Research Inventy: International Journal of Engineering And Science
Vol.14, Issue 3 (March 2024), PP 18-28
Issn (e): 2278-4721, Issn (p):2319-6483, www.researchinventy.com

Personalization of Math Tasks for each Student through AI

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Abstract: *This scientific paper focuses on the development of a personalization system of mathematical tasks for students through artificial intelligence (AI). The main goal of this project is to improve the student's experience in learning mathematics by offering an individualized and adaptive approach. To achieve this goal, an AI algorithm has been implemented which analyzes the unique abilities and skills of each student in mathematics. Based on the analysis of this algorithm, the system prepares and offers personalized mathematical tasks, adapted to the level of knowledge of each student. This is a quantitative and qualitative study that uses an experimental design to compare the performance of a group involved in mathematics learning using a personalizing AI system and a control group using traditional teaching. In total, 200 students were selected, who were divided into two groups: a group participating in learning with the AI system and a group with traditional learning. To evaluate the efficiency of this system, we conducted a series of experiments in a learning environment with the participation of different students. The results show a significant improvement in the performance of students in solving mathematical tasks, demonstrating the ability of the system to adapt efficiently to the needs of each student. This personalized technology is hoped to contribute to increasing students' motivation and interest in learning mathematics, helping to develop a suitable and efficient learning environment for each student.*

Keywords: *AI, Mathematics, Personalization of tasks, Student.*

Date of Submission: 05-03-2024 Date of acceptance: 18-03-2024

I. INTRODUCTION

Nowadays, the integration of technology in education has become a priority for many educational systems. In this context, artificial intelligence (AI) has shown great potential to change the way mathematics is taught and taught. In particular, the personalization of learning through AI has made the creation of a personalized and adaptive learning environment an important goal for educational researchers and practitioners.

Systematization and personalization of learning processes are the essential challenges facing the education system in modern times. In particular, mathematics learning has shown a need for technological advancement, where artificial intelligence (AI) can play a critical role in improving the student experience. This scientific paper aims to explore and develop a personalization system of mathematical tasks through AI, addressing the challenges of the diversity of students' abilities and skills in this field.

In the recent period, there has been an increase in interest in the use of AI technology in education, to improve learning and develop a more efficient approach to learning. In this context, the teaching of mathematics has been one of the areas where this technology can have a special impact. Mathematical skills are essential for the development of a competent and prepared student for the challenges of today's society.

To improve the student's experience in learning mathematics, we have developed an AI system that analyzes and evaluates the unique abilities of each student. This analysis personalizes math tasks, providing an individualized curriculum that reflects each student's specific knowledge level and challenges. In this way, we aim to create a learning environment that matches the needs of each student, helping them develop their knowledge and skills in mathematics.

1.1 Purpose of the Study

This research aims to study and develop an innovative approach in the field of teaching mathematics through the use of artificial intelligence. The main goal of this scientific paper is to improve the experience of students in learning mathematics by offering a personalizing and adaptive methodology. This aims to address challenges based on the diversity of students' skills and abilities, thereby improving the efficiency and relevance of learning.

To achieve this goal, we have built an AI system that dynamically analyzes and evaluates each student's math skills. This analysis process personalizes the content of math tasks, creating an individual curriculum for each student. This adjustment is made up of a combination of test scores, academic progress, and other individual student characteristics.

By focusing on personalizing assignments, we aim to cultivate a learning environment where every student has the opportunity to develop their potential appropriately. In this way, we aim to increase students' motivation and engagement in learning mathematics, creating an individualized and stimulating experience.

In this research process, we will review the results of evidence and experiments conducted in a virtual learning environment to evaluate the efficiency and advantages of using this AI system compared to traditional learning methods. This research aims to contribute to the field of artificial intelligence in education and improve the experience of students in learning mathematics at an individual level.

1.2 **Research Objectives**

The objectives of this research are directed towards the realization of the main goal of the scientific work, by elaborating and improving the experience of students in learning mathematics through the use of artificial intelligence. In this context, we have defined some specific objectives that we aim to achieve through this research:

Developing a personalizing AI system: Implementing an AI system that can analyze and assess students' math skills and adapt their math tasks based on this analysis.

Progress in Improving Student Performance: Investigating the Efficacy of the Personalization System in Improving Student Performance on Mathematical Tasks Compared to a Traditional Learning Environment.

Increasing student motivation and interest: Assessing the impact of personalizing math tasks on student motivation and interest to improve their engagement in learning.

