition differentiation

In a second round of analysis dedicated to the direct and indirect effects of the perceived ChatGPT capabilities on students' engagement and motivation, more specific attention was dedicated to the differentiation between the 4 conditional groups participants were assigned to. Based on the differences in the stimuli material each group was exposed to, this study investigated whether these differences in conversational and relational capabilities have an impact on students' perceived student engagement and motivation, as well as fulfilling their needs for autonomy, competence and relatedness.

While most direct effect differences were not significant, the direct effect between the first and third group was significant, in which the third group perceived themselves less motivated than the first group. In this group, the sophistication of ChatGPT's conversational capabilities were high, while its relational capabilities were low. The dialogue presented displayed an academic level of linguistic complexity, while it lacked context comprehension and information retention, meaning that ChatGPT had to be reminded of the context by the user. While Group 1's stimulus material lacked sophistication

in both, the data shows that students who were exposed to a contrast between the two capabilities levels, perceived themselves as less motivated when the capabilities were not consistent with each other.

Now, again in line with the assumptions of SDT, investigating the indirect effects mediated through the three needs' significant effects and differences were reported (Chiu, 2021, p. 1-2). Firstly, looking at the role of perceived autonomy, for both motivation and engagement, the results of the fourth (4) group were the strongest. Holding high sophistication for both conversation and relational capabilities, students do perceive themselves as more motivated and engaged. However, Groups 2 and 3 both displayed heightened motivation and engagement, too. Looking at the effect values, while they do differ, not to a large difference. It seems that in terms of autonomy, both heightened conversational and relational capabilities lead to an increase in students' autonomy during work. While only one sophisticated capability alone lead to an increase in comparison to Group 1, the effect of both capabilities' high sophistication elevates the effect on students motivation and engagement further

Secondly, looking at the impact of the group differences on perceived competence to mediate the effects on motivation and engagement, Group 4 was again found to be most motivated and engaged. Specifically for student engagement, only Group 4 was significantly more engaged in comparison to Group 1, while Groups 2 and 3 displayed no significant effect at all. This shows students when supported by a tool that utilises both sophisticated linguistic and context-aware capabilities appropriate for academic work, it assists students to feel more capable of solving their tasks.

Lastly, looking at perceived relatedness as a mediator, the effects of all three groups compared to Group 1 showed no significant difference on both students engagement and motivation. Further confirming the results of the earlier iteration of mediation analysis, ChatGPT seems to not be capable of fulfilling students need for relatedness and as such, does not allow them to be more motivated and engaged, regardless of the extend of capability sophistication. Students do not perceive a meaningfully connecting relation to ChatGPT and as such parallel the results of Salikhova et al. (2020), indicating a general relational disconnectedness from online learning tools.

Looking at motivation, perceiving at least one of the two capabilities as sophisticated seems to positively affect students' motivation. While the impact between the groups with only one heightened capability and the fourth group with both heightened capabilities, is not substantially large. Again, experiencing a coherent mix of the two does lead to students being more motivated.

While only marginal in differences, the results indicate that the sophistication of conversational capabilities is more important for students to feel engaged and motivated. This indicates that students rather appreciate responses reflecting a higher level of academic sophistication than the ability to keep the answers closer to the context of the task. Paralleling the research on Self-Determination Theory, students who can choose their task path, without being dictated on what needs to be done, display higher motivation (van den Broeck et al., 2010). As ChatGPT gives suggestions in

a divergent manner, focusing on giving the student options, instead of making decisions for the student, it leaves the students to make the decisions themselves as they fit (Shoufan, 2023, p, 38806). While following mandatory instructions often hinders perceived autonomy, suggestive guidance when requested by the student does not inhibit their autonomy, instead leading to increased levels of competence (van den Broeck et al., 2010).

