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Higher Education Students' Task Motivation in the Generative Artificial Intelligence Context: The Case of ChatGPT

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Abstract: Artificial intelligence has been attracting the attention of educational researchers recently, especially ChatGPT as a generative artificial intelligence tool. The context of generative artificial intelligence could impact different aspects of students' learning, such as the motivational aspect. The present research intended to investigate the characteristics of students' task motivation in the artificial intelligence context, specifically in the ChatGPT context. The researchers interviewed 15 students about their experiences with ChatGPT to collect data. The researchers used inductive and deductive content analysis to investigate students' motivation when learning with ChatGPT. To arrive at the categories and sub-categories of students' motivation, the researchers used the MAXQDA 2022. Five main categories emerged: task enjoyment, reported effort, result assessment, perceived relevance, and interaction. Each category comprised at least two sub-categories, and each sub-category was further organized into codes. The results indicated more positive characteristics of motivation than negative ones. The previous results could be due to the conversational or social aspect of the chatbot, enabling relationships with humans and enabling the maintenance of good quality conversations with them. We conclude that a generative AI could be utilized in educational settings to promote students' motivation to learn and thus raise their learning achievement.

Keywords: artificial intelligence; task motivation; ChatGPT; higher education

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1. Introduction

Artificial intelligence (AI) has emerged as a transformative force in various domains of society, revolutionizing tasks, data processing, and predictive insights [1]. One AI platform that has garnered substantial attention and public interest is ChatGPT. This platform, powered by natural language processing algorithms, can potentially enhance the learning experience of higher education students [2]. However, to effectively incorporate ChatGPT in educational settings, it is crucial to understand the motivational issues of educators when using this AI technology for task completion, a claim raised in a similar context, specifically the robotics one [3].

In higher education, students' task motivation, in the context of ChatGPT, holds significant importance for academia and educational practitioners. This study contributes to the existing knowledge on integrating AI technologies in education. In the first place, this study addresses a research gap in the literature. While there have been studies exploring the use of AI technologies in education, e.g., in [4–7], there is limited research specifically focusing on the task motivation of students using ChatGPT and the recommendations to adopt qualitative research methods. This research will provide valuable insights into the specific motivations among higher education students when utilizing ChatGPT for task completion. In the second place, the findings of this study will inform educators and developers on how to effectively incorporate ChatGPT in educational settings, specifically

in higher education. We claim that understanding students' task motivation can help design effective learning experiences as well as instructional interventions.

Additionally, this study contributes to the theoretical understanding of task motivation in the context of AI technologies. By applying the theoretical frameworks of Self-Determination Theory (SDT) [8] and Expectancy-Value Theory [9], this study aims to provide a comprehensive understanding of the factors influencing students' task motivation when using ChatGPT. SDT was selected because it focuses on satisfying basic psychological needs: autonomy, competence, and relatedness. By applying SDT, this study aims to explore how ChatGPT impacts students' sense of autonomy in task completion, their perceived competence in using the technology, and the level of relatedness they experience in their interactions and engagement with ChatGPT. At the same time, the Expectancy-Value Theory was chosen because it emphasizes the role of expectations and values in shaping individuals' motivation.

Based on the preview above, the present study aims to investigate the task motivation of higher education students in the context of generative artificial intelligence, specifically focusing on the case of ChatGPT as a generative AI tool. The present study will utilize a qualitative research approach to obtain these goals and draw upon the theoretical frameworks of Self-Determination Theory (SDT) and Expectancy-Value Theory. By answering the main study question: What are the characteristics of students' task motivation in the context of Generative AI?

2. Literature Review

2.1. ChatGPT as AI Driven Tool

Previous research showed that AI is an expansive field concerned with creating systems and technologies that enable machines to perform tasks typically requiring human intelligence [10]. Despite its potential, the utilization of AI in education has been relatively limited, primarily manifesting in intelligent tutoring systems, which often view users as passive recipients of knowledge [11,12]. A series of studies have indicated that chatbots, AI implementations capable of tasks usually necessitating human intelligence, have recently garnered interest [4,13]. Among these, OpenAI's ChatGPT has sparked discussion in education, offering possibilities for personalized learning, instant feedback, and the reduction of learner anxiety [4,14,15].

While research on chatbot integration in education is still in its early stages, preliminary results suggest they effectively improve learning outcomes [5,16–19]. One notable example is ChatGPT, which offers tailored feedback that could enhance learner motivation and facilitate efficient knowledge acquisition [20,21]. Despite these advantages, comparing students' task performance using ChatGPT with those not using it is challenging. This was underscored by Lin et al. [22], who found ChatGPT's ability to produce superior reflective writing also introduced difficulties in differentiating AI-generated work from students' original work, indicating the need for effective differentiation approaches. Implementing AI in classrooms could potentially augment traditional teaching methods and bolster academic performance and engagement [23]. In line with this, a study completed by Yilmaz and Yilmaz [6] showed higher post-test motivation scale scores among students using ChatGPT to support computational thinking skills learning. Prior research suggests that ChatGPT also has the potential to alleviate language barriers for non-native English speakers by offering real-time support [24].

2.2. Task Motivation and Underlying Theories

As introduced by Julkunen [25], task motivation provides a comprehensive framework for understanding learners' motivation during tasks. Incorporating trait and state motivation allows educators to construct effective strategies that enhance students' task motivation, engagement, and success [26]. Task motivation is influenced by cognitive theories of motivation, such as intrinsic motivation or Self-Determination Theory [27] and Expectancy-Value Theory [9]. It includes the factors that drive a student's behavior during

a task, such as perceived value, enjoyment, difficulty, and effort [28], along with internal variables such as learning expectations and emotional state [29].

Several researchers have made seminal contributions showing that Self-Determination Theory, a well-established theory of human motivation and well-being, suggests four primary subtypes of extrinsic motivation and identifies three universal needs—autonomy, competence, and relatedness—that aid in the motivational progression from extrinsic to intrinsic motivation [27,30]. On the other hand, the expectancy-value theory maintains that individuals' actions are influenced by their belief in their ability to succeed and the value they assign to a task or activity [9]. Having this in mind, this theory explains how beliefs and values shape one's motivation to undertake a task, making it integral to understanding task motivation [9].

Considerable research underpins the significant influence of task motivation on learner performance, engagement, and learning outcomes [31–34]. Features related to task content, topic interest, personalized content, and relevance to life experiences have all been found to boost task motivation and, consequently, learner engagement [29,35]. Furthermore, prior research indicates that students' task values and expectations, essential aspects of the expectancy-value theory, can predict motivation and academic performance across various domains [36].

2.3. Research Rationale and Goals

Despite the acknowledged significance of motivation in the classroom [3,37–39], limited research has been conducted to address students' motivation in the generative AI context. Existing studies have primarily focused on students' motivation at various school levels and in different technological contexts. For instance, Daher [38] examined middle school students' motivation when engaging in modeling activities with technology, while Daher [3] investigated students' motivation to learn mathematics in a robotics environment. In light of the foregoing, the present research aims to investigate students' motivation to learn in generative AI contexts, thereby contributing to understanding higher education students' task motivation within this particular domain.

