

The Use of ChatGPT in Public Administration Higher Education: A Pilot Study

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Abstract

The use of ChatGPT in public administration higher education settings has garnered significant interest due to its potential impact on student behavior and academic performance. This pilot study, conducted in Hungary, at the Ludovika University of Public Service investigates these effects through empirical analysis, employing the Technology Acceptance Model (TAM) as a theoretical framework. The research aims to understand the influence of positive attitudes, user experience, and ease of availability on student performance and their intention to use ChatGPT in educational contexts. Student groups engaged with ChatGPT in diverse classroom scenarios, and the results suggest a favorable attitude towards the tool. Students attributed their enhanced academic performance to ChatGPT's user-friendly interface and seamless availability. The results reveal a positive correlation between a positive user experience and improved student performance, indicating ChatGPT's perceived value in education. Furthermore, the ease of access to ChatGPT significantly influenced students' perceptions and intentions to use the tool for academic purposes. In conclusion, this pilot study provides valuable insights into the impact of ChatGPT on student behavior in public administration higher education. Positive attitudes, good user experience, and easy availability contribute to enhanced student performance, fostering a strong intention to incorporate ChatGPT into educational settings. The perceived utility, influenced by ease of use, underscores ChatGPT's potential as a beneficial tool in public administration higher education.

Keywords

ChatGPT, public administration, higher education Technology Acceptance Model (TAM),

1. Introduction

The use of *artificial intelligence (AI) technologies* in educational settings has sparked significant interest and debate in recent years. Among these technologies, *ChatGPT*, developed by OpenAI, has emerged as a powerful tool capable of generating human-like text responses based on user input. The potential of ChatGPT to enhance student learning experiences has led to inquiries into its effects on student behavior and academic performance.

In this context, public administration higher education presents an ideal environment for exploring the utility of ChatGPT. Public administration programs often involve complex concepts and information, making them conducive to the application of AI-driven tools for learning and comprehension. Understanding how students

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perceive and interact with ChatGPT in this educational context is crucial for harnessing its potential benefits effectively.

This pilot study, conducted in Hungary, aims to delve into the impact of ChatGPT on student behavior and academic performance in public administration higher education. By employing an empirical approach and leveraging the adapted *Technology Acceptance Model (TAM)* as a theoretical framework, the study seeks to analyze student interactions with ChatGPT and uncover the factors influencing their attitudes and intentions toward its use in educational settings.

The primary objective of this study is to explore the influence of positive attitudes, user experience, and ease of availability of ChatGPT on student performance. By examining these dynamics through the lens of TAM, the study aims to provide valuable insights into the potential benefits and challenges associated with integrating ChatGPT into public administration higher education.

Through empirical analysis and qualitative inquiry, this study seeks to contribute to the growing body of literature on AI in education and inform educators, policymakers, and stakeholders about the implications of adopting ChatGPT in public administration higher education settings. Ultimately, by understanding the dynamics of student acceptance and adoption of ChatGPT, this study aims to pave the way for the effective use of AI technologies in public administration higher education, thereby enhancing student learning experiences and academic outcomes.

2. Literature review

The ChatGPT, an AI language model developed by OpenAI, has garnered significant interest since its introduction. As described by Sier (2022), ChatGPT has been recognized for its ability to generate human-like text and engage in natural language conversations. This capability has led to its exploration in various domains, including education, where it holds promise for supporting teaching and learning activities (Herman, 2022).

The use of artificial intelligence (AI) technologies in educational settings has become a focal point in contemporary discourse, particularly concerning the adoption and implications of tools like ChatGPT (OpenAI, 2022) in higher education. This literature review seeks to explore the existing scholarly discussions surrounding the use of ChatGPT in educational contexts, examining its potential impacts on student learning outcomes, pedagogical practices, and ethical considerations.

One central theme in the literature revolves around the efficacy of AI-driven tools in enhancing student engagement and academic performance. The study by Benjamin S. Bloom (1984) on the “*2 Sigma Problem*” underscores the significance of personalized instruction, a concept that resonates with the potential of AI chatbots like ChatGPT to provide tailored support to individual learners. Bloom's research highlights the transformative impact of one-to-one tutoring on learning outcomes, setting a precedent for exploring AI-driven personalized learning experiences in contemporary educational environments.

Furthermore, discussions on the use of generative AI in classrooms often intersect with broader debates on the future of education in the AI era (Hardman, 2023; Verhoeven & Rana, 2023). While proponents advocate for the

innovative potential of AI tools in revolutionizing pedagogical approaches and fostering creativity (Verhoeven & Rana, 2023), cautionary voices warn against hasty adoption and emphasize the need for careful consideration of ethical and practical implications (Hosseini et al., 2023; Sample, 2023).

Research has also investigated the role of ChatGPT in promoting student engagement and interaction. Miller (2022) highlighted how ChatGPT's interactive nature encourages students to ask questions, seek clarification, and actively participate in discussions. This increased engagement fosters a collaborative learning environment and empowers students to take ownership of their learning process. Moreover, Spencer (2022) argues that AI tools like ChatGPT can complement traditional teaching methods rather than replace them.

Ethical considerations surrounding AI adoption in education also feature prominently in the literature. Concerns range from issues of algorithmic bias and data privacy to questions of academic integrity and authorship (Hosseini, Gordijn, 2020; Sample, 2023). The ethical dimensions of using AI tools like ChatGPT in educational settings underscore the importance of transparent governance frameworks and critical awareness among stakeholders.

Moreover, the literature reflects ongoing dialogues on the role of AI in addressing pedagogical challenges and supporting diverse learner needs. As highlighted by Mollick (2023), the increasing ubiquity of AI technologies prompts educators to reimagine instructional practices and explore innovative approaches to student-centered learning. In this context, ChatGPT emerges as a versatile tool with the potential to augment instructional strategies and facilitate personalized learning experiences (Lee, 2023).

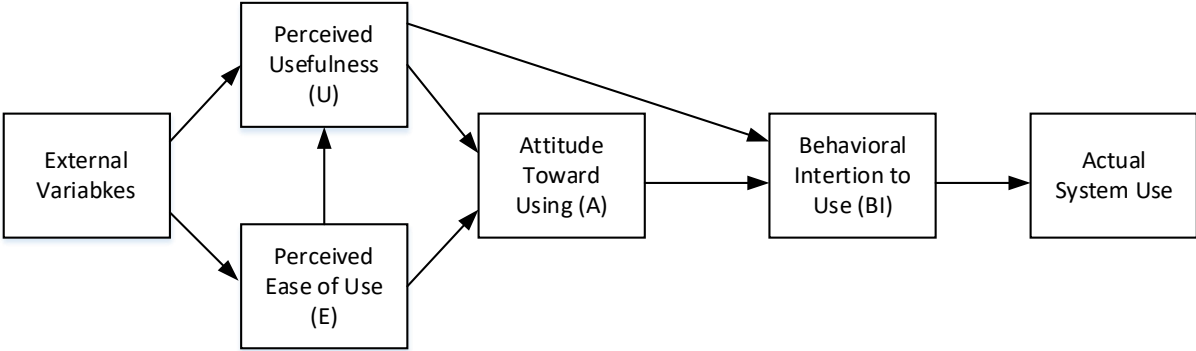
However, amid the enthusiasm for AI-driven educational innovations, practical considerations and implementation challenges cannot be overlooked. Issues such as digital literacy, equitable access to technology, and the need for professional development underscore the complex landscape of AI usage in educational settings (Alsalem, 2016; Fási, 2019; Leech et al., n.d.; Lieberman, 2020). Addressing these challenges requires a multifaceted approach that encompasses technological infrastructure, pedagogical support, and inclusive policies.

The Technology Acceptance Model (TAM), developed by Davis in 1986, offers a theoretical framework for understanding users' acceptance and adoption of technology (Varannai, Sasvári, Urbanovics, 2017). TAM posits that perceived usefulness and perceived ease of use are primary determinants of an individual's intention to use technology (Davis, 1989). Applied to educational contexts, TAM provides insights into how students perceive and interact with AI-driven tools like ChatGPT.

In conclusion, the literature surrounding the use of ChatGPT in higher education reflects a nuanced discourse, encompassing debates on its potential benefits, ethical implications, and practical challenges. While AI technologies offer promising avenues for transforming teaching and learning experiences, careful consideration of ethical, pedagogical, and socio-technical factors is essential to harness their full potential and ensure equitable outcomes in educational settings.