5.3 Conclusion

Building up from all previous sections of this research, within this section the overarching results are reiterated conclusively, providing both implications for the academic sphere, but also related to AI itself. Additionally, potential limitations of this research and suggestions for future research are provided. To answer the research question: *To what extent do conversational and relational capabilities influence students' engagement and motivation?* The data collected indicates that the capabilities of ChatGPT positively influence students' engagement and motivation during their working process. However, it is crucial to highlight that this facilitation of engagement and motivation is only possible through the fulfilment of students' need for autonomy and competence, as proposed by the Self-Determination Theory (Chiu, 2021, p. 1-2; Ryan & Deci, 1985). However, this indirect effect does not apply to the need for relatedness, which ChatGPT's capabilities cannot fulfil, yet.

5.3.1 Academic Implications

Firstly, as ascertained by previous research on Self-Determination Theory, the three innate psychological needs of autonomy, competence and relatedness are prerequisites for ensuring students' engagement and motivation (Chiu, 2021; Shaengchart et al., 2023). Students seem to appreciate ChatGPT's responsiveness, which allows them to utilise its capabilities in an assisting manner, which is driven by their skill and ability to make autonomous decisions and deliver work satisfactory to their standards. Mediating the effects of ChatGPT's capabilities, the needs for autonomy and competence allowed students to feel engaged and motivated during work, with the exception of relatedness.

From a comparative perspective, the group with the strongest extent of both capabilities was engaged and motivated the most (Group 4), displaying both heightened levels of autonomy and competence. While the conversational and relational capabilities of ChatGPT push the boundaries of previous chatbot sophistication, it seems to not match the support for students in terms of emotional and interpersonal connection that was found to be an effective predictor of relatedness in the academic setting (Chiu, 2021, p. 2; Luo et al., 2021, p. 1386-1387). As such, the results reflect this lack of a relational connection to ChatGPT and therefore an inhibitor of motivation and engagement.

5.3.2 Managerial Implications

Building on the results, this study re-confirms and asserts that students indeed value the current capabilities of ChatGPT (Tiwari et al., 2023, p. 14-15). Though, it is imperative to note for AI developers, that significant focus needs to be attributed to the enhancement of emotional and empathetic components of ChatGPT's outputs. While competence and autonomy were well-supported, the conversation style, regardless of its sophistication failed to make users feel meaningfully involved. Contrary to the capabilities of teachers in education, and despite ChatGPT's linguistic sophistication, it lacks the creation of genuine connections that human interaction fosters. Henceforth, AI developers must continue channelling their efforts into improving these capabilities through more soft-skills-sensitive outputs that foster a more trustworthy and safe environment.

An additional point of criticism to mention, which does not stem from the results of the data, but the experiment building itself, is the duration to which ChatGPT 3.5 can retain complex personas. While ChatGPT is capable of understanding and adopting complex and context-specific personas, retention of these personas for more than three prompts required constant reminding for ChatGPT to do so. Having to do this as a student during the working process, may inhibit their full working potential, and as such may discourage them from using ChatGPT in such a manner. Therefore, again for AI developers, increased attention should be paid to ensuring ChatGPT's persona embracing and retention is improved.

5.4.3 Limitations

Lastly, addressing the potential drawbacks and limitations of this study are crucial to consider and discuss. Firstly, it is crucial to again, stress that this study was solely based on the capabilities of the free ChatGPT 3.5, and not the newer paid 4.0 version. This was done to investigate the version that most students make use of. As such, the results reported within this paper display higher levels of external validity, which would have been lower if version 4.0 had been used. However, within the fast-paced environment of AI evolution, it is crucial to point out that newer and more sophisticated versions of ChatGPT, may be able to facilitate the SDT proposed needs better. With interaction capabilities becoming more sophisticated, they may become even more human and context-aware, as already visible in the 4.0 version. As such, the first recommendation for future research is the continuous investigation of both ChatGPT 4.0's impact on SDT and potential comparative studies with other future versions to come.

Secondly, a more interactive design, in which participants actively work with ChatGPT would allow their reported perceptions to be more authentic and correspond to their working style, instead of reacting to another person's work style (the researcher's style in this case). Due to time and resource constraints, this level of complexity was not realisable within this study.