This understanding will assist instructors in making informed decisions regarding incorporating generative AI contexts in education, particularly in higher education. Under those circumstances, the primary objective of the research is to conduct an in-depth investigation into the task motivation of higher education students within the specific context of ChatGPT. This study explores students' unique task motivation characteristics when utilizing ChatGPT for assignment completion. Additionally, it aims to examine the impact of ChatGPT on students' sense of autonomy, competence, and relatedness in task completion. Moreover, this study will delve into students' expectations and values associated with using ChatGPT for task completion. By the same token, this research aims to provide valuable insights for educators and developers, guiding the effective integration of ChatGPT in educational environments while considering students' perspectives and needs. By successfully achieving these objectives, this research will contribute to the existing knowledge on integrating AI technologies into education and offer practical recommendations for implementing ChatGPT in educational settings.

3. Methodology

This study is characterized by a qualitative content analysis motivated by a literature review. It examines the stimulus materials from previous ChatGPT studies, coding formal features and content observed therein using thematic analysis [40,41]. This study also bolsters observations and inferences with the results of the primary literature, as opposed to aggregating effect sizes, as would a quantitative meta-analysis.

3.1. Research Context and Participants

This study's interview analysis aims to explore higher education students' motivation for incorporating ChatGPT (Here ChatGPT 3.5) into their university assignments. Examples

of tasks given to ChatGPT by the students to suggest a solution to or to help in the solution are below, where generally these were tasks that the students were requested to discuss in the frame of reading an article in one of the courses:

- Can you please summarize the following text?
- Can you please reformulate the following text so that it is related to topic A?
- Can you please suggest a model for implementing strategy A?
- What relations do you suggest between the learning strategy A and the theoretical framework B?
- What is the difference between strategy A and strategy B?
- Can you suggest a lesson plan for integrating digital simulations in primary school?
- How can you convince a teacher to use digital simulations in secondary school?

Fifteen graduate students with at least a semester's experience in using ChatGPT for assignment completion were chosen for their extensive experience with educational chatbots. A description of the participants can be found in Table 1; the participants' names that appear in the table are nicknames. The collected interviews were analyzed using thematic analysis, a well-established method for analyzing textual material [42,43].

Table 1. Description of the Interviewees.

Participant	Gender	Ages
Ahmed	Male	39
Ali	Male	45
Narmeen	Female	35
Nada	Female	30
Laila	Female	40
Salma	Female	43
Mohammad	Male	36
Omar	Male	40
Abeer	Female	28
Huda	Female	27
Nader	Male	50
Abed	Male	39
Rula	Female	31
Malik	Male	34
Majed	Male	56

3.2. Data Collection Tools and Procedures

Given the need for a detailed analysis of the phenomena, semi-structured individual interviews were utilized to comprehend the factors influencing task motivation in the context of using ChatGPT. The interviews, designed by referencing existing literature on task motivation, specifically Guo et al.'s theoretical framework [4], aimed to identify critical aspects such as task enjoyment, reported effort, result assessment, perceived value, and interaction when using ChatGPT. Additionally, open-ended questions (see some questions below) encouraged in-depth responses without constraining exploration. Interviews, conducted via video call platforms such as Google Meet or Zoom, lasted 30 to 40 min and were transcribed verbatim. Follow-up questions solicited clarifications, delving into 'Why?', 'How?', 'Explain?' and 'Give an example.' scenarios. For instance, participants were asked about their experience with ChatGPT, task-solving strategy, and their comparison of ChatGPT-assisted tasks with traditional tasks. The questions asked during the interview are detailed below:

- Describe your personal experience about using ChatGPT.
- Do you prefer using the ChatGPT tool while solving tasks? Why?
- What steps do you take during the solving of your task using ChatGPT?
- Describe your feelings while using ChatGPT. Give please an example.

- Explain the difficulties you faced while solving tasks through ChatGPT. How did you overcome these difficulties?
- What effort do you put into solving your task using ChatGPT? Give please an example.
- If you were asked to evaluate the solution you arrived at using ChatGPT, how would you rate your work compared to your colleagues? And why?
- How would you describe the benefits of using ChatGPT to solve your tasks?
- Do you want to add any information that you think is important and was not covered in the previous questions?

The data was analyzed using Clarke and Braun's thematic analysis [42], with coding conducted by two primary coders and a third acting as a tiebreaker to resolve disagreements.

3.3. Data Analysis Method

In this study, the researchers employed Thematic Analysis [42] to decipher participants' experiences with ChatGPT. This six-step process started with repeated data readings for thorough comprehension, then mapping initial codes onto meaningful units within the data. Next, relationships and recurring patterns among codes were identified to extract themes, which were subsequently reviewed, refined, and assigned descriptive names. Finally, a comprehensive report was generated, encapsulating identified themes and supporting quotes. It is worth mentioning that the researchers used categories instead of themes in this study.

This method ensured structured and rigorous qualitative data analysis, combining inductive and deductive techniques to enhance research reliability and validity. The inductive process derived categories directly from coded data, ensuring their relevance to the original data. On the other hand, deductive analysis utilizes predefined theories to develop categories. This deductive analysis drew on Guo et al.'s [4] task motivation categories (task enjoyment, reported effort, result assessment, and perceived relevance). The software MAXQDA 2020 aided this study's coding process, where its function was a matter of facilitation, including the facilitation of finding the frequencies of the subcategories. Following interviews, initial codes were assigned to emerging concepts shaping sub-categories. Ultimately, 14 sub-categories of task motivation were extracted and reclassified, according to Guo et al.'s [4] task motivation framework, into five categories, where the authors agreed on the reclassification as meeting the mentioned theoretical framework.

The data analysis involved two coding cycles, as per Saldana [44], starting with interview transcription, followed by in vivo coding, line-by-line, and incident-by-incident, using MAXQDA 2020 and a developed codebook. The second cycle involved theoretical coding, including association, categorization, and classification. This study's analysis unit is the "theme", which encapsulates data meaning via phrases or sentences.

Table 2 describes the categories, sub-categories, and codes that served in finding the categories relevant to the present research. The categories and sub-categories were based on Guo et al.'s [4] task motivation theoretical framework, while the codes were arrived at inductively during the constant comparison done through reading and re-reading the interview text.

Table 2. Categories, Sub-categories and codes used in the present research.

Category	Sub-Categories	Codes
Task Enjoyment	Enjoyment	Enjoy, Like, Happy, Excited, Interested
	Curiosity	Desire for knowledge, Curiosity about ChatGPT, Curiosity stimuli.
	Anxiety	Anxious, Distrust, Apprehension, Incorrect Information.
	Satisfaction	Satisfied, Feeling good, Feeling relieved, Feeling confidence.