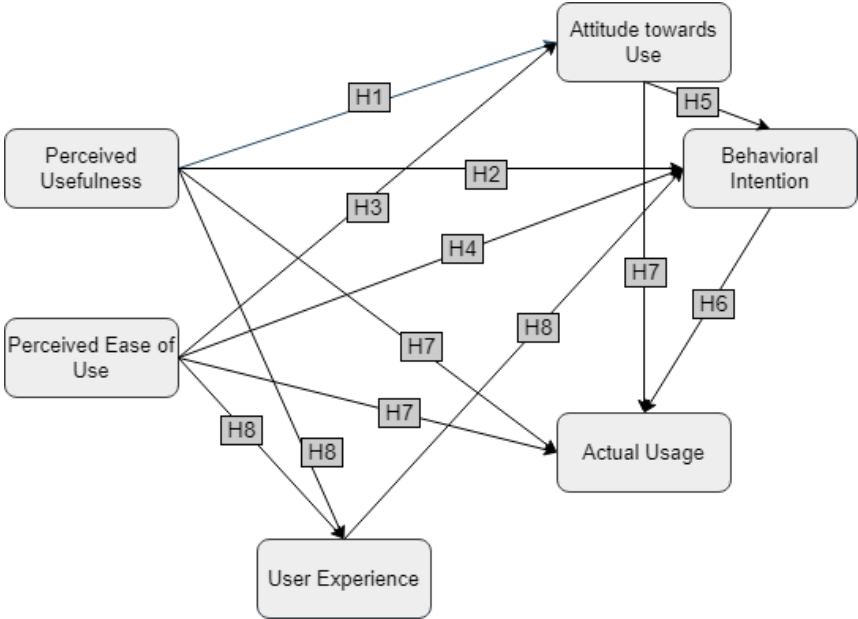
3. Research Methodology

The research is based on the Technology Acceptance Model (TAM), which posits that users' acceptance and adoption of technology are determined by their perceptions of its usefulness and ease of use. According to TAM, positive attitudes towards technology, combined with a favorable user experience and perceived ease of use, lead to increased intention to use the technology, ultimately influencing actual usage behavior. By applying TAM to the context of ChatGPT in public administration higher education, this study seeks to elucidate the factors influencing students' acceptance and adoption of this innovative tool. Figure 1 illustrates the interaction of the elements of the TAM.



1. Figure. Interaction of the elements of the Technology Acceptance Model. Source: Davis, Bagozzi and Warshaw (1989, p. 985).

This framework was adapted to our research to help elucidate the factors influencing students' acceptance and adoption of ChatGPT in public administration higher education settings. By examining perceived usefulness, ease of use, attitudes towards use, behavioral intention, actual usage, and user experience, the study aims to provide valuable insights into the use of ChatGPT as a beneficial tool for student engagement and academic achievement in higher education. Figure 2. illustrates the applied research model (based on Davis).



2. Figure. Applied research model (based on Davis).

Based on the model outlined, the relation between them can be supposed to the following assumptions:

1. *Perceived Usefulness*: shows how the user evaluates the usage of the system if they consider it adequate.
 - Hypothesis 1: Students who perceive ChatGPT as useful for improving their academic performance exhibit a positive attitude towards its use in educational settings.
 - Hypothesis 2: Positive perceptions of ChatGPT's usefulness positively influence students' intention to use it in their educational journey.
2. *Perceived Ease of Use*: shows how the user evaluates the complexity of the system.
 - Hypothesis 3: Students who find ChatGPT easy to use have a positive attitude towards its use in educational settings.
 - Hypothesis 4: Perceived ease of use of ChatGPT positively influences students' intention to continue using it in their academic pursuits.
3. *Attitude towards Use*: shows the willingness of the user to accept and use the system in case of continual use.
 - Hypothesis 5: Positive attitudes towards ChatGPT are positively associated with student's intention to use it in higher education.
4. *Behavioral Intention*: shows how the user relates to the future usage of the system.
 - Hypothesis 6: Students with a strong intention to use ChatGPT in educational settings demonstrate a higher likelihood of actual usage.
5. *Actual Usage*: shows to what extent the user is satisfied with the system concerning its accessibility.
 - Hypothesis 7: The actual usage of ChatGPT in educational settings is influenced by students' attitudes, perceived usefulness, and ease of use.
6. *User Experience*: shows what impact the usage of the system generates in the user.
 - Hypothesis 8: A positive user experience with ChatGPT leads to increased perceived usefulness and ease of use, thereby enhancing students' attitudes and intention to use it in educational settings.

The research utilizes a cross-sectional survey design to collect data from students in a public administration higher education institution in Hungary (Ludovika University of Public Service). Convenience sampling is employed to select participants from accessible student populations. A structured questionnaire based on the research objectives and hypotheses is administered to participants to gather data on attitudes, user experience, ease of availability, perceived utility, and intention to use ChatGPT. Descriptive statistics, correlation analysis, regression analysis, and other inferential statistical methods are used to analyze the data and test the hypotheses.

4. Discussion of Results

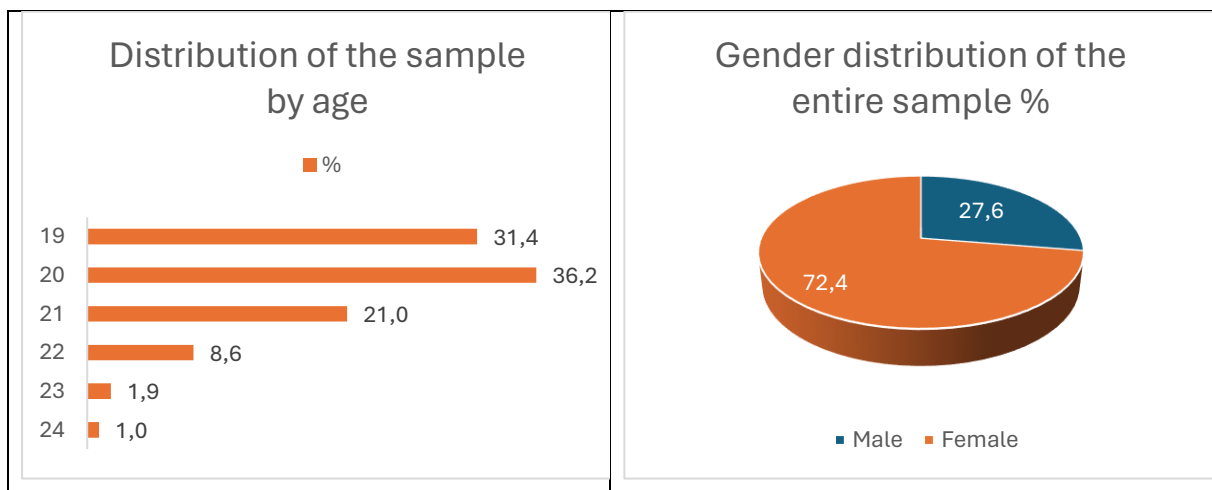
4.1 Research Process

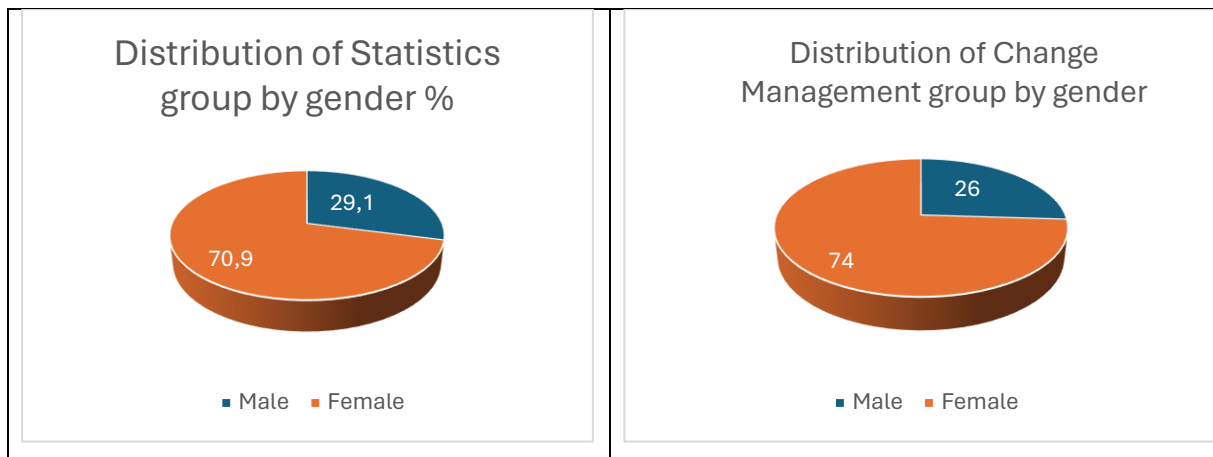
Following the establishment of objectives and hypotheses, the development of our questionnaire ensued. Two groups of students from the Ludovika University of Public Service participated in the survey. The questionnaire was distributed to the students in printed form during two different subject classes, each following the completion

of a targeted task requiring the use of ChatGPT. The data obtained were processed using the IBM SPSS Statistics 23 statistical software package.