Thirdly, the matter of sampling needs to be addressed. The use of convenience and snowball sampling brings potential threats to the validity and reliability of the data. Achieving representativeness through non-probabilistic sampling is difficult, as the researchers' biases, such as confirmation bias for selecting participant or their network through which the experiment was distributed may have impacted the data collected. To collect a more neutral sample and achieve higher representativeness, the use of probabilistic sampling methods should be used. In connection with a larger sample size, which was limited by time and resource constraints, this would benefit the validity and representativeness of future studies.

Lastly, the alterations made to the existing scales to fit the context of this research may result in compromising their previous validity. Changing the wording and the subject intended to be studied may change their effectiveness in investigating certain concepts. However, these alterations were crucial, as topic-specific scales addressing the research topic at hand, have either not been sufficiently peer-reviewed, or simply do not exist. While the final scales used were validated within the context of this study, their applicability to similar research is uncertain. Therefore, dedicating effort to either updating existing scales to adjust them to the newly developed capabilities of AI or building new scales for the future of AI research is deemed necessary.

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Appendix A

Table A1: Measures, factor loadings and Cronbach alphas

Construct	Items	Factor Loading
Conversational Capabilities	($\alpha = .82$) (1= strongly disagree, 5= strongly agree)	
	1. ChatGPT's communication was clear	0.81
	2. The interaction with ChatGPT felt like an ongoing conversation	0.56
	3. ChatGPT maintained a relevant conversation	0.84
	4. ChatGPT gave relevant information during the whole conversation	0.85
	5. ChatGPT is good at providing me with helpful responses at any point of the process	0.73
Relational Capabilities	($\alpha = .80$) (1= strongly disagree, 5= strongly agree)	
	1. ChatGPT was able to keep track of the conversations context	0.75
	2. The intentions of the prompts were understood by ChatGPT	0.81
	3. ChatGPT understood what was wanted and helped achieve the goal	0.83
	4. If ChatGPT encountered a problem, it responded appropriately	0.68
	5. ChatGPT's responses were easy to understand	0.64
Student Motivation	($\alpha = .87$) (1= strongly disagree, 5= strongly agree) If ChatGPT conversed like this,	
	1. ... I would enjoy working with ChatGPT	0.89
	2. ... I would find working with ChatGPT a pleasurable activity	0.89
	3. ... working with ChatGPT would be fun.	0.87
	4. ... I would get satisfaction from working with ChatGPT	0.88
	5. Doing well on this exercise with ChatGPT would be important to me.	0.53
Student Engagement	($\alpha = .86$) (1= strongly disagree, 5= strongly agree) If ChatGPT conversed like this,	
	1. ...I would feel interested in working with ChatGPT	0.85
	2. ...I would enjoy working with ChatGPT	0.89
	3. ...I would feel good when working with ChatGPT	0.85
	4. ...I would feel involved	0.77
	5. ...I would feel that I could ask ChatGPT about what I needed and wanted	0.65
6. ...I would feel that I could let ChatGPT know what I was interested in	0.59	
Need for autonomy	($\alpha = .73$) (1= strongly disagree, 5= strongly agree) If ChatGPT conversed like this,	

	1. ... I would feel free to express my own ideas and opinions	0.77
	2. ... I would feel like I had to follow ChatGPTs commands *	
	3. ... I would have the ability to do things differently	0.79
	4. ... I would feel free to do my job the way I think it could be done best.	0.85
	5. ... I would feel forced to do things I do not want to do *	
<hr/>		
Need for competence	($\alpha = .81$) (1= strongly disagree, 5= strongly agree) If ChatGPT conversed like this,	
	1. ... I would feel competent to complete the task	0.84
	2. ... I would master the task at hand	0.91
	3. ... I would doubt whether I was able to execute the task properly *	
	4. ... I would feel that I could even accomplish the most difficult tasks	0.82
<hr/>		
Need for relatedness	($\alpha = .44$) (1= strongly disagree, 5= strongly agree) If ChatGPT conversed like this,	
	1. ... I would feel like I could talk about the things that mattered the most to me (in relation to the task)	0.83
	2. ... I would feel alone while working (R)	0.32
	3. ...I would feel that ChatGPT really understood me	0.83

*After EFC, Item was dropped from scale to increase overall Cronbach's α of the scale

Appendix B.