Table 2. *Cont.*

Category	Sub-Categories	Codes
Reported Effort	Effort/Comfortable	Not tired, Not stressful, Simple, Easy to use, Saves effort.
	Effort/Fatigue	Overthinking, Checking information frequently, effort to verify information.
	Concentration	Maintain focus, keep attention, high concentration.
	Time/Spend Time	Time consuming, lose time.
	Time/Save Time	I do not feel the time, saves time, achievement in a short time.
Result Assessment	Self-Assessment	Self-evaluation, Self-performance critique, Reflecting self-perception of progress, Achievement, Self-rating.
	Judgement	Decision making, Judging the validity of information.
	Verification of Information	Information check, Compare information, and search for other sources.
	Locus of Control	Performance control during the task, Self-control while dealing with ChatGPT
Perceived Relevance	Usefulness/Value	Many tasks can be accomplished through ChatGPT, ChatGPT advantages.
	Usefulness/Useless	ChatGPT disadvantages: Frequent errors, Inaccurate information, Not useful.
	Self-Goals	Goal setting, self-goal determination, self-goal tracking.
Interaction	Feedback	ChatGPT feedback, User feedback, Revision, Response evaluation, Feedback exchange, and Immediate feedback.
	Conversation	Dialogue Interaction, ChatGPT conversation, Conversation flow.

3.4. Validity and Trustworthiness of the Analysis Method

3.4.1. Saturation

The saturation point of the sample size was determined through purposeful sampling in three levels. The first level was achieved by choosing students of a high education level. The second level was achieved by adjusting the samples based on gender differences and age. The third level was achieved by conducting and analyzing the interviews until no new code emerged. Table 3 presents that the saturation was achieved after the 10th interview. These results of saturation indicated that no further interviews were needed [45,46]. Despite these results, we further analyzed the rest of the interviews (five in number) to verify that no new codes emerged. This analysis showed that neither new codes nor new properties of a code showed.

Table 3. The Results of the Theoretical Saturation Measurement for students' task Motivation using ChatGPT Dimensions (x means that the category was mentioned in the interview).

Categories	Interviews														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Enjoyment			x		x	x	x	x	x	x	x	x	x	x	x
Curiosity					x			x	x	x	x	x	x		x
Satisfaction	x	x				x	x	x	x	x	x	x	x	x	x
Anxiety								x	x		x	x	x		x
Concentration		x				x	x			x	x		x	x	x
Effort	x	x		x	x	x	x	x	x	x	x	x	x	x	x

Table 3. *Cont.*

Categories	Interviews														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Time	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Verification of Information		x	x		x	x			x	x	x		x	x	x
Judgement									x	x	x		x		
Self-Assessment	x	x		x	x				x		x		x	x	x
Locus of Control		x			x			x	x	x	x	x	x	x	x
Usefulness	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Self-Goals	x	x		x		x	x	x	x	x	x	x	x	x	x
Feedback									x		x		x	x	x
Conversation			x		x		x	x	x		x	x	x	x	x
New codes in each interview	6	3	2	0	1	0	0	1	2	0	0	0	0	0	0

3.4.2. Trustworthiness

In order to establish trustworthiness in the current research, the criteria proposed by Lincoln and Guba [46] were employed, comprising Credibility, Conformability, Dependability, Transferability, and the recently introduced component of Authenticity. Credibility, an indicator of trust in the accuracy of the findings, was achieved by the precise identification and description of the research participants [47]. Conformability, representing the degree to which research findings can be independently verified [48], was established through clear delineation of the participant sample characteristics, as shown in Table 1. Dependability, reflecting data stability over time and in varying conditions, was demonstrated by the logical sequence of research steps and data collection [49]. Transferability, concerning the adaptability of findings to diverse settings and contexts [47], was ensured through comprehensive descriptions of the context, selection process, participant characteristics, and data analysis method. Authenticity, which signifies the fair and honest presentation of facts [50], was achieved through participant data verification and using the Holsti equation to calculate coder agreement, achieving a ratio of 0.93 [51]. Furthermore, the trustworthiness was enhanced through triangulation [47], which involved using two coding methods (deductive and inductive) and multiple encoding techniques such as in vivo coding, descriptive coding, and analytical coding.

4. Results

The analysis of interviews conducted in this study to examine the effectiveness of Artificial Intelligence (AI) on students' task motivation revealed five main categories: Task Enjoyment, Reported Effort, Result Assessment, Perceived Relevance, and Interaction. Each category consisted of two to four sub-categories and each sub-category further branched out into some codes.

Based on the methodology used in this study, including procedures, data analysis, and ethical considerations, this study's results addressed the research question: "How does the interaction with ChatGPT as an AI-driven tool impact the dimensions of Task Motivation?". Five categories and fourteen sub-categories were identified to identify the factors affecting students' task motivation while using ChatGPT, each of which is described below. The analysis results using MAXQDA 2022 for categories and sub-categories among factors affecting students' task motivation are given in Table 4.

Table 4. Frequencies of categories, sub-categories and codes used in the present research.

Subject	Frequency	Categories	Frequency	Sub-Categories	Frequency
Students' task motivation using ChatGPT	145	Task Enjoyment	37	Enjoyment	12
				Curiosity	8
				Satisfaction	11
				Anxiety	6
		Reported Effort	35	Concentration	8
				Effort	13
				Time	14
		Result Assessment	32	Verification of Info.	10
				Judgement	4
				Self-Assessment	8
				Locus of Control	10
		Perceived Relevance	26	Usefulness	14
				Self-Goals	12
		Interaction	15	Feedback	5
				Conversation	10

According to Table 4, the frequencies of students' responses during the interviews primarily described how chatbots impact their task motivation. The primary focus was on Task Enjoyment, accounting for (26%) of the total coding for the different categories. This was followed by Reported Effort (24%), Result Assessment (22%), Perceived Relevance (18%), and finally Interaction (10%). Below, the researchers provide a detailed breakdown of each category, including sub-categories derived from them.

Task motivation: The task motivation category consisted of 4 sub-categories:

Enjoyment, Satisfaction, Curiosity, and Anxiety.

Enjoyment:

The impact of ChatGPT utilization on task completion, as illustrated through students' responses, was evident. Notably, students did not feel the passage of time during task execution due to the high engagement and enjoyment of the chat system. One participant, Ahmed, elaborated on his experience by stating, "I lose track of time when I start interacting with ChatGPT. In other words, I feel content, comfortable, entertained, and excited." In a different context, Salma described her experience as enjoyable due to the chat system's ability to accommodate all her requests. She compared it to a magic lamp, expressing, "It was an extremely enjoyable experience. I felt at ease; indeed, it facilitated everything. I could describe it as Aladdin's lamp." The chat system, hence, transformed the learning experience, making it engaging and enjoyable for students.

Satisfaction:

The accomplishment of tasks through ChatGPT instilled a sense of internal satisfaction among students about their task completion and enhanced their confidence in the completed tasks. As Ali noted, "I have become capable of obtaining abundant and accurate information. I feel a greater self-confidence because I have been able to acquire more knowledge. I have developed satisfaction with the tasks I present because they have become of higher quality." Therefore, the use of ChatGPT in task completion has not only increased students' confidence but also improved the quality of their work.