The questions in the questionnaire used during the research were designed by the formulated hypotheses, with each question corresponding to a specific hypothesis. Respondents were asked to evaluate closed-ended questions on a five-point Likert scale, while four open-ended questions at the end of the questionnaire allowed students to elaborate on their responses, reinforce previous statements, and provide additional comments and suggestions regarding the use of ChatGPT in public administration higher education. The sample consisted of two groups of students (50-55 individuals each). One group was enrolled in a primarily theoretical course, imparting human knowledge (Change Management), while the other group was engaged in a "calculative" subject, dealing with real data (Statistics). These students utilized ChatGPT to solve a search task within the framework of their respective courses and based on their experiences during task completion (as well as previous usage of chatbots in other domains), they responded to the questionnaire. The deliberate selection of these two types of subjects aimed to examine whether there is a discernible difference in the difficulty level of tasks requiring the finding and processing of textual versus numerical data with the assistance of ChatGPT, as well as in the quality of solutions. The tasks assigned during classes focused on the change management of the Ludovika University of Public Service, within the framework of the "Change Management" course, while within the "Statistics" class, tasks addressed the impacts of climate change in Hungary, the measures taken, and the quantification of their results.

The respondents who completed the questionnaire were 105 students aged between 19 and 24, belonging to Generation Z, enrolled in undergraduate (BA) programs, specializing in Public Administration and Organizational Management. The distribution of the sample by gender was as follows: 72.4% (76 individuals) were female, and 27.6% (29 individuals) were male. Diagram 1. shows the characteristics of the sample.

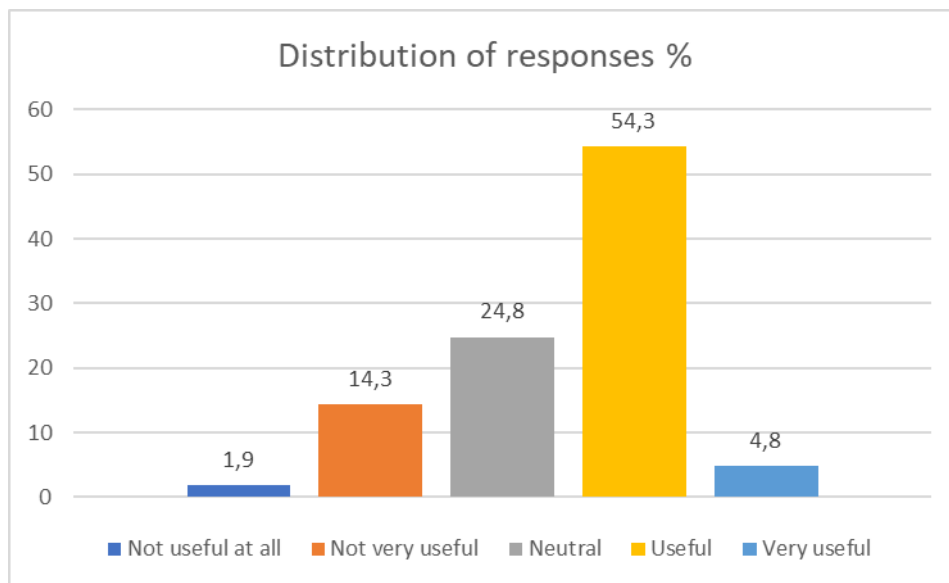




1. Diagram. The characteristics of the sample.

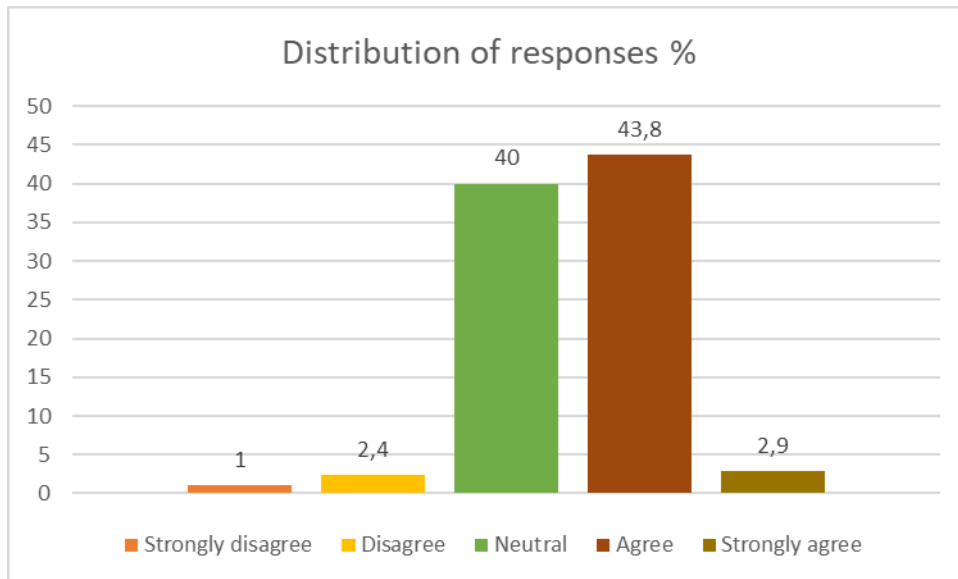
4.2 Analysis of Responses to Closed-ended Questions

Regarding the role of using ChatGPT in improving academic performance, 59.1% of students evaluated it positively (54.3% found it useful, 4.8% found it very useful), while 24.8% considered it neutral, and 16.2% of students did not qualify the use of the chatbot in higher education as useful (Question 2a).



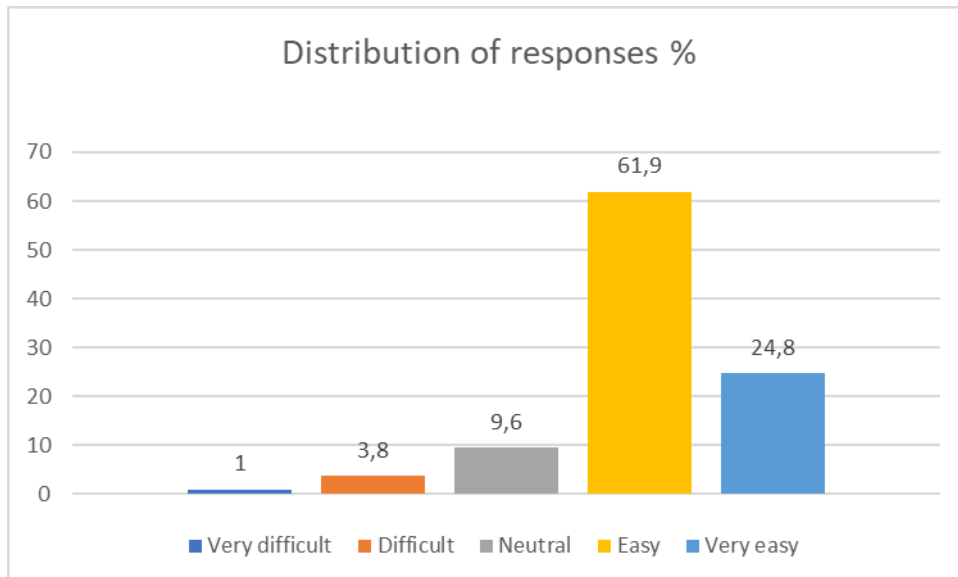
2. Diagram. Q2a) How do you perceive ChatGPT's usefulness for improving your academic performance in higher education settings?

Regarding the statement about the positive influence of the usefulness of the chatbot on usage intentions (Question 2b), 46.7% of respondents agreed, while 40.0% remained neutral. Overall, it can be said that only a small percentage of students feel that using the chatbot cannot contribute to improving their academic performance.