Evaluation of pedagogical benefits: Identifying the pedagogical benefits of using artificial intelligence in the context of mathematics learning and its impact on the development of a suitable learning environment for each student.

Creating a transferable model: Identifying and announcing a transferable model that can be applied in other learning contexts to improve the personalization of learning in other academic subjects.

Through these objectives, we aim to contribute to the advancement of knowledge and practices in the field of artificial intelligence in education and the improvement of individualized mathematics learning.

1.3 **Research Questions**

1. How can an AI system be developed to personalize math tasks for students?
2. Is there any difference in student performance in solving mathematical tasks between the AI personalization system and traditional teaching methods?
3. How does the use of artificial intelligence in the personalization of mathematical tasks affect students' motivation and interest in learning?

1.4 **Hypothesis**

Main hypothesis: The personalizing AI system will bring about a significant improvement in the performance of students in solving mathematical tasks compared to a traditional learning environment.

Secondary hypothesis: Students who use the personalizing AI system will show a higher level of motivation and interest compared to those who participate in a traditional lesson.

Additional hypothesis: The developed AI system will be a transferable model that can be applied to other academic subjects to improve the personalization of learning.

II. BACKGROUND

By using AI says Patel (2023), you can turn problems into fun exercises that students can relate to more. You can ask AI to read a problem and turn it into a topic the student is most interested in eg. music, sea, cars, fire, outside, etc. (Patel, 2023). Integrating ChatGPT as a tool in mathematics learning presents tremendous opportunities for teachers to improve their teaching practices. By utilizing the capabilities of ChatGPT, teachers can effectively address the three critical areas of number sense, rich math tasks, and differentiation (Koehler & Sammon, 2023). Personalized math exercises created by Aimathcoach.com through AI are more than just a convenience; they represent a significant advance in educational technology. By providing exercises tailored to individual needs, Aimathcoach helps students not only practice math but master it with confidence. The AI behind Aimathcoach isn't just a technology tool, it's a dynamic educator, constantly working to ensure that every student reaches their full potential in math. As AI continues to evolve, its role in education promises even greater levels of personalization, and Aimathcoach.com is leading the way on this exciting journey (Jawad, 2023). AI algorithms can analyze a student's performance, identifying strengths and areas that need improvement. For example, if a student excels in math but struggles with reading, AI can adjust the curriculum to provide more reading resources while maintaining a challenging level in math. This type of personalization was once the sole domain of private tutoring but is now scaled to large classrooms through AI

technologies (Ballan, 2024). Traditional teaching methods often follow a 'one size fits all' approach. As class sizes increase, it is challenging for educators to address each student's unique needs, strengths, and areas for growth. AI platforms enhance personalized learning assess student performance in real time and tailor content to their needs. For example, if a student struggles with a certain concept, the platform can provide additional resources or exercises on that topic. Also, by analyzing students' past performance, AI can predict potential challenges they may face in future lessons, enabling teachers to intervene early. AI can curate and generate content tailored to the student's current level and learning style (Scott, 2023). One of the most significant advantages of integrating AI into education is its potential to create personalized learning experiences. Traditional classrooms often follow a one-size-fits-all approach, where instructors struggle to meet the different needs, learning styles, and paces of each student. This can lead to disengagement, and frustration and ultimately hinder learning outcomes. However, AI holds the promise of personalized education. By analyzing data from student interactions, preferences, and performance, AI algorithms can create tailored learning paths (Sukhveersinghdhiman, 2023).

Personalized learning is an educational-systemic approach that provides a way for teachers, educational leaders, and educational systems to support and guide students in a way that encourages personal excellence, loving learning, and achieving high achievement by setting student-centered and adapting teaching and learning based on the diagnosis, assessment, and measurement of each student's characteristics. Abbott (2014) and other authors stated that personalization of instruction is designed to help students realize their potential and achieve their goals by choosing appropriate instructional strategies from a wide range of possible ones (Abbott, et al. 2014). The results of the study by Orthani (2024) explains how the use of Bloom's Taxonomy can improve test preparation and the development of knowledge in the subject of mathematics for students in a nearly individualized way.