Curiosity:

One factor that has enhanced the students' enjoyment is the curiosity that emerged during task resolution using ChatGPT. They sought more information to satisfy the curiosity prompted by the ChatGPT system's capabilities to expand knowledge. For instance, Rula

mentioned, "When I input a question or inquiry into ChatGPT and await the response, I feel curious about how the answer will be and how useful it will be. This curiosity propelled me to ask it more and more. I felt that it was enriching and bolstering my knowledge." It can be understood that ChatGPT has successfully stimulated curiosity among students, which, in turn, drives them to seek additional information and deepen their understanding.

Anxiety:

Despite satisfaction with tasks completed using ChatGPT, feelings of anxiety prevailed among other students. These concerns were attributed to several reasons, including a lack of complete trust in the program's information and fear that the task would be labeled as "cheating". Narmeen expressed, "Despite all the enjoyment I feel when using ChatGPT, I also harbor a feeling of anxiety resulting from not fully trusting the information the ChatGPT provides me with." Abed shared similar sentiments, noting, "I worry that my grade might be affected, and that the instructor might think I am cheating, and as a result, I would get a low score.". At the same time, the chat system was found to be helpful and engaging. It also raised concerns about the credibility of the information provided and the potential impact on academic integrity.

Reported Effort: The reported effort category consisted of 3 sub-categories:

Time, Effort, and Concentration

Time:

Students believed that task resolution using ChatGPT saved them considerable time compared to the long hours they used to spend solving tasks traditionally and searching for specific information to assist in those tasks. In this regard, Nader remarked, "The greatest benefit I got from the ChatGPT program is that it leads me directly to the answer, along with references and documentation. I no longer need to visit numerous pages and lose hours of my time until I find an answer." However, some students have argued that using ChatGPT consumes more of their time in task completion, though in a positive light. Laila shared, "Although ChatGPT facilitates access to information quickly, sometimes the program's vast amount of information distracts me. As a result, I have to read more and more to formulate the appropriate ideas needed to solve the task." This indicates that while the chat system aids in time-efficient problem-solving, its extensive information could also necessitate additional reading and processing time.

Effort:

The majority of students opined that ChatGPT spared them the effort involved in research to complete tasks. As Ahmed put it, "There is not much effort expended; the program is fast, provides all comforts, and does not require the student to spend much time answering any question". However, a small group of students felt that the process of thinking, comparing, and scrutinizing the answers provided by ChatGPT caused them fatigue and stress. Huda said, "I exert effort in verifying the information it gives me, whether it's correct and reliable". Thus, while the ChatGPT system expedites task completion, it also prompts a minority of students to invest effort in cross-checking the provided information for accuracy and dependability.

Concentration:

Some students believed that using ChatGPT for task resolution requires high concentration and attentiveness, primarily due to their lack of complete trust in its information. Abed stated, "It also requires high focus to interact with ChatGPT, understand the provided answers, and ensure they meet the needs of the assigned task." This viewpoint emphasizes that, despite the utility of ChatGPT, certain students still need rigorous engagement and scrutiny in their interactions with it.

Result Assessment: The result assessment category consisted of 4 sub-categories:

Verification of Information, Locus of Control, Self-Assessment, and Judgement.

Verification of Information:

The use of ChatGPT in task resolution bolstered the effectiveness of verifying the validity of the information provided by comparing it with other sources in record time.

The program offers the possibility of supplying the answer and its reference, allowing the student to examine and confirm it. Salma states, "The beauty of the ChatGPT program is that it provides me with the source along with the answer if I request it. Therefore, I can judge the answer and confirm its accuracy, which I always do when using it to solve any task." This demonstrates that the ChatGPT system plays a crucial role in providing information and ensuring its Authenticity by providing source references.

Locus of Control:

Contrary to the specific guidance offered by traditional programs, the ChatGPT program, according to students, offered high flexibility in its use, allowing them to control its direction in searching for the information they want, reject any inappropriate information, or request more information for expansion, within the vision imposed by the student. Omar says, "Certainly, my confidence increased significantly when I mastered using ChatGPT in a way where I was the absolute controller of the program, without it controlling or restricting me with the answer. I directed it in a way that provides information correctly and meets my requests. For example, sometimes the answer was lengthy, so I asked for an answer within a line or paragraph. Another example is when it gave me wrong answers. I directed it to give me what I wanted by modifying the way of the request or the phrasing of the question, and so on. Indeed, I felt a sense of complete control." This demonstrates the interactive nature of the ChatGPT system, which empowers students to guide and refine its responses, ultimately increasing their confidence in the information it provides.

Self-Assessment:

ChatGPT, according to students, enhanced their self-evaluation skills by giving them access to a vast amount of information in record time. The program assists them in determining whether their response is on the right track. For instance, Malik says, "ChatGPT has improved my self-evaluation skills and my task performance level". Similarly, Ali mentions, "The quality of my tasks has significantly and noticeably improved because the knowledge at my disposal is deep, precise, and extracted from the best cognitive references. Therefore, my evaluation of the tasks I present has become excellent." These testimonials underscore the program's role in bolstering students' abilities to self-assess, leading to quality outputs in their tasks.

Judgement:

Students described how ChatGPT cultivates higher-order thinking skills. The necessity to scrutinize the program's provided answers and judge their validity each time fosters the development of these skills. For instance, Mohammed says, "I have developed a strong ability to make decisions after using ChatGPT several times. This skill has been fostered through my constant research into the validity of the information provided by the program and the ability to determine whether to rely on this information for the task." This perspective suggests that ChatGPT, through its interactive process, fosters students' critical thinking and decision-making skills. By constantly assessing and scrutinizing the information provided, students strengthen their ability to discern, evaluate, and make informed decisions, all crucial components of higher-order thinking.

Perceived Relevance: The reported effort category consisted of 2 sub-categories:

Usefulness and Self-Goals.

Usefulness:

Most students perceived the ChatGPT program as highly effective and valuable as it augments solutions to their task completion weaknesses. Among the most prominent problems the program has helped solve are good phrasing, translation, summarizing, and generating creative ideas. This has made the overall learning process valuable and beneficial for students. As Nada puts it, "After using ChatGPT, I feel I possess a treasure trove given the vast, beneficial, and highly valuable possibilities it provides, such as assisting me in generating new ideas, summarizing paragraphs, paraphrasing, and much more. I feel a greater sense of value in the learning process."

Conversely, other students see several downsides to using ChatGPT. The most prominent of these was its unreliability, as it sometimes provided incorrect information, the

potential for fostering dependency and indolence in students and negating their writing style. As Abeer says, "The results I obtain are not always accurate or what's needed." Mohammed adds, "Despite Chat's data being reliable as claimed by the program's developers, if I were to rely on it completely, I would negate my personal feelings and language as a researcher and lose my personal touch in any answer I write." In summary, while the ChatGPT has been largely beneficial to students, addressing their areas of weakness in task completion, it is not without its shortcomings. The concerns about its reliability and potential to foster dependency highlight the need for students to balance such tools with their critical thinking and individual writing style.

Self-Goals:

ChatGPT played a commendable role in achieving personal ancillary objectives for students beyond just assisting them in task completion. Skills such as summarizing, translating, and paraphrasing were fortified as described by the students. Omar states, "ChatGPT doesn't merely aid me in solving tasks. It also enhances other skills such as correctly phrasing sentences and summarising an answer in a paragraph or a line." This alludes to the multifaceted utility of ChatGPT, illustrating that its use extends beyond task completion, facilitating the development of ancillary skills essential to academic progression.

