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Student Perceptions and Preferences in Personalized AI-driven Learning

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Abstract

Background: The use of artificial intelligence (AI) in education opens new possibilities for personalized learning. AI-driven systems allow students to progress at their own space, receive real-time feedback and have learning materials adapted to their individual needs. However, questions remain regarding students' perceptions of this approach and its effectiveness compared to traditional teaching methods.

Objective: This study aimed to analyse university students' attitudes and preferences towards AI-driven personalized learning and identify key factors influencing its effectiveness and adoption.

Methods: A mixed-method approach was employed, combining quantitative and qualitative data collection through a questionnaire survey conducted among students at the University of Ostrava. The data were collected in two phases during the winter semesters of 2023 and 2024, involving a total of 270 respondents.

Results: The findings indicate that 64.1% of students perceived AI-generated and adapted chapters as more helpful and effective than traditional study materials. The most valued aspects were content adaptability, real-time feedback and increased motivation to learn. However, 18.1% of respondents viewed AI-driven instruction as less beneficial, citing limited interactivity, a lack of detailed feedback and insufficient customization for advanced learners as the main drawbacks.

Conclusion: The research confirmed that AI-driven personalized learning can offer students a range of benefits, particularly in terms of adapting instructional content to individual needs, providing immediate feedback, and enabling self-paced study. However, certain challenges remain, especially regarding limited interactivity and insufficient depth of feedback, which may negatively affect students' acceptance of such systems. To enhance the effectiveness and broader implementation of AI in educational practice, it is essential to focus on the development of interactive features, the improvement of analytical feedback, and the thoughtful integration of AI with traditional pedagogical approaches.

Index Terms

AI-personalized learning; AI-driven learning; Artificial intelligence; Personalized learning; Student perception.

1 INTRODUCTION

Artificial intelligence (AI) is considered one of the most important technologies developed in the last few decades, affecting virtually all areas of human activity. As AI is developing quite rapidly, it is natural that its integration also affects the field of education, and applications based on its principles permeate education systems worldwide.

AI aims to mimic human intelligence in machines and enable them to perform tasks that usually require human cognition (Harkut and Kasat, 2019). AI thus encompasses a range of cognitive abilities such as visual learning, speech recognition, decision making and natural language processing. These technologies permeate various aspects of everyday life and include areas such as healthcare, commerce, industry and education (Raja et al., 2024; Elliott, 2019; Ltifi, 2024).

AI-based educational technologies are now becoming a focus for all participants in the education field – school management, teachers, students and often their parents. With the arrival and gradual adoption of virtual assistants such as Google Assistant, Siri and Alexa, AI is also being integrated into educational applications that aim to enhance students' knowledge beyond the school environment. For example, real-time learning platforms such as Duolingo have become some of the most popular. The development of massive open online courses (MOOCs) has also contributed to the wider application of AI in education, as these platforms use AI algorithms to deliver personalized learning and analyse students' outcomes (Jaakkola et al., 2020). Other AI-based solutions have also become popular, including chatbots and adaptive systems that not only support learning and teaching but also facilitate administrative tasks.

AI-enabled chatbots, also known as conversational agents, encompass a wide range of systems with different capabilities, but most researchers define them as tools that enable human-machine dialogue (Mekni et al., 2020). Some systems are designed to assist educators in teaching or are used for administrative purposes, such as answering frequently asked questions (FAQs) (Sandu & Gide, 2019). The main purpose of many AI chatbots is to provide information support related to teaching. For example, they can simply summarize the course material (Lee et al., 2020) or serve as virtual assistants for university study departments. In this role, they can help students obtain information about graduation dates, available courses or classroom locations (Mekni et al., 2020).

Adaptive learning systems focus on providing personalized content, individualised learning paths, diagnostic advice, recommendations and feedback (Xie et al., 2019). These systems are becoming more prevalent, particularly in countries such as the United States and the United Kingdom, where adaptive learning solutions are offered by companies such as DreamBox Learning, BYJU'S (Wang et al., 2023) and IBM Watson Education (Russo-Spena et al., 2019). They are designed to respond to students' different needs and abilities, while being able to provide real-time feedback that supports personalized learning and student motivation.