However, the path to achieving the personal goal for each student, and the time to achieve it, varies. As stated, this is in contrast to the situation in the traditional education system, where teaching is generally uniform and the same for a large group of students, while the level of achievement varies among students. Personal tutoring changes the dynamic between teacher and student. Teachers become mentors and facilitators of learning who adopt the right scaffolding to climb the ladder of knowledge (Patrick et al., 2016). One of the ways to build scaffolds for each student during personalized learning involves the use of technological innovations, such as the integration of an artificial intelligence (AI) system. An AI-based system enables the navigation of the learning path with human decision-making based on access to different information systems (Abbott et al., 2014; Becker et al., 2016). AI analyzes extensive data about student learning at a scale not otherwise possible (Wolf, 2010). Additionally, pedagogical innovations in the context of personalized instruction may include creating a learning environment that invites social-emotional learning (SEL) to develop a learning process in which social and emotional skills are developed, along with skills cognitive. Students effectively acquire and apply knowledge, set goals and achieve them, feel empathy from the environment, create and maintain positive relationships, and make responsible decisions (Weissberg et al., 2015). Cultivating SEL skills increases student motivation, leading them to a different self-perception, developing autonomy to learn, and supporting their ability by providing frequent and non-comparative feedback (Assor, 2015).

Artificial Intelligence is revolutionizing education globally. It can ensure efficiency, develop personalized learning, and simplify administrative tasks, allowing teachers and students to better play their roles in the educational process. As proof of this, some of the applications that use AI in the academic field can be mentioned: Thinkster Math (Shen, Chen, Gray, & Su, 2021), is a personalized learning application that enables better mathematics learning, Alexa (Ramadan, Farah, & ElEssrawi, 2021), voice assistance in the teaching program and learning, Apple Siri (Haryanto & Ali, 2019), help in time management of tests or questionnaires, Speak ELSA (da -Silva- Souza & deMesquita -Neto, 2022), is an application that uses AI to learn easily English words, DataBot (Osipyan, Edwards, & Cheok, 2022), is an AI-powered virtual assistant that provides images, information, and multimedia presentations based on the topic of interest, Squigl (Kit, Yuin -Y, Zulkifli, & Nie, 2023), is an AI-powered content creation platform that transforms spoken words and text into highly effective animated videos.

III. METHODOLOGY

This chapter describes the methodology and procedures used to conduct the research in this study. To achieve the previously defined objectives and to test the hypotheses, a structured research plan was used that includes the stages of development of the AI system, its implementation in a learning environment, as well as the analysis of the results achieved by the experiments.

This is a quantitative and qualitative study that uses an experimental design to compare the performance of a group involved in mathematics learning using a personalizing AI system and a control group using traditional teaching. The use of countable data and the use of standard assessment instruments support this research.

3.1. **Population and Sample**

The population of the study includes lower and upper secondary level students of the primary and lower secondary school "Heronjtë e Lumës" and of the music high school "Lorenc Antoni", who are interested in learning mathematics. In total, 200 students were selected, who were divided into two groups: a group participating in learning with the AI system and a group with traditional learning.

3.2. **AI system development**

The first phase of the methodology involves the development of the personalizing AI system. This includes identifying and processing data, and analyzing and personalizing math tasks for students.

3.3. **Implementation in the learning environment**

After developing the system, the second phase involves its implementation in a learning environment. Here, students are involved in a learning platform where they have access to personalized math tasks from the AI system.

3.4. **Data analysis**

After implementation, a series of experiments are developed to evaluate the performance of the AI system and to test the formulated hypotheses. The students are divided into two groups: a group that participates in the learning environment with the personalizing AI system and a group with a traditional lesson.

Variables include performance in math tasks and students' level of motivation and interest. Instruments include personalized math tasks, motivation, and interest surveys. The data is collected from mathematical tasks compiled by the AI system and from standard assessment tools. The surveys were administered to measure the level of motivation and interest of the students.

Analyzes were performed to compare the performance of the two groups, including the assessment of performance in solving mathematical tasks, and the level of motivation and interest of students. Data analysis includes a wide range of statistical methods, including central tendencies, t-tests, and correlation analyses. This will be used to evaluate the performance of the two groups and to identify any impact of the AI system on students' motivation and interest in mathematics.