Interaction: The reported effort category consisted of 2 sub-categories:

Conversation and Feedback.

Conversation:

The use of conversational interaction with a chatbot through ChatGPT provided students with a sense that they were engaging with a real person who was sharing thoughts and discussions about key concepts needed to complete tasks. Narmeen comments, "It was a wonderful feeling as if I was conversing with a real person, discussing methods of task completion. It shared ideas with me and proposed new thoughts I had not previously considered." This sentiment underscores the sophistication of chatbots driven by artificial intelligence, which successfully simulate a human-like interaction, thus enhancing the student's learning experience by generating an engaging, collaborative, and intellectually stimulating environment.

Feedback:

The conversations with ChatGPT were punctuated by immediate feedback regarding the questions and information the students sought. Nader's statement encapsulated this instantaneous communication: "It provides immediate comments and feedback on the questions I pose. I can also comment on and evaluate its responses, and it responds with justifications as to why it answered that way. It was indeed a very wonderful experience!" This highlights the two-way communication facilitated by ChatGPT, fostering a dynamic and engaging learning environment that supplies answers and prompts students to think critically about the information they are given, reinforcing the learning process through immediate and interactive feedback.

5. Discussion

The primary objective of this study was to explore how the employment of ChatGPT, a product of artificial intelligence, impacts students' task motivation. The theoretical frameworks of Self-Determination Theory [8] and Expectancy-Value Theory [9] guided this analysis. A comprehensive review of prior research was conducted to achieve this, followed by qualitative data collection through semi-structured interviews with 15 students. The subsequent findings were organized and analyzed into two distinct groups: sub-categories and categories. This, in turn, allowed for formulating a comprehensive model encompassing various dimensions of task motivation in response to the posed research question. Based on the frequencies generated through the MAXQDA 2020 program, several conclusions regarding the findings were drawn. This study demonstrated that the application of ChatGPT significantly influenced students' task motivation across the following categories

(in descending order of frequency as detailed in Table 4): task enjoyment, reported effort, result assessment, perceived relevance, and interaction.

Task Enjoyment:

The first category identified in this study, "Task Enjoyment", saw the highest frequencies. Participant responses suggest that ChatGPT increases their enjoyment, enhancing their motivation to complete tasks and assignments. This finding is supported by Zhou & Li [7], who noted that ChatGPT had been demonstrated as a beneficial supplemental learning tool for college students, fulfilling three basic needs, autonomy, competence, and interpersonal relationships. These factors directly influence students' interest and enjoyment, subsequently impacting their learning motivation. The second sub-category, "Satisfaction", emerged within the task enjoyment category. Coupled with this study's theoretical framework, which underscores intrinsic satisfaction as a crucial necessity, this satisfaction leads to self-motivation and effective functioning per the Self-Determination Theory [8]. Participants conveyed their satisfaction with using ChatGPT for task resolution using phrases such as "satisfied", "feeling good", "feeling relieved", and "feeling confident". This result is corroborated by several studies suggesting that chatbots can enhance learning and student satisfaction [4,17,52]. "Curiosity" emerged as the third sub-category, enhancing participant enjoyment when interacting with ChatGPT, spurring them to explore broader domains, and boosting task motivation. Students are drawn to intriguing, related concepts presented by the chatbot, sparking curiosity [53]. The final sub-category culled from participant responses pertains to the negative consequences of using ChatGPT to solve tasks, primarily anxiety due to potential misinformation provided by ChatGPT. Participants expressed their anxiety through phrases such as "anxiety", "distrust", "apprehension", and "incorrect information". This outcome is supported by Talan & Kalinkara [54], who noted that ChatGPT's responses might not always be accurate. Conversely, some participants highlighted a positive aspect of the "anxiety" sub-category, stating that ChatGPT usage could decrease task-related anxiety, a result supported by several studies [5,55]. This finding can be interpreted in light of educational psychology theories on task motivation; Boekaerts [56] emphasizes that task completion expenses, often described as student anxiety levels during task execution, are critical to task motivation.

Reported Effort:

A reported effort, defined as the amount of effort participants disclose investing in a task, is an index of self-reported motivation and task engagement [31]. This category produced three sub-categories: time, effort, and concentration. The primary sub-category, "Time", indicates that interaction with chatbot applications can sustain user engagement over extended periods [13]. This finding is corroborated by the current study, revealing that participants perceive their time investment as a positive factor contributing to the reported effort in two aspects: "Saving Time" and "Spending Time". Most participants noted that using ChatGPT for task resolution saved them time.

Conversely, a minority indicated that the time spent using ChatGPT positively impacted their task completion. This aligns with Kooli's [57] findings that ChatGPT allows users to consume and save time on tasks demanding high interpretative and analytical skills courtesy of primary data collection and formatting capabilities that typically require significant search time. A systematic review by Xia et al. [58] further demonstrated that educators could save numerous hours through AI technologies. Numerous studies have established that the novelty of chatbots can enhance student motivation and interest [59]. However, this effect may diminish over prolonged usage. The present study did not capture this dynamic, featuring participant usage of ChatGPT spanning 3 to 6 months. The second major sub-category, "Effort", pertains to task resolution through ChatGPT. Earle et al. [32] found a correlation between task load and increased fatigue and effort, with task motivation affecting task performance. Interviewees emphasized that ChatGPT saved their effort in searching for information necessary for task completion. This result supports findings from [4,5,31–33], suggesting that AI chatbot tools can enhance effort and reduce extraneous

cognitive load in task accomplishment. In line with the Expectancy-Value Theory [28], this outcome associates effort with task value, specifically as an indicator of cost, pointing to the task engagement's negative facets. The final sub-category, "Concentration", was evident in participant responses, characterized by indicators such as "maintaining focus", "keeping attention", and "high concentration". This interpretation finds support in prior research. For instance, Guo et al. [4] stressed that introducing chatbots in the classroom could increase student concentration and effort, promoting the construction of arguments with diverse ideas and substantial evidence. Safdari [33] also suggested that self-regulation, a task motivation contributor, could boost concentration and engagement.

Result Assessment:

The third category identified in the current study is "Result Assessment", sub-divided into information verification, locus of control, self-assessment, and judgment. "Information Verification" constitutes the first sub-category, emphasizing the necessity of evaluating available information against various resources to ascertain its accuracy. This was echoed in participants' descriptions of their experiences with information verification using ChatGPT. Corroborating this finding, Kooli [57] highlighted that researchers might harbor skepticism towards chatbot-generated results, thus underlining the importance of critical evaluation and verification of chatbot-provided information. The second sub-category, "Locus of Control", underscores participants' ability to control the flow of information. This finding aligns with Degachi et al.'s study [60], advocating increased user control in learning systems as a best practice for developing artificial intelligence through ChatGPT. "Self-Assessment" forms the third sub-category. The current study found that students engaged in self-assessment practices after completing tasks using ChatGPT. Mendoza et al. [61] support this result by showing that self-evaluation is a behavioral mechanism linking motivation and levels of achievement. Finally, "Judgment" emerges as the last sub-category. The results underscore participants' need to master critical thinking skills to facilitate judgment. Kooli [57] proposed that chatbot-generated results often necessitate human interpretation and evaluation to impart meaningful and actionable insights.