With the growing importance of online and hybrid learning models, which have become more prevalent especially in the wake of the COVID-19 pandemic, there is a growing need for scalable and effective personalized learning solutions. AI-driven learning is both an innovative approach to education and a key technology of the future. However, its success depends on its ability to adapt to students' preferences and expectations. If these systems are useful and motivating for students, they can make a significant contribution to the transformation of education.

However, if these systems fail to meet learners' expectations—particularly in terms of interactivity, feedback quality or emotional support—their adoption and sustained use in educational practice may be limited. To address these challenges and design effective AI-based educational tools, it is essential to anchor their implementation in robust pedagogical frameworks and contemporary learning theories.

The use of AI in learning spaces offers new possibilities for personalized learning. AI-supported platforms can have content, pace and feedback personalized to each student's individual needs, thereby enabling more personal interaction and self-study. Recent research observes that AI-powered personalized learning is aligned with constructivist pedagogical principles, which emphasize active construction of knowledge via individual experience and situated interaction (Ayeni et al., 2024). Here, AI can be a facilitator providing adaptive routes, formative evaluation and supportive feedback according to student progress.

Current research confirms that AI-based systems can improve learning outcomes through greater differentiation, autonomy and responsiveness in the learning process. For instance, Merino-Campos (2025) conducted a systematic review demonstrating that AI technology has immense potential for optimizing academic achievement through the tailoring of content and feedback according to individual learner needs. Furthermore, one of the most debated benefits of AI systems, immediate feedback, allows students to correct mistakes instantly and improve metacognitive regulation (Wang et al., 2023).

Apart from the pedagogical value, emotional and motivational support is an essential component of effective AI systems. The new trend in affective computing allows AI systems to recognize and respond to students' emotions and thereby provide personalized motivational interventions (Number Analytics, 2025). However, it has been established that the impersonality of AI feedback can limit its impact compared to human interaction and there is a requirement for hybrid models of AI support combined with traditional pedagogical practices (Paugh, 2025).

This study focuses on exploring university students' opinions and experiences of AI-driven personalized learning. It aims to assess the usefulness (effectiveness) of these systems and their potential for future implementation in university education. Key areas of this research focus on the extent of AI use in the educational process, the perceived effectiveness of AI-generated learning materials and the differences between traditional and AI-personalized learning. Based on these aspects, the following research questions were formulated:

1. How do students perceive AI-driven personalized learning?
2. How do students evaluate the effectiveness of AI-generated learning materials and exercises compared to traditional learning materials?

2 RESEARCH METHODS

This research is based on a constructivist paradigm that aims to understand how university students perceive and interpret AI-driven personalized learning. The research focuses on the individual perspectives of the respondents, because each person develops their own worldview based on their own personal experiences and social environment (Creswell, 2014). A constructivist approach allows us to better understand how students perceive and evaluate this type of learning, which is a key to its future implementation.

The study uses a mixed research design, combining both quantitative and qualitative methods. Data were collected through a questionnaire survey consisting of 12 questions. Students answered both closed-ended (Likert scale) questions and open-ended questions aimed at exploring subjective experiences. The questionnaire was distributed via Moodle and took approximately 15-20 minutes to complete.

As part of the experimental design, one fully AI-generated chapter was integrated into each course. These chapters were created using ChatGPT-4 and developed based on pre-existing teacher-designed materials. The content included study texts, exercises, as well as automated feedback and encouragement. The AI-generated chapters were intentionally placed in the middle of the course, a period identified as optimal for supporting fluctuating student motivation. Students were explicitly informed that this content was generated by AI, ensuring transparency.

Figure 1: *Example of AI-generated chapter. Source: (Slepankova, 2025).*

A total of 270 students from University of Ostrava (Czech Republic) participated in the research survey. The data collection took place in two phases. The first phase was conducted between October and December 2023 and involved 150 respondents, while the second phase took place in the same period of 2024 and included 120 students.

The participants were enrolled in the courses *Fundamentals of Informatics (TIN)*, *Logic for Informatics (LOG)* and *English for the Major 1 (ENG)*. Students were able to compare the AI-personalized chapter with traditional course chapters that they had studied earlier in the same semester. This allowed them to evaluate the AI-generated content in relation to their direct experience with conventional materials. The study did not aim to identify demographic differences in AI perception (e.g., by gender or age). Instead, it focused on capturing general attitudes and overall readiness to engage with AI-personalized learning across a naturally diverse student population. Based on self-assessment, students were categorized into three knowledge levels: beginner (BEG), intermediate (INT) and advanced (ADV). The AI-generated materials were then adapted to these levels through prompt engineering. For beginners, the content focused on simplified explanations and foundational concepts. Intermediate learners received moderately complex content and practice, while advanced students engaged with more sophisticated theoretical material and challenging exercises. This stratification allowed students to interact with material appropriate to their abilities and learning pace.