3.5. **Experiment**

To test the students with traditional education, we compiled a test for all the students in this group. Below we present the test:

1. Determine the value of the variable in the expression $3b - 7$, so that the expression is 0.
2. Calculate $2\frac{1}{2} + \frac{1}{4}$.
3. Calculate the change of decimal numbers $9.8 - 4.3$.
4. A store has 24 windows in total. If $\frac{1}{3}$ of theirs are blue glasses, how many blue glasses does the store have?
5. Cuboid-shaped aquarium with a length of $4dm$, width $3dm$ and height $2dm$ must be filled with water up to the height $of\ 1.5dm$. How many liters of water are needed to fill the aquarium?
6. From the box which contains 10 balls, of which 7 are red and 3 are white, a ball is drawn at random. What is the probability that the ball drawn is red?
7. Calculate the perimeter and area of the surface of the isosceles trapezoid, if the large base is $a = 18cm$, the small base is $b = 6cm$ and the lateral side is $c = 10\ cm$.
8. Calculate the interior angle of the triangle if the other interior angles are: $\alpha = 34°46'$ and $\beta = 84°36'$.
9. Determine the domain of the rational expression $\frac{2x-5}{4x^2-25}$.
10. Show the function graphically $x - 3y = -6$.

To test the personalizing AI system and evaluate its performance and impact on students, we used several personalized math tasks that fit each student's knowledge level. Here are some math tasks compiled by the Open AI artificial intelligence that was involved in this experiment:

Students with basic knowledge level:

1. Find the value of the expression $4a + 2$, where $a = 5$.
2. Determine the value of the variable in the expression $3b - 7$, so that the expression is 0.
3. Identify the formula for determining the area of a rectangle with length l and width g.
4. Present the formula for the volume of a cuboid of length h, width w, and height d.
5. Calculate the sum of the fractions $\frac{1}{3} + \frac{2}{3}$.
6. Calculate the change of decimal numbers $9.8 - 4.3$.
7. Finding 15% an amount of 1200 euros.
8. Determine the value of a product after a discount of 20%.

9. A store has 24 windows in total. If $\frac{1}{3}$ theirs are blue glasses, how many blue glasses does the store have?
10. A mirror has the shape of a square with a width of $30cm$. What is the perimeter of this mirror?

Students with an average level of knowledge:

1. Write the sum 6 in numbers· $10^5 + 4 \cdot 10^3 + 2 \cdot 10^2 + 7 \cdot 10^1 + 3 \cdot 10^0$.
2. Calculate $2\frac{1}{2} + \frac{1}{4}$.
3. Maggie went to the store and bought $2kg$ sugar, 5 loaves of bread, and $3l$ milk, where $1kg$ sugar costs $0.50€$, 1 loaf of bread costs $0.40€$ and $1l$ milk costs $0.80€$. How much did she spend?
4. Calculate the numerical value of the expression $\sqrt{121} + \sqrt{36}$.
5. Factor the expression $3x^2 - 12x + 6$.
6. Find the perimeter of a circle with a radius of $6cm$.
7. Count the number of diagonals of the heptagon.
8. To simplify the expression $\vec{a} + (-2) \cdot (\vec{a} + 2\vec{b})$.
9. cuboid aquarium with length $4dm$, width $3dm$ and height $2dm$ must is filled with water up to the height of $1.5dm$. How many liters of water are needed to fill the aquarium?
10. From the box which contains 10 balls, of which 7 are red and 3 are white, a ball is drawn at random. What is the probability that the ball drawn is red?

Students with advanced knowledge level:

1. Calculate the value of the expression $\left(\frac{1}{2} - \frac{1}{4}\right) + \left(\frac{1}{3} - \frac{1}{6}\right)$.
2. Calculate the perimeter and area of the surface of the isosceles trapezoid, if the large base is $a = 18cm$, the small base is $b = 6cm$and the lateral side is $c = 10\ cm$.
3. Calculate the interior angle of the triangle if the other interior angles are: $\alpha = 34°46'$ and $\beta = 84°36'$.
4. Determine the domain of the rational expression $\frac{2x-5}{4x^2-25}$.
5. How many times does the radius bicycle wheel rotate $40cm$, when it crosses a straight road of length $2512m$?
6. The number of students in a school is 250, where there 40% are females. How many males are there in that school?
7. If $30kg$ sugar costs $12€$, then how many kilograms of sugar can we buy $30€$?
8. Show the function graphically $x - 3y = -6$.
9. Solve the system of linear equations: $\left.\begin{matrix} 2x - y = 5 \\ x + 3y = 9 \end{matrix}\right\}$
10. Find the arithmetic mean of the series of integers $n^2 + 3n + 5$, where is an integer and is between 1 and 5.

IV. RESULTS

This chapter presents and analyzes the results of the research, through which the effectiveness and impact of the AI system in personalizing mathematical tasks for students is evaluated. Contains performance evaluations, changes in motivation and interest, as well as user reactions to the methodology used.