Survey and Manipulation Material

Explanation: In line with the Guidelines of generative AI, as outlined by the AI declaration in Appendix C, this part of the study was created collaboratively with ChatGPT. Specifically, ChatGPT was used to create the manipulated material that was used for the conditional groups. The prompts by the user were written by the researcher and the consequent responses were taken from ChatGPT itself.

Start:

Welcome, my name is Nikolas Wierz and the following experiment is part of my thesis for the Masters in "Media & Business". Thank you for participating this experiment!

In this experiment you will be exposed to an excerpt of collaborative working between a student and ChatGPT for academic purposes. Afterwards, you are asked to fill out a questionnaire detailing your thoughts.

Participation is voluntary, and your responses will remain confidential and anonymous. Data will be stored only until completion of my master's thesis. If you'd like a follow-up about the results, you can provide your email at the end of the survey.

If you have any additional questions please contact the researcher of this project (Nikolas Wierz) through the following email: 577296nw@eur.nl

Q1: We hereby ask for your consent to use the data provided within this experiment for the indicated reasons above.

- a) I hereby give my consent
- b) I do not give my consent

Q2: Have you previously worked with ChatGPT on academic assignments?

- a) Yes
- b) No

Imagine the following scenario: For your academic writing class you were asked to write a short text, analysing a selected animation movie, focusing on the portrayal and discussion of underlying social norms. You chose the Pixar movie "Ratatouille" Following the first submission, you were asked by your teacher, to revise the text in collaboration with ChatGPT to improve the writing in terms of formality and academic writing standards.

In the next section, an interactive dialogue with ChatGPT is shown, detailing how to improve your essay. Please pay attention to the support ChatGPT provides you for reworking your essay. Pay attention to ChatGPT's responses to the given prompts.

Afterwards reading the material, you are asked to complete a questionnaire related to the material you previously read. It is imperative that you approach this task with attentiveness and honesty.

Q3: The following task is related to working with ChatGPT in academia?

- a) Yes, that is correct
- b) No, that is incorrect

Please proceed to the next page to view the material.

Manipulation material for all four conditional groups (distributed using randomisation logic of Qualtrics).

Group 1: Low Conversational/Low Relational

Task Instructions given to ChatGPT: For my academic writing class, I was asked to write a short essay on my favourite animation movie, and based on its content analyse the social criticism displayed within. I have written a text, but I need assistance and suggestions on how to improve the formality and academic writing style of my essay.

ChatGPT: Sure, you can show me your essay and I'll try to help!

You: *Paste essay*

ChatGPT: I read the essay. The Ratatouille movie is good. It's about cooking and not judging. Remy and Linguini cook together. Remy challenges stereotypes

You: How can I make my essay more formal and appropriate for academic writing?

ChatGPT: Make it sound more serious and smart. Like talking to a teacher. No jokes. Use fancier words and longer sentences. Make use of formal language and avoid slang or casual expressions. Use words like "however" or "moreover" to connect ideas. Also make sure to cite any sources you use.

You: Can you give me an example of how I should transform one of the sentences to match your instructions?

ChatGPT: Make it sound smart. Like when you're talking to a teacher. Say something like, "It is a movie that delves into the complexities of *movies topic* while also discussing challenging preconceptions about *other topic*." If you remind of the text again I can formulate a sample sentence for you.

You: Yes, here it is *paste text*.

ChatGPT: Say something like, "Ratatouille is an animated film that delves into the complexities of culinary artistry while simultaneously challenging societal preconceptions and stereotypes."

You: If I incorporate these suggestion will my essay be better than what I first showed you?

ChatGPT: It might be better. Making those changes can help improve your essay's quality and make it more suitable for academic standards.

Group 2: Low Conversational/High Relational

Task Instructions given to ChatGPT: For my academic writing class, I was asked to write a short essay on my favourite animation movie, and based on its content analyse the social criticism displayed within. I have written a text, but I need assistance and suggestions on how to improve the formality and academic writing style of my essay.

ChatGPT: Sure, just share your text, and I'll do my best to help you with it.

You: *Paste essay*

ChatGPT: Oh, sure! Your writing about Ratatouille. It's cool but needs some tweaks.