2.1 Quantitative data analysis

The quantitative data analysis was based on an evaluation of students' responses to a questionnaire survey that included two key questions:

1. How do students rate the effectiveness of AI-generated learning materials and exercises compared to traditional learning materials?
2. How do students perceive AI-driven personalized learning?

The data were collected through a questionnaire survey in which students answered the two main questions using a Likert scale. The Likert scale ranged from 1 = much more effective to 5 = completely ineffective, with respondents rating the effectiveness of AI-generated materials compared to traditional teaching methods and the benefit of content personalisation to their learning. The data were then analysed using descriptive statistics, including calculation of frequencies, percentage distributions and means. For better interpretation, the results were presented using pie and bar charts. The focus was on illustrating the distribution of students' attitudes and identifying trends in their perceptions of AI-driven personalized learning. Inferential statistical tests were not conducted, as the primary aim was descriptive analysis rather than hypothesis testing.

2.2 Qualitative data analysis

We used thematic analysis, which systematically identifies, analyses and organizes patterns in qualitative data (Braun & Clarke, 2006). We aimed to uncover and describe key themes in respondents' answers in line with the research questions.

A deductive approach was chosen for the analysis (following Graneheim et al., 2017), which provided an opportunity to compare the data with existing models of personalized learning. The analysis process consisted of several steps:

1. **Preliminary data exploration** – transcripts of student responses were read repeatedly to identify initial patterns and relationships between statements.
2. **Coding of data** – individual passages of text were coded to capture key aspects of respondents' answers.
3. **Category formation** – codes were grouped into broad categories reflecting the main concepts associated with AI-driven personalized learning.
4. **Identification of main themes** – four dominant themes were defined based on the grouped codes: *personalisation, support, feedback and good change*.
5. **Data review and interpretation** – final themes were analysed in relation to the research questions and previous studies, enhancing the theoretical understanding of the topic.

This approach provided a structured framework for examining students' responses and offered deeper insights into their experiences and attitudes towards AI-driven personalized learning.

In addition to the content and exercises, ChatGPT-4 also generated motivational feedback for students. These encouraging messages were inspired by the tripartite encouragement model (TEM) of Wong (2015), which emphasizes personal growth, emotional support and self-actualization. The goal of these messages was to boost

students' confidence, particularly after mistakes or when they doubted their abilities. By reinforcing effort and persistence, the AI support aimed to sustain students' motivation throughout the learning process.

This research approach allows us to capture a wide range of student attitudes and experiences, which helps us better understand how effective and beneficial personalized learning using AI can be.