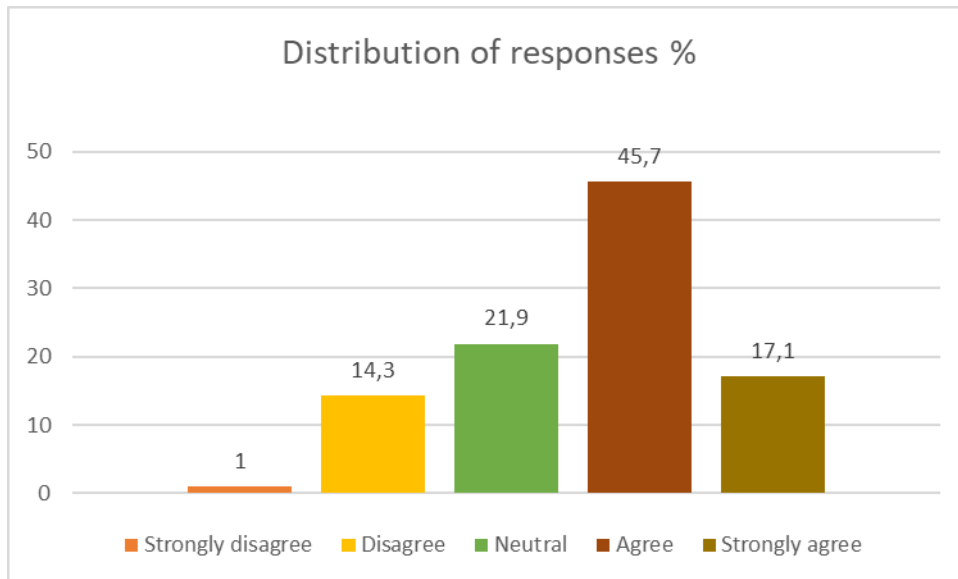


3. Diagram. Q2b) To what extent do you agree with the following statement: "ChatGPT's usefulness positively influences my intention to use it in my educational journey."?

Responses to the two questions regarding the simplicity of using the program (Questions 3a and 3b) unequivocally confirm its user-friendly nature, with 86.9% of students experiencing no difficulty in using ChatGPT, which further enhances the usage intention of the majority (62.8%).

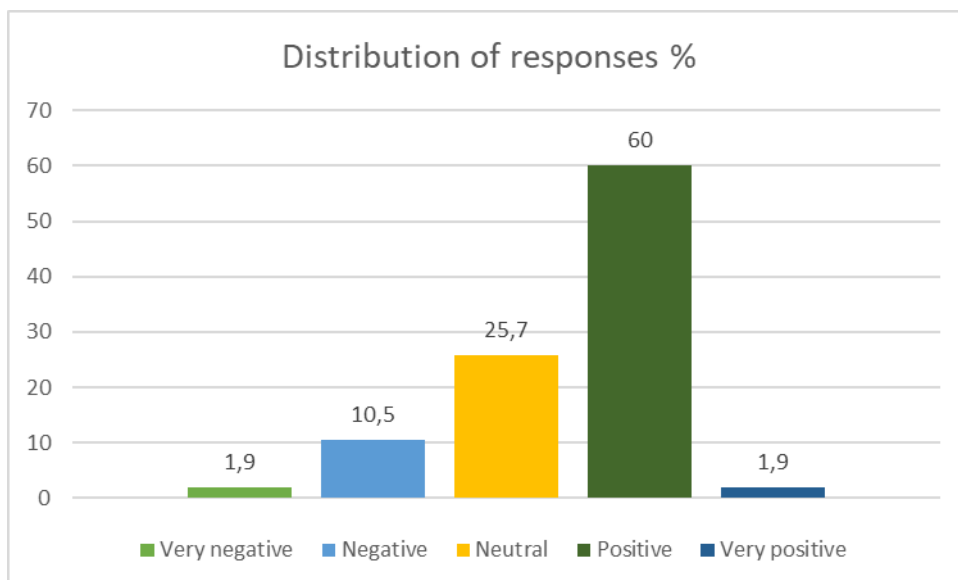


4. Diagram. Q3a) How easy do you find ChatGPT to use in educational settings?



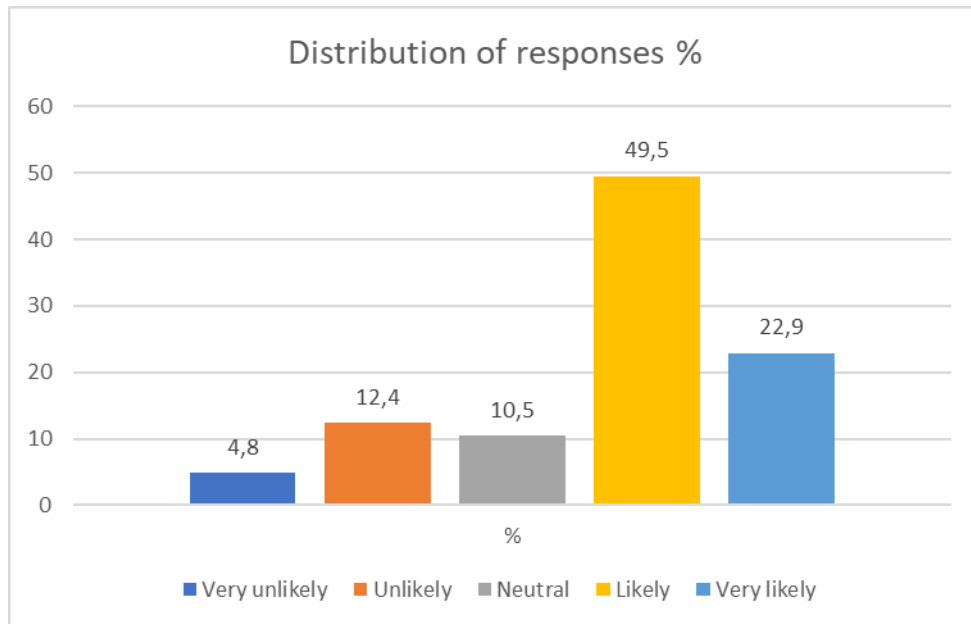
5. Diagram. Q 3b) Do you agree or disagree with the following statement: "The ease of use of ChatGPT positively influences my intention to continue using it in my academic pursuits."?

The combination of ease of use and the possibility of performance enhancement results in a positive attitude towards using ChatGPT among the majority of students, with 61.9% having a positive attitude, while 25.7% remain neutral towards using the chatbot, indicating that negative attitudes are characteristic of only 12.4% of respondent students (Question 4).



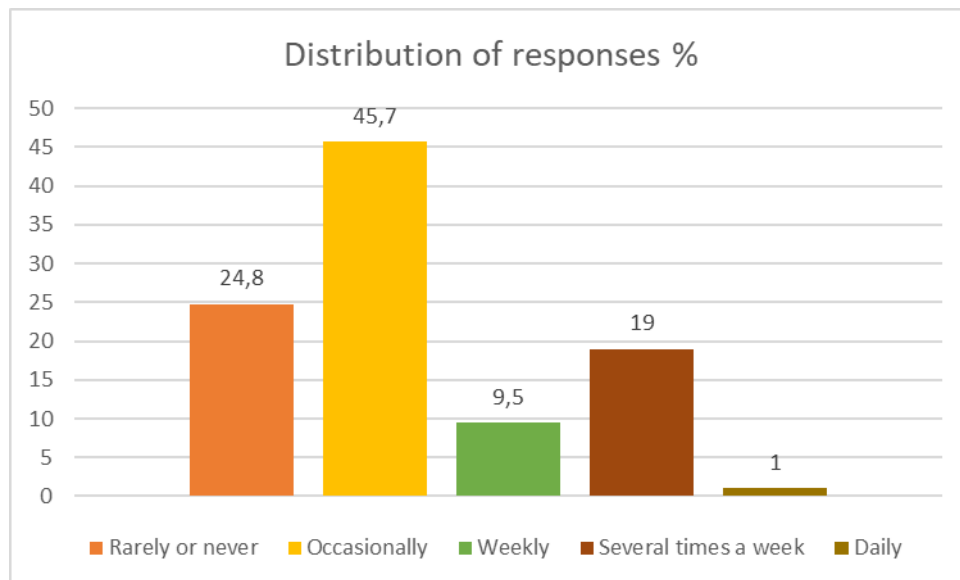
6. Diagram. Q4) Please rate your overall attitude towards using ChatGPT in educational settings.