Perceived Relevance:

The current study identified "Perceived Relevance" as a critical category for strong task motivation, leading students to regard a task as pertinent, beneficial, and necessary [33]. Participants found their interactions with ChatGPT highly motivating and engaging due to the relevance and meaningfulness of the content. The results delineate two primary sub-categories within the perceived relevance category: "Usefulness" and "Self-Goals". Indicators of usefulness refer to the specificity, relevance of information, and assistance provided by ChatGPT. Most responses concentrated on these aspects of usefulness, corroborated by several studies [5,33,52,62]. However, some participants faced challenges with ChatGPT, such as inaccurate answers and inconsistent responses to the same subject, supported by findings from [10,62,63]. The second sub-category, "Self-Goals", emerged from the results and aligned with the Self-Determination Theory (SDT) principles. According to SDT, identified regulation represents the most self-determined form of extrinsic motivation, encompassing the personal values and goals learners associate with the task outcome [8]. This study's findings suggest that ChatGPT's implementation in education has the potential to elucidate participants' learning goals and focus. Corresponding to these results, ChatGPT could suggest learning paths based on an individual's self-goals and interests, such as facilitating mastery of a programming language by providing instructions on necessary learning requirements, resources, and steps. This approach could enrich students' learning experiences and assist in achieving their goals [64].

Interaction:

The category "Interaction", as identified in the current study, comprises two sub-categories: "Conversation" and "Feedback". According to the findings, ChatGPT promptly delivers feedback to students, a characteristic also highlighted in Huang et al.'s research [52],

which suggested that utilizing chatbots in language learning could enhance feedback provision, stimulating student interest, participation, and satisfaction. The report by Sabzalieva and Valenini [21] further corroborates this by demonstrating that ChatGPT can offer personalized feedback to students derived from information supplied by students or teachers, potentially heightening their learning motivation. The second sub-category, "Conversation", reveals participants' heightened interest and motivation to use applications such as ChatGPT due to their dialogic interaction, simulating a conversational partner during task completion. This finding aligns with the study by Wu & Yu [5], emphasizing the appeal of such applications in replicating human-like conversations. As documented in various studies, the focus on conversational or social chatbots confirms that they are primarily designed to maintain high-quality conversations with humans or establish certain relationships [13].

6. Conclusions, Limitations, and Recommendations

6.1. Conclusions

This study provides initial insights into the various dimensions of task motivation associated with using ChatGPT in higher education. The research results revealed that the implementation of ChatGPT positively impacted students' task motivation in five core categories: task enjoyment, reported effort, result assessment, perceived relevance, and interaction. Task enjoyment emerged as the category with the highest frequency, demonstrating that ChatGPT enhances learners' enjoyment, satisfaction, and curiosity, thus improving their task motivation. However, it also unveiled an element of anxiety associated with incorrect information provided by the tool. The reported effort category highlighted that ChatGPT facilitates concentration and saves time and effort in task completion. In the result assessment category, it became evident that students valued the ability to verify information, control the information flow, conduct self-assessment, and exercise judgment. The category of perceived relevance underscored the importance of meaningful, useful tasks aligned with self-goals, thereby fostering motivation among students. Lastly, the interaction category demonstrated the tool's ability to provide immediate feedback and promote engagement through conversational interaction. Despite this study's significant findings, it also underlined potential challenges, including the inaccuracy of some responses provided by ChatGPT and the need for critical evaluation of its outputs. Nonetheless, the results support that ChatGPT can be a potent tool for enhancing task motivation among higher education students.

6.2. Limitations

While the research presents encouraging findings on the influence of ChatGPT on student motivation, it also recognizes several constraints. Firstly, it must be remembered that motivation is a complex phenomenon, significantly affected by the surrounding environment, such as family, school, or community. Thus, the indispensable role of a teacher in nurturing a positive attitude towards tasks cannot be understated. Secondly, the impact of contextual factors such as subject area and education level on the efficacy of ChatGPT in bolstering task motivation has little been scrutinized. Comprehending how contextual factors interact with ChatGPT usage can furnish vital insights for devising efficient interventions. Thirdly, this study's findings are derived from a specific set of higher education students experienced in utilizing ChatGPT for assignment completion, limiting the results' generalizability to other populations or educational scenarios. Fourthly, this study was designed to capture students' immediate perceptions and experiences using ChatGPT, leaving the long-term effects and shifts in perceptions over time unaddressed.

Moreover, influencing factors such as task type, previous experience with ChatGPT, and individual approach were not investigated in the present research. Future research, especially quantitative research should study the influence of these aspects on students' motivation to work with generative AIs.

In addition to the above, the present research included 15 participants, and future research is needed to verify the results of the present research with other samples and populations.

6.3. Recommendations

Building upon this study's findings, several recommendations are proposed for augmenting the integration of ChatGPT in higher education. Firstly, educators should offer explicit guidelines and instructions to students on using ChatGPT for task completion. These guidelines can be written in a booklet. In addition, students should be referred to videos that explain the advantages and disadvantages of using generative AI in task solving in higher education.

Secondly, students should be urged to engage in self-assessment and reflection post-ChatGPT usage to enhance their learning experience. This self-evaluation can encompass reviewing the generated responses' quality, contemplating the information's relevance, and identifying areas that require further improvement. The students should also refer to the literature that describes the quality of generative AI's answers for problems in the various disciplines.

Moreover, attention must be given to improving the accuracy of responses generated by ChatGPT and amplifying its capacity to verify information. In terms of future research directions, a more holistic methodology employing a mix of qualitative and quantitative approaches is recommended to study students' motivation to learn with chatbots. Other affective and psychological variables can also be studied regarding students' learning in the context of chatbots. This would pave the way for a deeper, more comprehensive exploration of the yet untouched areas of chatbot application within the educational domain.

Today, several bots are present in the educational context. Higher education workshops should be held in the universities for their students, where these workshops discuss the potentialities of the different bots and how to blend them for problem-solving tasks. The ethical issue should be part of these workshops in order for the students to assess the ethical aspects of their work with generative AIs. Previous research has proved the efficacy of higher education workshops in developing the participant's implementation of digital tools [65,66], which points to the need for such workshops in the case of using generative AI tools.