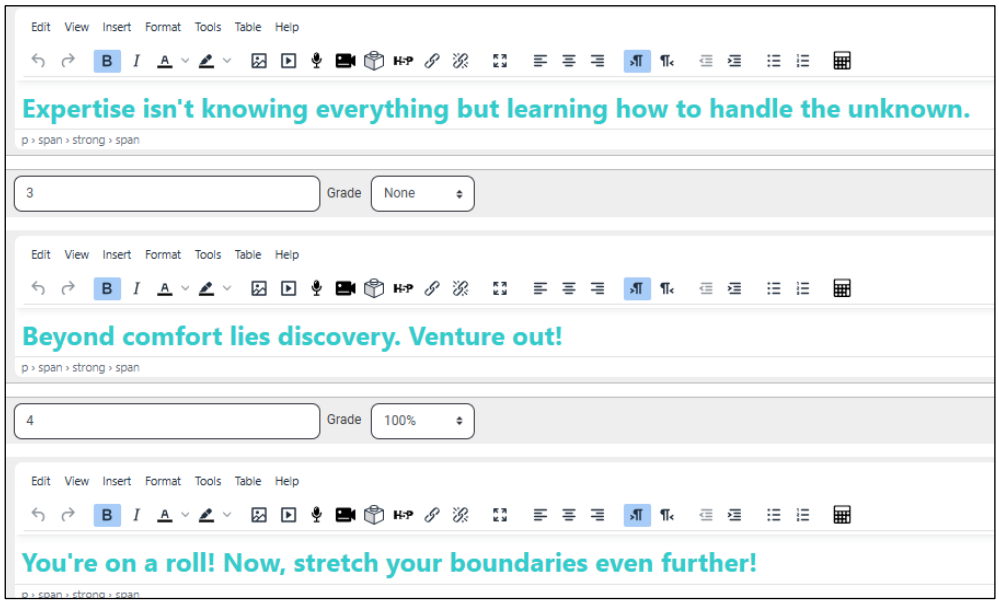

Figure 2: *Example of encouragement. Source: (Slepankova, 2025).*

Figure 3: *Examples of positive feedback. Source: (Slepankova, 2025).*

3 RESEARCH RESULTS

3.1 Quantitative results

The survey focused on two main questions: how students perceive the effectiveness of AI-generated learning materials compared to traditional methods and what benefits they see in personalized content. Respondents provided their ratings on a five-point Likert scale, where 1 indicated the most positive response and 5 the most negative.

3.1.1 Perceived effectiveness of AI-generated learning materials

As demonstrated in Figure 4, the results indicate that many students found AI-personalized chapters to be marginally more effective in comparison to traditional chapters. Specifically, 64.1% of the respondents evaluated AI-generated materials as more effective, while 13.9% found them to be much more effective and 50.2% considered them to be slightly more effective.

Conversely, 17.8% of the students regarded the effectiveness of AI-personalized chapters as comparable to traditional teaching methods, while 18.1% of the respondents perceived AI-driven learning negatively. Of these, 15.8% reported that AI-generated chapters were less effective than traditional instruction and 2.3% rated them as completely ineffective.

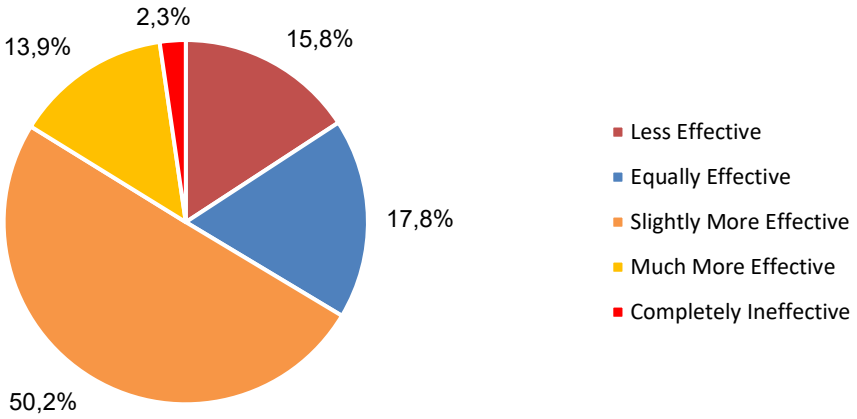

Figure 4. *Student perceptions of AI-personalized chapter design. Source: (Slepankova, 2025).*

3.1.2 Benefits of content personalisation

As demonstrated in Figure 5, the personalisation of content was perceived positively by many students, with 54% of the respondents indicating that it was beneficial (38.2% reported it to be somewhat more effective and 15.8% deemed it to be much more effective). This trend indicates that AI-driven personalized learning is widely regarded as beneficial, particularly in terms of customising learning materials to suit individual student needs.

A neutral stance on content personalisation was adopted by 30.5% of the students, who did not perceive a substantial difference between AI-generated and traditional learning materials. This suggests that while personalisation may confer benefits to certain groups of learners, it may not add significant value to others.

Conversely, 15.4% of the respondents held a negative perception of content personalisation. Specifically, 13.9% expressed that AI-personalized materials were somewhat less effective and 1.5% considered them to be much less effective. These results indicate that while AI-driven personalisation has the potential to enhance the learning process, its benefits are not universally applicable and there is scope for further optimisation and improvement.