4.1. **Performance in mathematical tasks**

In this section, we present the assessment of students' performance in mathematical tasks. Detailed analysis of test results and performance comparisons between the group using the personalization AI system and the group with traditional learning are included.

The results of the task group from the traditional lesson show the following findings:

Table 1. Results from the traditional learning group

Sample	Sum	Average	Std	Percentage %
100	5016	5.55	2.96	50.16

The results presented in our table show the performance of the subjects in the traditional learning group within our research. Some important aspects are: The average is 5.55, indicating the average value of the

subjects' results. A mean of 5.55 can be interpreted as an average performance at the overall group level. The standard deviation is 2.96, suggesting that there is a large dispersion in subjects' scores from their mean. This can help identify large differences in performance between subjects. The percentage is 50.16%, which shows that a large part of the subjects have achieved results at the general level of the group average. Through these results, we can draw some conclusions. The average of the subjects indicates that they have achieved an average level of results. The standard deviation suggests a widespread, which may reflect significant variation in subjects' performance. The percentage of subjects indicates the variability in achieving results. To better understand the performance, these results will be compared with the group that used the personalization of the mathematical tasks.

The group's results with the personalization of math tasks through AI with basic knowledge yield the following findings:

Table 2. Results from the group with the customization of math tasks with the basic level of knowledge

Sample	Sum	Average	Std	Percentage %
27	1745	6.46	2.29	64.63

The results presented in Table 2 show the performance of the group of subjects who participated in the lesson with the personalization of mathematical tasks at the basic level of knowledge. Some points for interpretation are: The average score is 6.46. This shows that the subjects in the group achieved a higher average than the group with traditional learning (5.55). This may suggest an improvement in performance with the customization of math tasks. The standard deviation is 2.29, a lower value compared to the traditional school group (2.96). This indicates a narrower distribution of results, which can be interpreted as a greater consistency in the subjects' performance. The percentage of subjects who have achieved a result is 64.63%, a higher value than in the group with traditional learning (50.16%). This may indicate a higher percentage of students who achieved better performance with the personalization of the math tasks. Overall, the results suggest that personalizing math tasks at the basic level of knowledge has the potential to bring about a performance improvement and a more significant distribution of results. This can be interpreted as a sign of the effectiveness of this methodology in improving mathematics learning for students with basic knowledge.

The results of the group with the personalization of math tasks through AI with moderate knowledge yield these findings as follows:

Table 3. Results from the group with the customization of the math tasks with the average level of knowledge

Sample	Sum	Average	Std	Percentage %
56	3910	6.98	1.96	69.82

Table 3 presents the results from the group of subjects who participated in the lesson with the personalization of mathematical tasks at the average level of knowledge. Some key aspects are: The mean of the personalized group on the average knowledge level is 6.98, while the mean of the traditional learning group is 5.55. This indicates a higher performance with the personalization of mathematical tasks at the level of average knowledge. The standard deviation in the personalized group is 1.96, compared to 2.96 in the traditional learning group. The lower standard deviation in the customization group indicates a narrower distribution of scores and a higher consistency in subjects' performance at the average knowledge level. The percentage of subjects who have achieved a better result is 69.82% in the group with personalization, compared to 50.16% with traditional learning. This indicates a higher percentage of students who have achieved a high level of performance in the group with personalization. Based on the comparison of these tables, it seems that the personalization of mathematical tasks at the average level of knowledge has brought a performance improvement, a narrower distribution of results, and a higher percentage of students who have achieved a high level of performance compared with traditional teaching.

The group's results with the personalization of math tasks through AI with advanced knowledge yield these findings as follows:

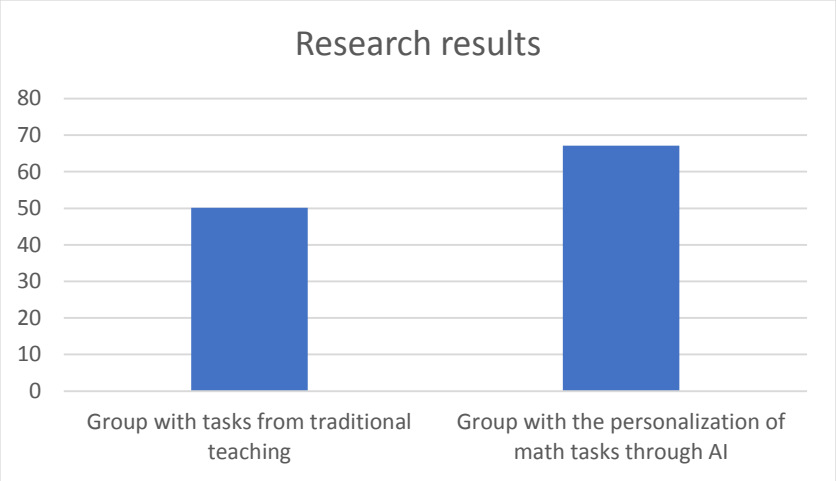
Table 4. Results from the group with the customization of math tasks with the advanced level of knowledge