You: How can I specifically improve the formality of my essay to make it more academic?

ChatGPT: To make your writing more formal and academic, follow these steps:

1. Use formal language instead of casual phrases.
2. Be clear and precise in your writing.
3. Avoid using slang or unknown expressions.

4. Structure your writing with clear paragraphs and starting sentences."

You: Can you give me an example of how I should transform one of the sentences to match your instructions?

ChatGPT: Sure! Here's an example of transforming one of your sentences to match what I said before:

Original sentence: "Let's dive into Ratatouille."

Transformed sentence: "This analysis will explore Ratatouille."

You: If I incorporate these suggestion will my essay be better than what I first showed you?

ChatGPT: By following these suggestions, you can better your Ratatouille-based essay. Let me know if you need more help!

Group 3: High Conversational/Low Relational

Task Instructions given to ChatGPT: For my academic writing class, I was asked to write a short essay on my favourite animation movie, and based on its content analyse the social criticism displayed within. I have written a text, but I need assistance and suggestions on how to improve the formality and academic writing style of my essay.

ChatGPT: Sure, I'm here to help! Go ahead and provide your text, and we'll work on improving it together.

You: *Paste text*

ChatGPT: Certainly! Your essay effectively outlines the movie, but refining its structure and language can enhance its academic quality. By incorporating a more formal tone and organizing your ideas with clear topic sentences and supporting evidence, you can elevate the professionalism of your analysis.

You: Great, how can I specifically improve the formality of my essay to make it more academic?

ChatGPT: To improve the formality of your essay, consider using more formal language and structure. Start with a formal introduction that clearly states the purpose of your essay and provides an

overview of the main points you'll discuss.

1. Use academic language instead of informal expressions or slang.
2. Organize your ideas into paragraphs with clear topic sentences and supporting evidence.
3. Avoid contractions and colloquialisms to maintain a professional tone throughout your writing.

Would you like more examples or further explanation?

You: Yes please, an example would help me a lot.

ChatGPT: Okay, I do not remember the exact text you provided me, can you provide me with a sentence to help you?

You: Here you go: "Let's dive into Ratatouille, that awesome animated flick that takes us into the kitchen with a rat named Remy."

ChatGPT: Right, here's an example of how to transform one of your sentences to improve its formality:

Transformed sentence: "This essay will explore the themes presented in the animated film Ratatouille, which follows the journey of a rat named Remy into the culinary world."

You: If I incorporate these suggestion will my essay be better than what I first showed you?

ChatGPT: Incorporating these suggestions should definitely improve the overall quality of your essay. By enhancing the formality and academic style, your essay will likely become more polished, organized, and easier to understand. It's always a good idea to carefully review your essay after making revisions to ensure that it meets your goals and objectives. Let me know if you need further assistance or guidance!

Group 4: High Conversational/High Relational

Task Instructions given to ChatGPT: For my academic writing class, I was asked to write a short essay on my favourite animation movie, and based on its content analyse the social criticism displayed within. I have written a text, but I need assistance and suggestions on how to improve the formality/academic style and argumentation structure of my essay.

ChatGPT: Certainly, I'm here to assist you! Please proceed and provide your text, and we'll

collaborate to enhance both the writing style and the argumentation structure.

You: *Paste text*

ChatGPT: Thank you for sharing your essay on Ratatouille! Your summary of the movie's key themes and characters is commendable, however, your essay's tone is too conversational, which may not align with academic writing's expected formality. Additionally, the provided text lacks argumentation depth and appropriately supported claims. Let's address each aspect individually for specific improvement suggestions. Which would you like to tackle first?

You: I need help improving the formality and of my essay to make it more academic. What do I need to pay attention to here?

ChatGPT: To formalize your essay, consider these suggestions:

1. *Use Formal Language:* Substitute colloquial expressions with formal language. For example, replace "awesome animated flick" with "animated film" and "a bit of a clumsy guy" with "a somewhat uncoordinated individual."