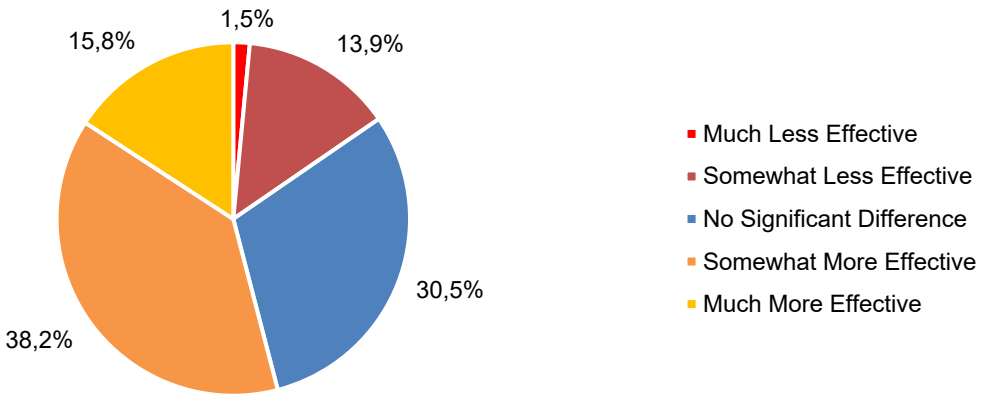

Figure 5. *Effectiveness of AI-generated materials vs traditional materials. Source: (Slepankova, 2025).*

3.2 Qualitative results

A qualitative analysis was conducted through thematic analysis, which resulted in the identification of four primary themes, eight secondary themes and six codes (see Table 1). Participants were designated as respondents (R1, R2, R3, … RXXX) for the purposes of the research.

Table 1. *Themes identified through thematic analysis.*

Primary themes	Secondary themes	Codes
PERSONALISATION	*Interactive learning*	*Lack of advanced interactivity and visualisation*
	Simplify content	
SUPPORT	*Increased motivation*	
	Self-assessment	*Credibility check*
FEEDBACK	*Need detailed feedback*	*Next steps*
		Interaction
	Immediate feedback	*Automated feedback*
GOOD CHANGE	*AI as the future of education*	
	Adoption of AI in education	*I "like" it.*

3.2.1 Personalisation

The personalized approach to teaching was perceived positively by many students. Students expressed appreciation for the ability to adjust the pace of learning, the accessibility of materials for different levels of knowledge and adaptive exercises to suit individual needs. However, some students pointed to the lack of advanced interactivity to enable a deeper understanding of the material.

Table 2. *Selected student responses.*

Respondent	Respondent's answer
R11	*I liked the personalization, so AI was able to explain the topic very well and I think even a person who doesn't study computer science or isn't involved in it would understand it.*
R49	*I liked the advanced knowledge exercises because the test questions were harder. They made me really think; I had to read them twice and consider each of the possible answers on the test.*
R84	*Adapting to the student's level of proficiency was a nice change in the approach to learning.*
R23	*I miss the interactivity where I could ask a question or get further explanation.*
R176	*I liked the chapter on artificial intelligence; I didn't follow it much in class because the teacher talks much more unpleasantly and quickly. Here I had my own time to read the questions and think about the answers – at my own level of knowledge.*

3.2.2 Support

The motivational and supportive elements of AI were found to be positively rated by many students. The positive feedback and encouragement received from AI was appreciated by students, as it helped maintain their motivation to continue learning. However, it was also noted by some students that the AI-generated support was not as emotionally effective as encouragement from the teacher.

Table 3. *Selected student responses*

Respondent	Respondent's answer
R38	*I found it very beneficial and the style of explaining the material was easy to understand. I also liked the encouraging approach after each chapter.*
R162	*The encouragement gave me more confidence. Although I felt like a beginner at first, I eventually moved up to the next level and surprisingly knew most of the answers. Of course, I made a few mistakes, but that's part of learning. And because somewhere at the beginning of the test it said, "AI is not judging you", this also contributed to my confidence during the tests.*
R215	*I appreciated the encouragement from the AI, especially when she advised not to give up after a mistake, but to see it as motivation to keep studying and improving (even though you may already know this, it's nice to have it pointed out).*
R223	*The AI encouragement was surprisingly effective and quite entertaining. In my opinion, this is a beneficial aspect of online learning.*
R127	*The sentences that were supposed to encourage us didn't seem very effective. I don't find it encouraging when the computer writes a generic encouraging sentence. Encouragement from an AI is not same as from a teacher, it doesn't carry the same weight. I'd rather get it directly from a teacher who can appreciate my performance.*

3.2.3 Feedback

The real-time feedback was met with a positive response from students; however, some expressed a desire for more comprehensive explanations of errors and more in-depth verbal evaluation. While automatic feedback enabled swift correction of answers, some students indicated a preference for a more personalized approach or at least more thorough analytical feedback.