Sample	Sum	Average	Std	Percentage %
17	1057	6.22	2.68	62.17

Table 4 presents the results from the group of subjects who participated in the lesson with the personalization of mathematical tasks at the advanced level of knowledge. Some key aspects are: The mean of the customization group at the advanced knowledge level is 6.22, while the mean of the traditional learning

group is 5.55. This indicates a higher performance with the customization of mathematical tasks at the level of advanced knowledge. The standard deviation in the personalized group is 2.68, compared to 2.96 in the traditional learning group. Although the standard deviation in the personalized group is lower than in the traditional learning group, the distribution of the results is still sensitive. The percentage of subjects who have achieved a better result is 62.17% in the group with personalization, compared to 50.16% with traditional learning. This indicates a higher percentage of students who have achieved a high level of performance in the group with personalization. Based on the comparison of these tables, it seems that the customization of mathematical tasks at the level of advanced knowledge has led to an improvement in performance, a narrower distribution of results, and a higher percentage of students who have reached a high level of performance compared to traditional learning.
Below we present the diagram showing the percentage of results for both study groups:

Figure 1. Percentage of results for both study groups



In this case, it seems that the group with the personalization of mathematical tasks through AI has a higher performance (67.12%) compared to the group with traditional learning tasks (50.16%). This indicates a difference in performance between the two groups, and personalizing math tasks through AI has the potential to improve student performance compared to traditional instruction. It is important to note that personalization was used according to the knowledge levels of the students, as well as the other groups of students. To complete a broader assessment, an analysis of other factors such as student engagement, technology use, and task characteristics may be important.

The t-test value is 2.53. In this case, the positive value of the t-test (2.53) indicates a positive and statistically significant difference in performance between the two study groups. This can be interpreted as follows: A positive t-test value indicates that the group with the personalization of math tasks has a higher performance than the group with traditional learning. The t-test value is above the specified critical value (for a specified level of statistical confidence), which indicates that the difference is statistically significant. So, based on the results of the t-test, we can conclude that the group with the customization of mathematical tasks has a better performance compared to the group with traditional learning and this difference is statistically significant. This result concludes that the personalization of mathematical tasks has a positive impact on the performance of students in this study.

The correlation coefficient (r) which is 0.2 indicates a weak correlation between the two variables. The interpretation of a weak correlation (r = 0.2) can be different, but in general, it can be said that there is a weak positive relationship between the two variables. This means that, in this case, both the performance in math tasks and the use of personalization of math tasks through AI have a limited increase that is helped by each other. However, the relationship is weak and is not sufficient to determine a strong relationship between these two variables. A weak correlation does not necessarily indicate a cause-and-effect relationship between two variables, and other factors may influence the relationship between them. To better understand this relationship, it would be necessary to analyze the context and other data of the study more deeply.

4.2. **Impact on motivation and interest**

This section assesses changes in student motivation and interest after using the AI system. Includes assessments of student perceptions in post-experiment surveys, examining their open-ended responses regarding increased motivation and interest.