Positive opinions reinforce usage intentions, with close to three-quarters (72.4%) of respondents likely to use the chatbot more frequently during their study activities (Question 5).



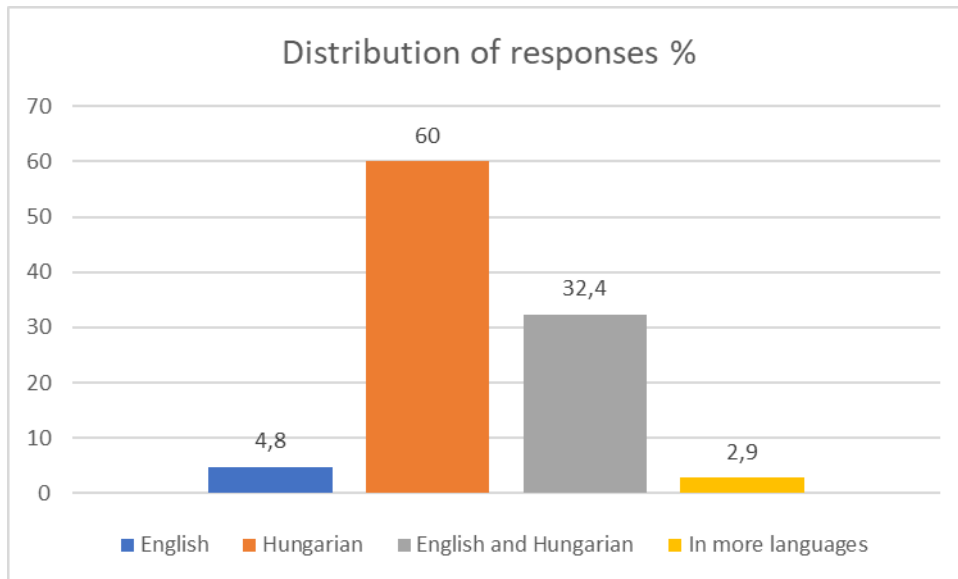
7. Diagram. Q5) How likely are you to use ChatGPT in your educational journey?

The increased demand for more frequent usage is also interesting because responses to Questions 6a and 6b revealed that currently only one-fifth of students (20.0%) use the program's assistance more than once a week during their studies, 55.2% have only attempted to use it out of curiosity, and a quarter of students (24.8%) have never used it.



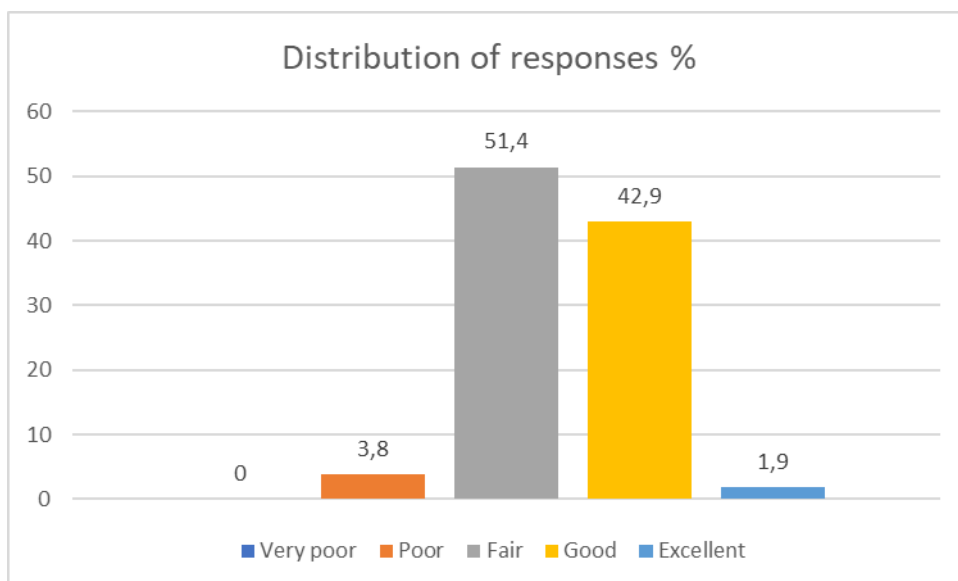
8. Diagram. Q6a) How often do you currently use ChatGPT in educational settings?

The language of use is predominantly Hungarian (60%), but many also prefer English language searches during usage.



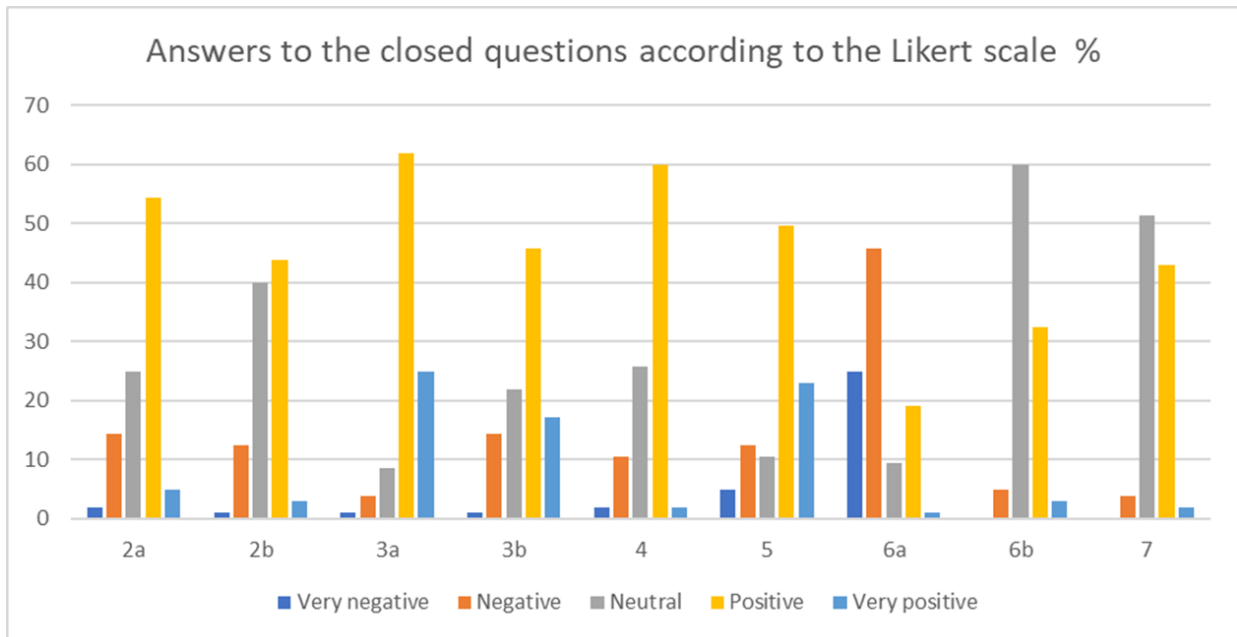
9. Diagram. Q6b) What language do you use ChatGPT in?

None of the respondents rated their user experience with ChatGPT as "very poor" (Question 7), and the combined ratio of "fair" and "good" ratings at 94.3% suggests the likelihood of widespread, everyday use of AI-based "chatbots" in the future.



10. Diagram. Q7) Based on your experience; how would you rate your user experience with ChatGPT in educational settings?

The summary of student's responses to closed-ended questions is shown in Diagram 11.