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References

1. Yang, W. Artificial intelligence education for young children: Why, what, and how in curriculum design and implementation. *Comput. Educ. Artif. Intell.* **2022**, *3*, 100061. [CrossRef]
2. Cooper, G. Examining Science Education in ChatGPT: An Exploratory Study of Generative Artificial Intelligence. *J. Sci. Educ. Technol.* **2023**, *32*, 444–452. [CrossRef]
3. Daher, W. Students' Motivation to Learn Mathematics in the Robotics Environment. *Comput. Sch.* **2022**, *39*, 230–251. [CrossRef]
4. Guo, K.; Zhong, Y.; Li, D.; Chu, S.K.W. Effects of chatbot-assisted in-class debates on students' argumentation skills and task motivation. *Comput. Educ.* **2023**, *203*, 104862. [CrossRef]
5. Wu, R.; Yu, Z. Do AI chatbots improve students' learning outcomes? Evidence from a meta-analysis. *Br. J. Educ. Technol.* **2023**, 1–24. [CrossRef]

6. Yilmaz, R.; Karaoglan Yilmaz, F.G. The effect of generative artificial intelligence (AI)-based tool use on students' computational thinking skills, programming self-efficacy and motivation. *Comput. Educ. Artif. Intell.* **2023**, *4*, 100147. [CrossRef]
7. Zhou, L.; Li, J. The Impact of ChatGPT on Learning Motivation: A Study Based on Self-Determination Theory. *Educ. Sci. Manag.* **2023**, *1*, 19–29. [CrossRef]
8. Ryan, R.M.; Deci, E.L. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am. Psychol.* **2000**, *55*, 68–78. [CrossRef]
9. Wigfield, A.; Eccles, J.S. Expectancy–Value Theory of Achievement Motivation. *Contemp. Educ. Psychol.* **2000**, *25*, 68–81. [CrossRef]
10. Chen, X.; Zhai, X.; Zhu, Y.; Li, Y. Exploring debaters and audiences' depth of critical thinking and its relationship with their participation in debate activities. *Think. Ski. Creat.* **2022**, *44*, 101035. [CrossRef]
11. Feng, S.; Law, N. Mapping artificial intelligence in education research: A network-based keyword analysis. *Int. J. Artif. Intell. Educ.* **2021**, *31*, 277–303. [CrossRef]
12. Graesser, A.C.; VanLehn, K.; Rose, C.P.; Jordan, P.W.; Harter, D. Intelligent tutoring systems with conversational dialogue. *AI Mag.* **2001**, *22*, 39. [CrossRef]
13. Rapp, A.; Curti, L.; Boldi, A. The human side of human-chatbot interaction: A systematic literature review of ten years of research on text-based chatbots. *Int. J. Hum.-Comput. Stud.* **2021**, *151*, 102630. [CrossRef]
14. Smutny, P.; Schreiberova, P. Chatbots for learning: A review of educational chatbots for the Facebook messenger. *Comput. Educ.* **2020**, *151*, 103862. [CrossRef]
15. Zhang, R.; Zou, D.; Cheng, G. Chatbot-based training on logical fallacy in EFL argumentative writing. *Innov. Lang. Learn. Teach.* **2023**, *17*, 932–945. [CrossRef]
16. Lameras, P.; Arnab, S. Power to the Teachers: An Exploratory Review on Artificial Intelligence in Education. *Information* **2022**, *13*, 14. [CrossRef]
17. Raschka, S.; Patterson, J.; Nolet, C. Machine Learning in Python: Main Developments and Technology Trends in Data Science, Machine Learning, and Artificial Intelligence. *Information* **2020**, *11*, 193. [CrossRef]
18. How, M.-L.; Cheah, S.-M.; Chan, Y.-J.; Khor, A.C.; Say, E.M.P. Artificial Intelligence-Enhanced Decision Support for Informing Global Sustainable Development: A Human-Centric AI-Thinking Approach. *Information* **2020**, *11*, 39. [CrossRef]
19. Daher, W.; Diab, H.; Rayan, A. Artificial Intelligence Generative Tools and Conceptual Knowledge in Problem Solving in Chemistry. *Information* **2023**, *14*, 409. [CrossRef]
20. Rudolph, J.; Tan, S.; Tan, S. ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *J. Appl. Learn. Teach.* **2023**, *6*, 1. [CrossRef]
21. Sabzalieva, E.; Valentini, A. *ChatGPT and Artificial Intelligence in Higher Education: Quick Start Guide*; UNESCO: Paris, France, 2023.
22. Lin, C.; Huang, A.Y.Q.; Yang, S.J.H. A Review of AI-Driven Conversational Chatbots Implementation Methodologies and Challenges (1999–2022). *Sustainability* **2023**, *15*, 4012. [CrossRef]
23. Wang, J.; Hwang, G.H.; Chang, C.Y. Directions of the 100 most cited chatbot-related human behavior research: A review of academic publications. *Comput. Educ. Artif. Intell.* **2021**, *2*, 100023. [CrossRef]
24. Lo, C.K. What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature. *Educ. Sci.* **2023**, *13*, 410. [CrossRef]
25. Julkunen, K. Situation- and Task-Specific Motivation in Foreign-language Learning and Teaching. Ph.D. Thesis, University of Joensuu, Joensuu, Finland, 1989.
26. Lamb, M.; Csizér, K.; Henry, A.; Ryan, S. *The Palgrave Handbook of Motivation for Language Learning*; Springer Nature: Berlin/Heidelberg, Germany, 2020.
27. Deci, E.L.; Ryan, R.M. *Intrinsic Motivation and Self-Determination in Human Behavior*; Springer Science & Business Media: Berlin/Heidelberg, Germany, 2013.
28. Poupore, G. Task Motivation in Process: A Complex Systems Perspective. *Can. Mod. Lang. Rev.-Rev. Can. Lang. Vivantes* **2013**, *69*, 91–116. [CrossRef]
29. Poupore, G. The Influence of Content on Adult L2 Learners' Task Motivation: An Interest Theory Perspective. *Can. J. Appl. Linguist.* **2014**, *17*, 69–90. Available online: https://doaj.org/article/060e43cef96744fb9cab876a76f61864 (accessed on 14 November 2023).
30. Ryan, R.M.; Deci, E.L. *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*; Guilford Publications: New York, NY, USA, 2018.
31. Guo, K.; Zhong, Y.; Li, D.; Chu, S.K.W. Investigating students' engagement in chatbot-supported classroom debates. *Interact. Learn. Environ.* **2023**, 1–17. [CrossRef]
32. Earle, F.; Hockey, B.; Earle, K.; Clough, P.J. Separating the effects of task load and task motivation on the effort–fatigue relationship. *Motiv. Emot.* **2015**, *39*, 467–476. [CrossRef]
33. Safdari, S. Task Motivation and Transfer of Learning across Tasks: The Case of Learning the English Definite Article. *Issues Lang. Teach.* **2021**, *10*, 203–232. [CrossRef]
34. Zare, J.; Delavar, K. Enhancing English learning materials with data-driven learning: A mixed-methods study of task motivation. *J. Multiling. Multicult. Dev.* **2022**, 1–17. [CrossRef]