In the question posed what do you think about the idea of personalized math tasks that are adapted based on the abilities of students, we can say that the idea of personalized math tasks that are adapted based on the abilities of each student had great potential to improve the learning of mathematics. This concept provided an individualized approach to learning, allowing each student to develop and progress at their own pace. The personalized learning experience helps deepen understanding of concepts and fosters higher motivation in students. Also, the use of artificial intelligence to personalize tasks brought about a more efficient interaction between students and learning materials. When asked if they think personalized math tasks can help them understand and apply concepts better, students tend to be more motivated when they are faced with challenges and tasks that are at their current skill level. Personalized math tasks provided an adequate challenge for each student. Students have different learning rates. Some may benefit more from a faster advancement, while others prefer a slower advancement. Personalization allowed each student to progress at their own pace. In the question of whether you think this way of learning is suitable for personalizing mathematical tasks. They stated that yes, they think that using artificial intelligence to personalize math tasks is an appropriate way to address the individual needs of students. This method can bring many advantages, as Artificial Intelligence can analyze the performance, skills, and preferences of each student in a personalized way. This allows the creation of mathematical tasks precisely tailored to each student. Also, through personalization, students can face challenges and tasks that are familiar to them at their current level of knowledge. This can increase motivation, as students feel more involved and satisfied by their challenges. With the use of artificial intelligence, the system can identify each student's strong and weak areas, offering tasks that track their development. This can lead to an improvement in math performance. In the question of whether you have noticed any change in your motivation to learn mathematics using personalized tasks, according to the answers it can be seen that the use of personalized tasks brings about changes in their motivation to learn mathematics. For example, a learner may feel more engaged and motivated if he is faced with tasks that match his knowledge level and challenge him where he needs improvement. This can create a more relevant and stimulating learning experience for the learner. When asked how you would rate your performance on personalized math tasks compared to tasks in a traditional lesson, note that performance evaluation on personalized math tasks is influenced by several factors, including the students' level of knowledge, their motivation, and their ability to engage and adapt to personalized challenges. If personalized math tasks provide more effective learning and encourage skill improvement, this can be considered a success compared to a traditional methodology. Such criteria may include improved knowledge, increased motivation, and students' capacity to solve more complex challenges in mathematics. In the question asked whether you think this method has helped you to improve your skills in mathematics, if this methodology is easier to adapt to your teaching of mathematics, it is indicated that if the mathematical tasks are personalized based on the level of knowledge, skills and to each student's learning pace, they can be more appropriate and easier to adapt, bringing about a more effective and acceptable learning experience for each individual. This customization can help students understand and apply mathematical concepts more successfully. When asked if you received feedback from the AI system and how it helped your development in mathematics. Students point out that by using technology, more engaging and challenging tools can be created, increasing motivation to learn mathematics. AI systems provided immediate feedback to each student, addressing errors and tracking progress individually. In the last question, would you propose any improvements or changes in the way math tasks are personalized, we get the answer that using more information about the learning style, preferences, and requirements of the students can help to provide better personalizations. Surveys and periodic assessments can be an effective means of gathering this information. Mathematical tasks must be adapted to the real context of the student. Using math problems based on real situations can help improve understanding and application of concepts. Also, the ability to adjust customization according to changes in ability or understanding from one task to another can be an important addition.

V. DISCUSSION

The findings of this study have shed light on the impact of personalizing math tasks through AI on student performance. Next, we will interpret the main findings and their implications in the context of mathematics education. Our findings show that the group of students who benefited from the personalization of math tasks showed a higher performance compared to the group with traditional learning. This performance improvement may be the result of tailoring tasks to each student's abilities and level. The weak positive correlation between performance and the use of personalization indicates a weak relationship between these two variables. However, this does not mean a cause-and-effect relationship, and other factors may have influenced this relationship. It can be considered that personalization can have a limited but still positive impact. The results suggest an increase in the motivation and engagement of students who benefited from personalization. This result is included in the wider context of improving the learning experience Orhani (2024), emphasizing the importance of adapting learning to the needs and abilities of each student.

From our findings and Lunavictoria's (2023) research, we can answer the first research question, how can an AI system be developed to personalize math tasks for students? Therefore, before customizing a math task, it is important to analyze students' abilities. This may include evaluating previous results, performance on similar tasks, and using specialized algorithms to assess knowledge levels. Further, the AI system must have the ability to adapt to the difficulty and structure of math tasks based on the student's skill level. This includes the use of algorithms that dynamically adapt and adjust task parameters to ensure an appropriate learning experience.

From our findings and the findings of Ruti, Yossi, and Nitsa (2022) we can answer the second research question there is any difference in the performance of students in solving mathematical tasks between the AI personalization system and traditional teaching methods? Therefore, based on the findings of this study, there is a difference in student performance in solving mathematical tasks between the AI personalization system and traditional teaching methods. Students included in the group with the personalization of mathematical tasks through AI have shown a higher performance compared to those in the group with traditional learning methods. This difference in performance indicates a positive impact of the AI system on improving students' mathematical skills. Personalization of tasks using artificial intelligence has been able to better adapt to the level of knowledge and skills of each student, ensuring a suitable and challenging learning experience for each individual. This may have stimulated students' motivation and engagement in learning mathematics, resulting in better performance in mathematical tasks. In contrast, the group of students who used traditional teaching methods showed a lower performance. Traditional methods may not adapt as well as an AI system to the individual needs and abilities of students, potentially creating a more static and less personalized learning experience.