11. Diagram. Answers to closed-ended questions.

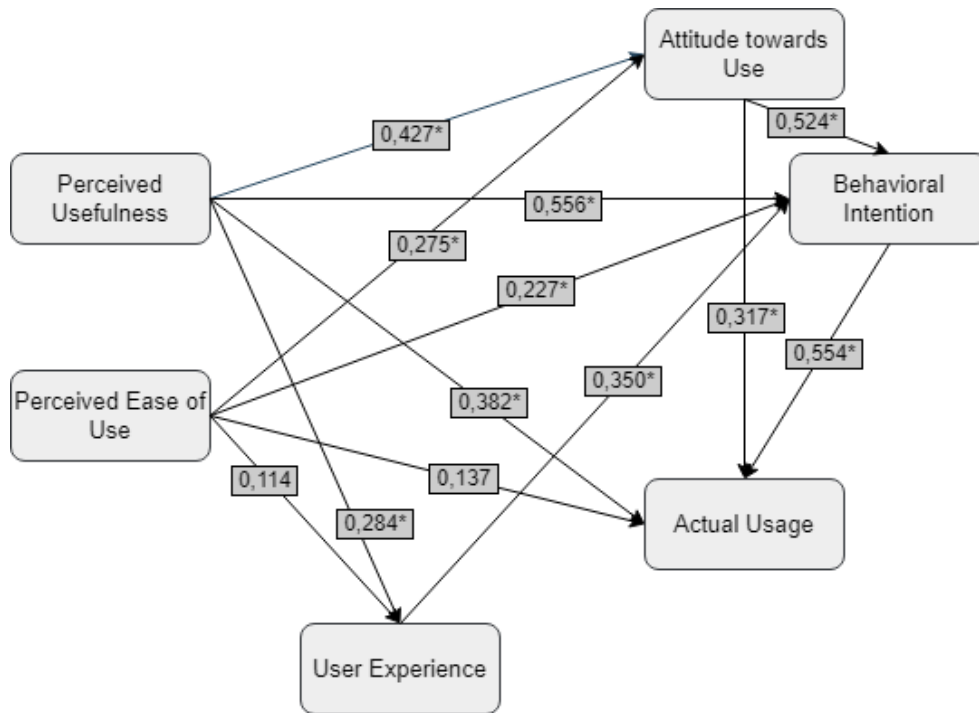
Before evaluating the results of the questionnaire using the SPSS statistical program, to obtain answers as to how accurately our questionnaire reflects the opinions of the respondents, we tested the reliability of the questionnaire using Cronbach's alpha coefficient. The coefficient's value of 0.75 (for 9 questions) demonstrated the reliability of our survey (if Cronbach's $\alpha > 0.7$, then the test can be considered reliable).

The research also sought answers to whether significant differences could be detected between the responses of the two groups (humanities and sciences subjects). The results of the independent samples t-test ultimately showed only three questions where differences in responses were attributed not to chance but to the nature of the subjects. Perceptions of ChatGPT usefulness, intention to use, and language of use showed significant differences between the groups' responses. The significant difference in perceived usefulness confirms our initial expectations that ChatGPT contributes differently to improving academic performance in the two fields of study (further details on the analysis of responses to open-ended questions will be discussed). Table 1. illustrates the results of the independent samples t-test.

1. Table: Results of independent samples t-test.

Question	$\rho < 0.05$
2a. How do you evaluate the usefulness of ChatGPT in improving academic performance in higher education?	0,008
5. How likely are you to use ChatGPT for learning purposes?	0,015
6. In what language do you use ChatGPT	0,002

The relationships between elements of the TAM model for the entire sample are summarized in Figure 3.



3. Figure. Correlation between the elements of the model (* $p < 0,05$)

Significant positive correlations are observed at a 5% significance level between Perceived Usefulness (Question 2a) and Attitude (Question 4), as well as between Usefulness and Intention to Use (Questions 2b and 5), confirming hypotheses H1 and H2.

Hypotheses H3 (Ease of Use and Attitude) and H4 (Perceived Ease of Use and Intention) are supported by the significant positive relationship between perceived ease of use (Question 3a) and positive attitude (Question 4), as well as between ease of use and intention to use (Questions 3b and 5).

Similarly, a significant positive relationship supports hypotheses H5 (Attitude and Intention) and H6 (Intention and Actual Usage).

For hypothesis H7, there is a significant correlation between Actual Usage (Question 6a) and Perceived Usefulness (Question 2a), while there is a positive but not significant correlation between Actual Usage and Ease of Use (Question 3a) according to the statistics.

Hypothesis H8 is supported by the significant positive relationship between User Experience (Question 7), Perceived Usefulness (Question 2a), and Intention to Use (Question 5), as well as the non-significant positive relationship between Perceived Ease of Use and User Experience.

Overall, we can conclude that all our assumptions have been validated. The results demonstrate that the use of ChatGPT is gaining ground in higher education, as more and more students discover the benefits and usefulness of its ease of use during their academic activities.

4.3 Analysis of Responses to Open-ended Questions

The purpose of the four open-ended questions at the end of the questionnaire was to provide students with an opportunity to reinforce their responses to closed-ended questions and to elaborate on their opinions, thoughts, feelings, ideas, and suggestions regarding the use of ChatGPT in greater detail. In several cases, responses to different questions overlapped, meaning that students sometimes formulated responses to one question that also addressed another question.

Question 8a: In what ways has your experience with ChatGPT influenced your perception of its usefulness and ease of use?

A small proportion of students (10.5%) felt that the information retrieval task performed in class did not or only to a small extent ("not very much", "to some extent, but not overly") influence their perception of usefulness and ease of use.

Among the respondents who felt influenced, more than half firmly stated that using ChatGPT is very easy and provides good assistance and support in solving tasks, aiding in the resolution of "unnecessarily long" tasks. Students from the Change Management course felt its use was slightly easier than those solving the statistical task. Only 4 students felt that ChatGPT's structure is "illogical," making its use difficult, as it requires repeated questioning in various forms to provide a specific and truly relevant answer to the posed question.

Almost all students who perceived ChatGPT as useful emphasized its speed of search, i.e., "quick access to information," as the program's greatest advantage, aiding in meeting deadlines for assignments and essays. Additionally, the "point-form" response format, "good text summarization" ability, "clear and simple language," and "understandable wording" were mentioned as further advantages. Several respondents primarily find ChatGPT's assistance "very useful" in the "ideation phase, as a starting point, as guidance" in research.

Among those students (27.7%) who disagreed with the usefulness of using ChatGPT, they justified their negative opinions with various arguments, criticizing both the answers provided by ChatGPT and the program's operation, as well as the attitudes of students towards learning.

The most commonly mentioned counter-argument by respondents criticizing the answers provided by ChatGPT was that the accuracy and reliability of the answers given by ChatGPT are questionable, therefore, the accuracy of the received answers must be verified, "the correctness of the data must be checked," "there is still a lot of work to do if I want to submit a decent assignment," thus the speed of response does not provide real-time savings in the research process. In cases where ChatGPT "overthinks the question," i.e., provides a too complicated answer to the posed question, the task of filtering out the essence remains with the questioner, thus not maximizing the facilitation of their work. Several respondents complained about the problem of "wording without coherence," "frequent repetition of words," and repeating the same statement in different words, which also requires the questioner to reformulate the answers, thus requiring time and energy from them. Another problem mentioned was that the chatbot "does not attach a source to the given information," which reduces the reliability of the information

on one hand and, due to the mandatory source citation requirement for papers, requires additional research work from students.

Another group of respondents questioning the usefulness of ChatGPT argued that the use of the chatbot negatively affects the learning process, as it "reduces learning motivation," "impairs the quality of one's work," "pushes back learning skills, independent thoughts," "students do not invest enough time in learning and preparing for successful assignments because of it."

Among the responses to the question, several additional comments emerged:

- For those who initially found using ChatGPT cumbersome, it is good news that "repeated use assists in easier/better formulation of questions, correct ways of posing questions, as well as interpretation of answers, and detection of errors".
- It is not correct to rely solely on the answers provided by the program during our work, but rather "the collaboration of ChatGPT and personal experience provides exact knowledge".
- As an alternative, the suggestion of using other chatbots also arose: "Bing Chat is a better version than ChatGPT".

Question 8b: In what ways do you believe ChatGPT has influenced your academic performance or learning experience positively?

Since the two groups (humanities and STEM subjects) provided nearly identical responses to the question, the responses of both groups were aggregated. Several respondents addressed the question in two parts, separately discussing the impact of ChatGPT on academic performance and the learning experience. Those who typically mentioned positive learning experiences did not necessarily perceive the use of the chatbot as a factor positively influencing academic performance.

Students who viewed ChatGPT positively also expressed positive sentiments regarding their learning experience. The simplicity of using the chatbot, the advantage of "quick access to information," and thereby facilitating work, assisting in writing assignments, essays, and presentations by providing "idea generation," providing "guidance" to start work, "assisting in understanding difficult materials," and the opportunity to "deviate from traditional teaching methods" were cited as the basis for this.