Table 4. *Selected student responses.*

Respondent	Respondent's answer
R20	*... it's a pity that after the test results have been evaluated, it is not explained what was wrong and, more importantly, how it should be done correctly. More detailed feedback is missing. Thank you for the opportunity to try this course.*
R56	*... I would like it if the AI explained to me during the course why my answer was incorrect and after the explanation asked me if I understood the topic. If not, she would have taken a different approach to explaining the problem I didn't understand so I could be sure of the topic...*
R214	*I would welcome an explanation of the correct answers – for example, practical examples, experience or more detailed information.*

3.2.4 Good change

The students' attitude towards the integration of AI in educational settings was predominantly positive. A significant proportion of the respondents regarded AI as having considerable potential to transform education, primarily citing its capacity to enhance efficiency and personalise learning materials according to individual students' requirements.

Table 5. *Selected student responses.*

Respondent	Respondent's answer
R5	*In my opinion, AI is the future in all fields, including education. This course is a direct example of what this could look like in the future, where the course adapts to my needs and my experience in the subject matter.*
R21	*I'm glad your faculty is working with AI because it can make learning more beneficial for future generations – and more time-efficient for you as educators.*
R52	*In the future, AI-generated materials will be very beneficial for learning.*
R60	*I think it's an innovative way of teaching that will become useful and commonly used over time. I'm happy with artificial intelligence.*
R74	*The positive motivation was a very pleasant change compared to standard LMS Moodle courses. Keep it up!*

Respondent	Respondent's answer
R236	*I liked the connection between the curriculum and AI and the overall concept. So far, I'm not sure what could be changed or improved.*

The thematic analysis illustrated by the bar chart (see Figure 6) demonstrates the frequency of mentions in the four primary themes of feedback, personalisation, good change and encouragement. Respondents specifically cited personalisation 27 times, encouragement 20 times, good change 12 times and feedback 12 times.

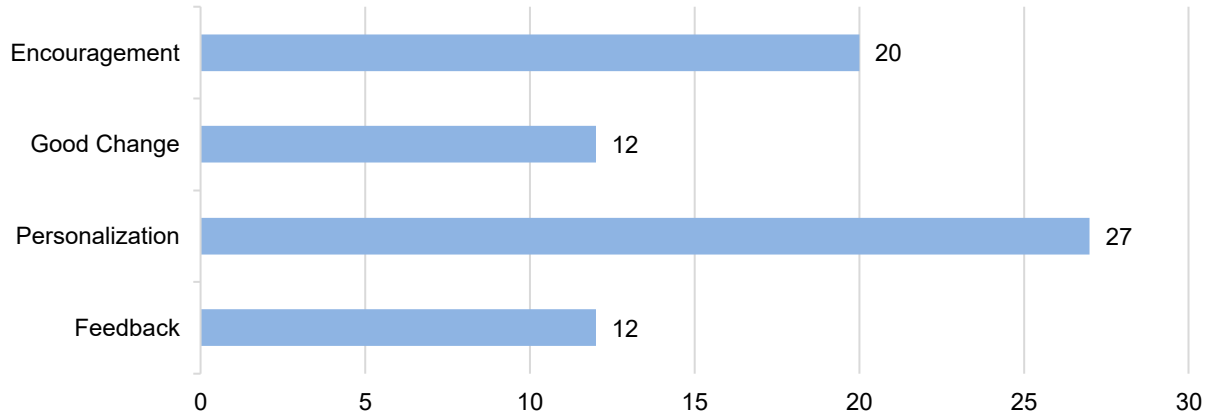

Figure 6. *Frequency of mention of main themes.*

4 DISCUSSION

This study focused on the perception and evaluation of AI-driven personalized learning among university students. It aimed to answer two key questions: (1) how students perceive AI-driven personalized learning and (2) how they evaluate the effectiveness of AI-generated learning materials and exercises compared to traditional teaching methods.

The research focused on the impact of personalization on student engagement and learning outcomes. The results showed that many students perceived AI personalized chapters positively. In fact, the most frequently cited benefits were the ability to learn independently, adapting the pace and content to individual needs and providing real-time feedback. These findings correspond to earlier research (e.g., Katiyar et al., 2024) that found that adaptive education systems have the potential to increase student motivation and learning efficiency.