2. *Formalize Sentence Structure:* Ensure sentences follow a formal structure, with clear subject-verb-object constructions. For instance, change "But Ratatouille isn't just about cooking – it's got some deep stuff going on too" to "However, Ratatouille explores more than culinary themes; it addresses deeper social and cultural issues."

3. *Use Academic Vocabulary:* Incorporate academic vocabulary relevant to your essay's themes and concepts. Replace informal terms like "cool" or "neat" with words like "significant," "noteworthy," or "profound." By implementing these adjustments, you can elevate your essay's formality while maintaining clarity and coherence. Need further clarification or assistance with any of these suggestions?

4. *Citation of Sources:* Incorporate scholarly sources or theoretical frameworks to support your analysis. This could involve referencing academic articles, books, or theories that relate to the themes and social criticisms depicted in Ratatouille. Providing citations adds credibility to your argument and demonstrates a depth of research.

5. *Analytical Depth:* Dive deeper into your analysis of the social criticisms presented in the movie. Instead of simply summarizing the plot or themes, critically evaluate the underlying messages and implications. Consider how the movie reflects or challenges broader societal norms and ideologies.

You: If I incorporate these suggestion will my essay be better than what I first showed you?

ChatGPT: Yes, incorporating these suggestions should improve the overall quality of your essay. By enhancing the formality and academic writing style, your essay will be more polished and effective in conveying your analysis of Ratatouille's social criticism. It will likely be clearer, more organized, and easier for your readers to understand and follow your arguments.

Q4: If you see this window, you finished reading a conversation with ChatGPT about the improvement of an academic essay. Is this accurate?

- a) Yes
- b) No

Now, please go through the next pages and fill out the questionnaire about the relevant theoretical concepts. Please answer them carefully and thoroughly. There are a total of 7 question blocks.

Here the questionnaire displayed in Appendix A is given to the participants.

Appendix C

Declaration Page: Use of Generative AI Tools in Thesis

Student Information

Name: Nikolas Wierz

Student ID: 577296

Course Name: Master Thesis CM5000

Supervisor Name: dr. Serge Rijdsdijk

Date: 26.06.2024

Declaration:

Acknowledgment of Generative AI Tools

I acknowledge that I am aware of the existence and functionality of generative artificial intelligence (AI) tools, which are capable of producing content such as text, images, and other creative works autonomously.

GenAI use would include, but not limited to:

- Generated content (e.g., ChatGPT, Quillbot) limited strictly to content that is not assessed (e.g., thesis title).
- ~~Writing improvements, including~~ grammar and spelling corrections (e.g., Grammarly)
- Language translation (e.g., DeepL), without generative AI alterations/improvements.
- Research task assistance (e.g., finding survey scales, qualitative coding verification, debugging code)
- Using GenAI as a search engine tool to find academic articles or books (e.g.,

I declare that I have used generative AI tools, specifically [ChatGPT; Grammarly], in the process of creating parts or components of my thesis. The purpose of using these tools was to aid in generating content or assisting with specific aspects of thesis work.

I declare that I have NOT used any generative AI tools and that the assignment concerned is my original work.

Signature: [digital signature]

Date of Signature: [Date of Submission]

Extent of AI Usage

I confirm that while I utilized generative AI tools to aid in content creation, the majority of the intellectual effort, creative input, and decision-making involved in completing the thesis were undertaken by me. I have enclosed the prompts/logging of the GenAI tool use in an appendix.

Ethical and Academic Integrity

I understand the ethical implications and academic integrity concerns related to the use of AI tools in coursework. I assure that the AI-

generated content was used responsibly, and any content derived from these tools has been appropriately cited and attributed according to the guidelines provided by the instructor and the course. I have taken necessary steps to distinguish between my original work and the AI-generated contributions. Any direct quotations, paraphrased content, or other forms of AI-generated material have been properly referenced in accordance with academic conventions.

By signing this declaration, I affirm that this declaration is accurate and truthful. I take full responsibility for the integrity of my assignment and am prepared to discuss and explain the role of generative AI tools in my creative process if required by the instructor or the Examination Board. I further affirm that I have used generative AI tools in accordance with ethical standards and academic integrity expectations.

Signature: 

Date of Signature: 26.06.2024