Among the positive effects that facilitate completing academic tasks, the following remarks were mentioned:

- "Speeds up learning and saves a lot of time," "helps solve long tasks," "can quickly get answers to simple questions"; "Using it shortens the preparation time for certain subjects, leaving more time for difficult, quasi-major subjects".
- "Can shed light on connections that wouldn't occur to me".
- It simplifies learning because "it easily summarizes longer texts and breaks them down into more learnable parts," and "can quickly summarize one or two things, which helps in understanding the material".

- "It can help start research, provide guidance," "can help a lot in brainstorming, for example, how to structure/build an assignment, or what topics would be worth researching".
- "Has already made my studies easier on several occasions, especially when preparing presentations, and lectures," "can be useful for preparing assignments, collecting ideas, or can help me 'get started' on a path," and "useful during outlining".
- "Can be very useful in sourcing (relevant studies, articles)".
- "Can be a great help in learning foreign languages," "helps a lot in writing assignments, solving tasks in my specialized subject".
- "Can explain some things more simply and make them easier to understand."

There are also some students (3 individuals) who believe that using ChatGPT does not affect academic performance, while those who evaluate its impact *negatively* presented the following arguments:

- "It greatly reduces my motivation to learn and my actual effort," "If I were to use it more often, I would neglect to study, and my grades would decline".
- "I think we become lazy with it, so it's negative," "students become lazy, they rush their work"; "people will study even less because using ChatGPT might seem much simpler and timesaving than studying".
- "Negative, because I spend less time studying certain subjects because I know that ChatGPT will help anyway"; "since it searches and/or selects things for me, I don't do meaningful work, I don't use my brain," "it doesn't encourage learning because it answers everything for me"; "the student won't research the subject matter as thoroughly".
- "Reduces students' inclination and motivation to learn," "undermine learning motivation and detracts from the quality and credibility of my work, instructors don't see my own expressed opinion, but a template opinion"; "users think they don't need to study, although it saves time, knowledge does not increase".
- "Makes task-solving simpler and faster, but this often has a negative impact on quality," "If someone is only concerned with saving time, it does not increase performance," and "takes away creativity by throwing most of the information at you".
- "Not profitable if I write an assignment with the help of artificial intelligence and get caught," "provides a lot of false/not very accurate information, which many believe without checking, this will be revealed, instructors don't like it, so academic performance worsens".
- "I like to study, and what I learn remains mine."

Question 8c: Are there any challenges or limitations you have encountered while using ChatGPT in your educational journey?

Among the four open-ended questions, the responses to the question regarding the limitations of ChatGPT revealed the sole discrepancy between the two groups, that is, between the solvers of the two types of tasks, confirming our assumption about the quality difference in the assistance provided by the chatbot for tasks related to humanities and STEM subjects.

Out of the respondents, 16 individuals have not yet encountered any challenges when using ChatGPT, or according to their admission, they have not used the program enough to encounter its limitations. In addition to the simple "I have not experienced it" responses, the following formulations appeared in the questionnaire: "I always achieved what I wanted," "Its use is very easy," and "There are difficulties, but the system corrects and improves itself."

Summarizing the responses of those facing limitations, along the lines of various keywords:

2. Table. Summary of student responses to open question 8c

Keywords	Number of mentions (pcs)
Provides false, inaccurate, or unreliable information, the accuracy of answers must be verified	22 + 13
Does not cite sources, reliability of answers cannot be verified	1 + 1
Produces different answers to the same question, contradictions are found in responses	0 + 2
The answer to a decisive question is not clear	0 + 2
Does not understand the question, answers differently, requires thorough rephrasing of the question	11 + 6
Provides only general answers, not specific ones	8 + 3
Provides long answers to short questions (additional work to shorten)	0 + 1
Language barrier: lacks Hungarian fluency; repetitions of words; meaningless text	4 + 4
Does not find answers to the questions asked	5 + 3
Lacks up-to-date information (data only up to 2022), does not provide numerical data	16 + 4
Limitation due to the necessity of registration	0 + 2

In addition to the more frequently mentioned limitations, some less common remarks were also made:

- Suitable only for solving short and simpler tasks, not for complex or longer ones.
- Less knowledgeable in less known, non-popular topics, its performance is weaker.

The difference between the responses of the two groups solving tasks in different scientific fields is particularly noticeable in statements regarding the accuracy of information provided by the chatbot and the deficiencies in responses related to numerical data: statements such as "does not understand the question, answers differently," "provides only generally formulated, not specific answers," and especially "does not have up-to-date information, does not provide numerical data" were noticeably more frequent in the responses of those solving statistical tasks requiring numerical data, as confirmed by their following formulations:

- "Does not have all the data, but indicates where to look; sometimes it provided incorrect data",

- "It is relatively difficult or impossible to obtain numerical statistical data," "It does not want to provide numerical statistical data",
- "Does not have up-to-date data," "does not provide accurate numerical data," "its knowledge is incomplete, it only has data up to 2022, and often provides inaccurate, incomprehensible data," "not up-to-date, sometimes provides downright wrong data",
- "The program's data is sometimes outdated, it cannot answer everything."

Interestingly, several students from the change management group also made comments regarding the obsolescence or deficiencies of numerical data, presumably referring not to the pre-survey task, but to their experiences gained during research related to other subjects.

Question 8d: Do you have any additional comments or feedback regarding your experience with ChatGPT in higher education settings?

The suggestions of students regarding the use of ChatGPT in higher education settings, beyond the formulation of permission requests for assistance in research, idea generation for assignments, and solving shorter tasks as indicated in responses to previous questions, included the following summarized recommendations in the table below.

The main factors of suggestions are as follows:

1. Ensuring access to ChatGPT,
2. Importance of involvement in classroom work,
3. The necessity of training on the use of ChatGPT,
4. Necessity of legal regulation of use,
5. Improvement of the search quality of the chatbot,
6. Recommendation of the use of other chatbots,
7. Prohibition of the use of ChatGPT in educational settings.

3. Table- Summary of student responses to open question 8d

Keywords	Responses (as formulated by respondents)
Ensuring access	<ul style="list-style-type: none"> - It should be made more accessible in education and learning. - Free access should be provided to version 4.0. - It should be available offline as well. - It would be worth subscribing to the upgraded version for the university, thereby ensuring quality search availability for students too.
Importance of involvement in classroom work	<ul style="list-style-type: none"> - It should be promoted more among students. - It could be introduced for use in class or for outlining essays, as it can provide great assistance in that.

	<ul style="list-style-type: none"> - Even during classes, as a supplement to the curriculum for additional information acquisition, teachers could also use it. - It's excellent for brainstorming; students could be given tasks that must be solved exclusively using ChatGPT. - It should be used more because it can make a class more interesting. - This is the future; ChatGPT needs to evolve more, but it should be gradually integrated into higher education. - It could be allowed, for example, for writing theses. - It should be allowed when writing theses, obviously restricted, and it could be an integral part of classes. - It shouldn't be completely banned from use; people shouldn't have such an aversion to it. - There shouldn't be a strong aversion; it should be usable in classes, for example, for tasks. - Within the framework of the class, asking for opinions on various topics, why a particular event happened, and what process led to the specific change, for example, in a history class or the historical introduction of the given subjects. - Possibly its use during classes (seminars). - It should be freely usable. - Over time, I think its use should be included in the curriculum. - In my opinion, its use could be integrated into the curriculum, within regulated frameworks. - Its features that could help students in their studies should be identified, while attention should also be paid to preventing cheating. - Its use should by no means be banned; students should be trusted to use it responsibly, as it may not always benefit them. - Full utilization of ChatGPT should be made possible, either in theses or other school assignments. - It's important to acknowledge ChatGPT and have an open attitude towards it.
<p style="text-align: center;">Training/education on usage</p>	<ul style="list-style-type: none"> - It would be important to introduce it in seminar classes as study material so that we can learn how to use ChatGPT. - More discussion should be held among students, and it should be used appropriately; it's a great help in any case. - Attention should be drawn to its dangers. - Assistance in understanding its use and helping to filter out the appropriate data is needed. - It would be useful to teach students how to use it correctly. - I would assist students with precise usage. - Experts in the field could give students advice on how to use ChatGPT better and more effectively.