However, 30.5% of the respondents though that there was not much difference when using traditional materials and AI-generated materials, which means that in their opinion, personalized learning could only be effective when it comes to students' learning styles and preferences.

In terms of examining the effectiveness of AI-generated learning materials and exercises, the data showed that most students appreciated the AI-generated materials, but the level of positive feedback varied. According to 54% of the students, they were the most preferred of all, whereas 38.2% of the grades were in-between and 15.8% opted for higher ratings. Fast real-time feedback was an important aspect as students considered it an essential tool that allowed them to immediately get a clear picture of mistakes and know how to adjust their learning strategies. This finding is well-aligned with a study carried out by Vorst & Jelicic (2019), which demonstrated that automated feedback can greatly enhance the effectiveness of learning.

Nevertheless, some students did not fully approve of the feedback as they considered it less valuable and less detailed compared to the feedback provided by the teacher. 15.4% of the students thought that AI-personalized materials were less useful, while 13.9% and 1.5% only rated them slightly less and significantly less useful, respectively. It was identified that the worst aspects were the absence of opportunities for interaction and the lack of advanced visual tools, which is in line with Jian (2023), who mentioned that currently, AI learning systems are not as interactive and dynamic as they should be.

The findings indicate that technology-driven education linked to AI is a beneficial option for students; nonetheless, the way this benefit plays out is subject to the quality of the feedback, the level of interactivity and the availability of pedagogical material. This means that the AI tool needs to generate instant feedback to students, but the machine should also be able to explain the mistakes and give some specific suggestions as well. Further advancement of interactivity, for instance, through visual simulations as well as direct communication with an AI tutor, is generally considered to be most exciting. AI would rather play a supportive role to the educator, which would enable the students to have a more comfortable and individualized way of learning. This idea is further validated by our finding that almost one-third of the respondents did not think that AI personalisation had any significant impact. Thus, the educational sector could think of combining AI with the conventional teaching process into mixed learning so that students are given more flexibility and better access to study materials.

5 CONCLUSION

This research confirmed that AI-driven personalized learning can bring many benefits to students, particularly the customization of content to individual needs, instant feedback and the ability to learn at their own pace. Yet, challenges remain, mostly related to limited interactivity and depth of feedback, which may affect the adoption of AI-driven learning among students.

To make AI education systems more effective and widely adopted, there is a need to focus on developing interactive elements, expanding analytical feedback and integrating AI with traditional pedagogical approaches. This could address students' main reservations while strengthening the role of AI as a useful tool for modern education.

The quantitative analysis revealed that 64.1% of students found AI-generated materials more effective than traditional teaching materials. On the other hand, 18.1% of students expressed a negative attitude, mainly due to limited interactivity and lack of deeper analytical feedback.

ADDITIONAL INFORMATION AND DECLARATIONS

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Conflict of Interests: The authors declare no conflict of interest.

Author Contributions: M.S.: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing – Original Draft, Visualization. K.K. (Kilianova): Resources, Data curation, Writing – Original Draft, Writing – Review & Editing. P.K.: Resources, Data curation, Writing – Review & Editing, Project administration, Funding acquisition. K.K. (Kostolanyova): Supervision, Funding acquisition. M.K.: Resources, Supervision. H.H.: Formal analysis, Data curation, Supervision.

Institutional Review Board Statement: This type of long-term research was approved by the Ethics Committee for Research of the Faculty of Education, University of Ostrava (protocol numbers OU-143541/45-2023 and OU-101659/45-2025).

Informed Consent Statement: Informed was obtained from all participants involved in the research. Each participant received detailed information about the study via e-mail and was informed by their teacher before the research began. Participation was voluntary, and students had the option to decline before engaging with the AI-generated content. Additionally, traditional study materials remained available, ensuring that students could complete the course without using AI-base materials.

Statement on the Use of Artificial Intelligence Tools: The authors declare that artificial intelligence tools were used in this study. ChatGPT was utilized for generating the abstract and part of conclusion, with the final version reviewed and edited by the authors. Additionally, DeepL was used for translation. The use of these tools complied with the journal's ethical guidelines. All AI-generated content was reviewed, verified, and edited by the authors, who take full responsibility for the final content.

Data Availability: The data supporting the findings of this study are available from the corresponding author upon request.

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