35. Lambert, C.; Philp, J.; Nakamura, S. Learner-generated content and engagement in second language task performance. *Lang. Teach. Res.* **2016**, *21*, 665–680. [CrossRef]
36. Wigfield, A.; Gladstone, J.R. What Does Expectancy-value Theory Have to Say about Motivation and Achievement in Times of Change and Uncertainty? In *Advances in Motivation and Achievement*; Emerald Publishing Limited: Bingley, UK, 2019; pp. 15–32. [CrossRef]
37. Alfahel, E.; Daher, W.; Anabousy, A. Students' motivation to study science: The case of Arab students in Israel. *Eurasia J. Math. Sci. Technol. Educ.* **2023**, *19*, em2291. [CrossRef] [PubMed]
38. Daher, W. Middle School Students' Motivation in Solving Modelling Activities with Technology. *Eurasia J. Math. Sci. Technol. Educ.* **2021**, *17*, em1999. [CrossRef] [PubMed]
39. Daher, W.; Alfahel, E.; Anabousy, A. Moderating the Relationship Between Student's Gender and Science Motivation. *Eurasia J. Math. Sci. Technol. Educ.* **2021**, *17*, 1956. [CrossRef] [PubMed]
40. Braun, V.; Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [CrossRef]
41. Bryman, A. *Social Research Methods*; Taylor & Francis eBooks; Taylor & Francis: Abingdon, UK, 2010; pp. 157–184. [CrossRef]
42. Clarke, V.; Braun, V. Thematic Analysis. In *Encyclopedia of Critical Psychology*; Springer: Berlin/Heidelberg, Germany, 2014; pp. 1947–1952. [CrossRef]
43. Flick, U. *An Introduction to Qualitative Research*; SAGE: Newcastle upon Tyne, UK, 2009.
44. Saldana, J. *The Coding Manual for Qualitative Researchers*; SAGE: Newcastle upon Tyne, UK, 2021.
45. Ailincai, R.; Gabillon, Z. Analysing Teachers' Representations of Digital Technology Using a Grounded Theory Approach. *Eurasia J. Math. Sci. Technol. Educ.* **2018**, *14*, em1595. [CrossRef]
46. Daher, W. Saturation in Qualitative Educational Technology Research. *Educ. Sci.* **2023**, *13*, 98. [CrossRef]
47. Lincoln, Y.S.; Guba, E.G.; Pilotta, J.J. Naturalistic inquiry. *Int. J. Intercult. Relat.* **1985**, *9*, 438–439. [CrossRef]
48. Polit, D.F.; Beck, C.T. *Nursing Research: Generating and Assessing Evidence for Nursing Practice*; Lippincott Williams & Wilkins: Philadelphia, PA, USA, 2020.
49. Walters, S. Book Review: Chilisa, B., & Preece, J. (Eds.). (2006). Research Methods for Adult Educators in Africa. UNESCO, UNESCO Institute for Lifelong Learning, Institute for International Cooperation of German Adult Education Association, University of Botswana and Pearson Education South Africa. 150 pp. $27.50. *Adult Educ. Q.* **2008**, *59*, 84–86. [CrossRef]
50. Elo, S.; Kääriäinen, M.; Kanste, O.; Pölkki, T.; Utriainen, K.; Kyngäs, H. Qualitative Content Analysis. *SAGE Open* **2014**, *4*, 215824401452263. [CrossRef]
51. Holsti, O.R. Content Analysis for the Social Sciences and Humanities. *Am. Sociol. Rev.* **1970**, *35*, 356. [CrossRef]
52. Huang, W.; Hew, K.F.; Fryer, L.K. Chatbots for language learning—Are they really useful? A systematic review of chatbot-supported language learning. *J. Comput. Assist. Learn.* **2021**, *38*, 237–257. [CrossRef]
53. Tegos, S.; Psathas, G.; Tsiatsos, T.; Katsanos, C.S.; Karakostas, A.; Tsibanis, C.; Demetriadis, S. Enriching Synchronous Collaboration in Online Courses with Configurable Conversational Agents. In *Lecture Notes in Computer Science*; Springer Science + Business Media: Berlin, Germany, 2020; pp. 284–294. [CrossRef]
54. Talan, T.; Kalinkara, Y. The Role of Artificial Intelligence in Higher Education: ChatGPT Assessment for Anatomy Course. *Uluslar. Yönet. Bilişim Sist. Bilgi. Bilim. Derg.* **2023**, *7*, 33–40. [CrossRef]
55. Liu, H.; Peng, H.; Song, X.; Xu, C.; Zhang, R. Using AI chatbots to provide self-help depression interventions for university students: A randomized trial of effectiveness. *Internet Interv.* **2022**, *27*, 100495. [CrossRef] [PubMed]
56. Boekaerts, M. Te on-line motivation questionnaire: A self-report instrument to assess students' context sensitivity. In *Advances in Motivation and Achievement*; Pintrich, P.R., Maehr, M.L., Eds.; New Directions in Measures and Methods; JAI: Amsterdam, The Netherlands, 2002; Volume 12, pp. 77–120.
57. Kooli, C. Chatbots in Education and Research: A Critical Examination of Ethical Implications and Solutions. *Sustainability* **2023**, *15*, 5614. [CrossRef]
58. Xia, Q.; Chiu, T.K.F.; Zhou, X.; Chai, C.S.; Cheng, M. Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Comput. Educ. Artif. Intell.* **2023**, *4*, 100118. [CrossRef]
59. Jeno, L.M.; Vandvik, V.; Eliassen, S.; Grytnes, J. Testing the novelty effect of an m-learning tool on internalization and achievement: A Self-Determination Theory approach. *Comput. Educ.* **2019**, *128*, 398–413. [CrossRef]
60. Degachi, C.; Al Owayyed, M.; Tielman, M.L. Trust and Perceived Control in Burnout Support Chatbots. In Proceedings of the CHI 2023—Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems, Hamburg, Germany, 23–28 April 2023; Association for Computing Machinery (ACM): New York, NY, USA, 2023. [CrossRef]
61. Mendoza, N.B.; Yan, Z.; King, R.B. Domain-specific motivation and self-assessment practice as mechanisms linking perceived need-supportive teaching to student achievement. *Eur. J. Psychol. Educ.* **2022**, *38*, 607–630. [CrossRef]
62. Tlili, A.; Shehata, B.; Adarkwah, M.A.; Bozkurt, A.; Hickey, D.T.; Huang, R.; Agyemang, B. What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learn. Environ.* **2023**, *10*, 15. [CrossRef]
63. Wardat, Y.; Tashtoush, M.; Alali, R.M.A.; Jarrah, A. ChatGPT: A Revolutionary Tool for Teaching and Learning Mathematics. *Eurasia J. Math. Sci. Technol. Educ.* **2023**, *19*, em2286. [CrossRef]
64. Mogavi, R.; Deng, C.; Kim, J.; Zhou, P.; Kwon, Y.D.; Metwally, A.; Tlili, A.; Bassanelli, S.; Bucchiarone, A.; Gujar, S.; et al. Exploring User Perspectives on ChatGPT: Applications, Perceptions, and Implications for AI-Integrated Education. *arXiv* **2023**, arXiv:2305.13114. [CrossRef]

65. Daher, W.; Baya'a, N.; Jaber, O.; Awawdeh Shahbari, J. A Trajectory for advancing the meta-cognitive solving of mathematics-based programming problems with Scratch. *Symmetry* **2020**, *12*, 1627. [CrossRef]
66. Daher, W. Students' adoption of social networks as environments for learning and teaching: The case of the Facebook. *Int. J. Emerg. Technol. Learn.* **2014**, *9*, 16–24. [CrossRef]