	<ul style="list-style-type: none"> - It could be useful to teach and introduce it. - It could be integrated into creative learning themes, for experimentation (e.g., we pose a question to 100 people and see how many people get different/misleading answers), or to experiment on how to phrase the question properly for it to provide a proper answer. - The ethical use of ChatGPT could be demonstrated by lecturers in a separate class/standard.
<p>Legal regulation</p>	<ul style="list-style-type: none"> - A regulated area should be created for ChatGPT in higher education because currently it is very unclear where it can and cannot be used.
<p>Need for quality improvement</p>	<ul style="list-style-type: none"> - It should be resolved so that it doesn't come up with random things. - Not everything it says is true, so attention should be paid. - It's necessary to verify the information provided by it, to investigate. - You should never fully trust it and always review it. - Comparison of actual data and data collected by ChatGPT. - It would be better if ChatGPT had access to more information in different fields. - Unfortunately, it's not useful for me because it doesn't give good answers to my questions, so it would be good if it were further developed to give good answers. - We need a ChatGPT for higher education that university students can confidently use, which should be free and not contain false information, and should always cite and indicate sources.
<p>Recommendation of other platforms</p>	<ul style="list-style-type: none"> - I would recommend other platforms: Mistral.AI; Gemini, SCISPACE. - I usually use BigAI more, but mostly for creating images for fun. It would be worth using to make classes more colorful, and it managed to solve a specific task in more mathematical subjects. The latter is more of an assistance to students. - Bing chat was positive for me because it marks the sources it used at the end of the answer, so I often used it for legal questions, where I would recommend its use. And Bing chat is also free. - Any AI is currently more efficient, e.g., Chat Mistral.
<p>Not useful/ prohibition of use</p>	<ul style="list-style-type: none"> - It could be used as assistance; however, I wouldn't incorporate it into education. - They should rather look things up and not base everything on this program. - I don't find the use of ChatGPT in higher education useful. - You should never fully trust the answers of ChatGPT. - Students should be rigorously checked if they used it, and instead, creativity should be strengthened. - If it doesn't become reliable, then nobody should use it. - I would only recommend its use for generating ideas; it rarely provides correct or not misleading answers to specific questions. - At the moment, I can't find a way that would help with learning, as it mostly does the work for the student.

	<ul style="list-style-type: none"> - It should be minimized or restricted so that students don't rely solely on it. - I would not recommend using it for writing a thesis. - I wouldn't apply it. - If its development reaches a level where the mistakes of artificial intelligence are few, I wouldn't allow its use, so students wouldn't misuse it, and higher education could be modernized with other methods as well. - Students shouldn't only use this source; they should research on multiple platforms and look into things. - We shouldn't force it.
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A summary of the students' open-ended responses is illustrated by the word cloud which is shown in Figure 4.



4. Figure. summary of the students' open-ended responses.

The mixed nature of the responses also confirms the complex questions that arise about the use of ChatGPT in public administration higher education.

5. Conclusion and recommendations

This pilot study contributes to understanding the impact of ChatGPT on student behavior in public administration higher education. Positive attitudes, good user experience, and easy availability are found to enhance student performance and intention to use ChatGPT in educational settings. The study underscores ChatGPT's potential as a valuable tool in the public administration higher education and emphasizes the importance of considering factors such as perceived utility and ease of use when integrating AI technologies into educational practices.

Based on both closed and open-ended questions, it can be said that overall, most university students surveyed have a positive attitude towards using the chatbot for their academic activities. Students perceive its usefulness as contributing to brainstorming, organizing ideas, and significantly reducing the time required for learning and solving written assignments through ChatGPT. However, responses indicate that there are also reservations and negative criticisms regarding the use of the chatbot. Users perceive its shortcomings and errors, and some express ethical and moral concerns regarding its use.

When interconnected closed and open-ended questions are asked, it is observed that, albeit to a lesser extent, extreme negative evaluations and opinions emerge, which nuances the belief in the omnipotence of artificial intelligence. For instance, the responses to the closed question Q2a assessing the utility of ChatGPT indicate that 16.2% of respondents do not find it beneficial, while an additional 24.8% are neutral towards its utility in their academic pursuits. This reserved opinion is amplified by the negative arguments, doubts, perceived errors, and ethical reservations expressed in the open-ended inquiries. The results of the closed question Q5 probing the probability of future use of ChatGPT indicate that 17.2% of respondents currently consider it unlikely to use the chatbot in their future studies. Nonetheless, it should be noted that the present survey was conducted among undergraduate (BA) students. Therefore, it would be beneficial in a subsequent study, providing additional research opportunities for the authors, to examine whether there would be any disparities in the evaluation of the criteria presented in the questions if the study were conducted with a more advanced target group in their studies (MA, PhD).

Based on the research results, it is possible to established that ChatGPT can be effectively integrated into the public administration higher education curriculum to enhance student learning and engagement through the following strategies:

- *Personalized Learning Environments:* ChatGPT provides personalized learning environments, individualized tutoring/feedback, and a variety of learning materials, which can enhance student engagement and learning outcomes.
- *Development of 21st Century Skills:* When used with proper guidance, ChatGPT can facilitate the development of 21st-century skills such as collaboration, communication, critical thinking, and creativity.
- *Support for Students with Disabilities:* ChatGPT can support students with disabilities or learning difficulties, providing them with tailored assistance and resources.
- *Enriching Instruction for Teachers:* ChatGPT can assist teachers in enriching their instruction by providing creative ideas, solutions, and tailored content, as well as helping with assessment and evaluation.
- *Student Motivation and Engagement:* Research indicates that ChatGPT substantially impacts student motivation and engagement, leading to improved learning outcomes.
- *Teacher Training and Awareness:* Successful implementation of ChatGPT requires teachers to be familiar with its operation, highlighting the importance of teacher training and awareness.
- *Balancing Benefits and Risks:* While ChatGPT offers numerous opportunities for student empowerment and enhanced educational experiences, it is essential to address the potential risks, such as overreliance leading to a decrease in higher-order thinking skills.

In conclusion, the use of ChatGPT in the public administration higher education curriculum can offer significant benefits for both students and instructors, but it requires careful planning, teacher training, and awareness to maximize its potential while minimizing risks.

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Questionnaire: The Use of ChatGPT in Public Administration Higher Education

Thank you for participating in our study on the use of ChatGPT in higher education settings. Your responses will provide valuable insights into students' perceptions and experiences regarding the use of ChatGPT in educational environments. Please answer the following questions honestly and to the best of your ability.

1. Demographic Information:

1. Gender:
 - Male
 - Female
 - Non-binary / Other
2. Age: _____ years
3. Academic Level:
 - Undergraduate
 - Postgraduate
 - PhD/Doctoral
4. Field of Study: [Open Text]
5. Subject: [Open Text]

2. Perceived Usefulness:

a. How do you perceive ChatGPT's usefulness for improving your academic performance in higher education settings?

- Not useful at all - Not very useful - Neutral - Useful - Very useful

b. To what extent do you agree with the following statement: "ChatGPT's usefulness positively influences my intention to use it in my educational journey."

- Strongly disagree - Disagree - Neutral - Agree - Strongly agree

3. Perceived Ease of Use:

a. How easy do you find ChatGPT to use in educational settings?

- Very difficult - Difficult - Neutral - Easy - Very Easy

b. Do you agree or disagree with the following statement: "The ease of use of ChatGPT positively influences my intention to continue using it in my academic pursuits."

- Strongly disagree - Disagree - Neutral - Somewhat agree - Agree

4. Attitude towards Use:

Please rate your overall attitude towards using ChatGPT in educational settings:

- Very negative

- Negative
- Neutral
- Positive
- Very positive

5. Behavioral Intention:

How likely are you to use ChatGPT in your educational journey?

- Very unlikely
- Unlikely
- Neutral
- Likely
- Very likely

6. Actual Usage:

a. How often do you currently use ChatGPT in educational settings?

- Daily
- Several times a week
- Weekly
- Occasionally
- Rarely or never

b. What language do you use ChatGPT in?

- Only in English
- Only in Hungarian
- Both in English and Hungarian
- In more languages

7. User Experience:

a. Based on your experience; how would you rate your user experience with ChatGPT in educational settings?

- Very poor - Poor – Fair - Good - Excellent

8. General Feedback:

- a. In what ways has your experience with ChatGPT influenced your perception of its usefulness and ease of use? [Open Text]
- b. In what ways do you believe ChatGPT has influenced your academic performance or learning experience positively? [Open Text]
- c. Are there any challenges or limitations you have encountered while using ChatGPT in your educational journey? [Open Text]
- d. Do you have any additional comments or feedback regarding your experience with ChatGPT in higher education settings? [Open Text]

Thank you for your participation in this survey. Your input is greatly appreciated and will contribute to our understanding of the role of ChatGPT in higher education.