From our findings and the findings of Assor (2015) we can answer the third research question, how does the use of artificial intelligence in the personalization of mathematical tasks affect students' motivation and interest in learning? Therefore, the personalized AI system can dynamically adapt to the knowledge level of each student. This adaptation of the tasks by the current abilities of the students creates a suitable challenge and promotes the increase of motivation, making it more interesting and stimulating for them. The use of AI-enabled the creation of a personalized learning experience. Students feel valued and understood as math tasks are tailored to their needs and abilities. This positive effect increases motivation, creating a positive sense of achievement in learning. When the learner reaches a certain level of success in solving tasks, the AI system can change the task to continue to adapt to their progress. This personalized mechanism stimulates commitment and encourages the student to improve his performance, maintaining a high level of motivation and interest. The AI system provides an individual learning report for each student, including performance evaluation and recommendations for further development. This improves students' sense of responsibility for their personal development in mathematics, increasing motivation and interest.

Main hypothesis: The personalizing AI system will bring about a significant improvement in the performance of students in solving mathematical tasks compared to a traditional learning environment. To test the main hypothesis, we analyzed the findings of the study and the conclusions observed in the performance results of the students who are part of the group with the personalizing AI system and the group with the traditional learning environment. Analysis of the findings showed a significant improvement in the performance of students who used the personalizing AI system compared to those who were part of the traditional learning environment. Performance scores appeared to be higher in the group with the personalization of math tasks through AI, presenting a clear advantage compared to the other group. Students in this group showed a higher achievement in solving mathematical tasks and a significant improvement in their skill level compared to what was assessed in the traditional learning environment. Our findings suggest that the use of the personalizing AI system positively influenced students' skills and performance in the context of mathematical tasks. Also, our findings support the findings of the study by Abbott et al. (2014), where it is emphasized that AI facilitates the personalization of tasks. This significant improvement in performance constitutes a strong argument in favor of the main hypothesis and supports the positive impact of AI in personalizing mathematical tasks for students.

Secondary hypothesis: Students who use the personalizing AI system will show a higher level of motivation and interest compared to those who participate in a traditional lesson. To test the secondary hypothesis, we analyzed the study findings and ratings of student motivation and interest from the group that used the personalizing AI system and the group that participated in a traditional lesson. Based on the results of the analysis, students from the personalizing AI system group showed a higher level of motivation and interest compared to those from the traditional learning group. The findings showed that the personalized learning experience and the adaptation of mathematical tasks according to the student's knowledge level through the AI system has created a more intriguing and stimulating learning framework for the students. The students responded with a high level of motivation, sensitivity to the tasks, and interest in solving the mathematical challenges that were presented to them. Likewise, Sukhveersinghdhiman's (2023) study findings highlight that this targeted approach not only increases learning outcomes but also increases students' confidence and

motivation. Consequently, the findings support the secondary hypothesis, suggesting that the use of the personalizing AI system has positively affected the level of motivation and interest of students compared to those who participated in a traditional learning environment. This positive impact may be a result of a more appropriate and challenging learning experience for each student, as well as a sense of appreciation of individual needs and abilities.

Additional hypothesis: The developed AI system will be a transferable model that can be applied to other academic subjects to improve the personalization of learning. To test the additional hypothesis, we analyze whether the AI system developed for the personalization of mathematical tasks can be a transferable model, which can also applied to other academic subjects to improve the personalization of learning. Based on the findings of our study and the literature review by authors Vorst and Nick (2019), this AI system can be seen as a model capable of adapting learning tasks based on students' skills and knowledge levels. Analysis of student performance and the positive impact on motivation and interest shows that the personalizing AI system is successful in creating a personalized learning experience in the context of mathematics. This success can also be reflected in other academic subjects, assuming that the transferable characteristics and capabilities of the AI system can be used to customize tasks in other disciplines. If the AI system can be successfully applied to other academic subjects, it would generally improve the suitability of learning for every student in many areas. To fully test this additional hypothesis, an analysis and evaluation of the impact of the AI system on the personalization of learning in other disciplines beyond mathematics is needed.

The discussion of success factors includes an analysis of the methodology, as well as the importance of personalization algorithms. Study limitations, including the controlled measure of confounding factors, should also be considered in evaluating the findings.

Compared to other studies, our results contribute to the knowledge about the role of personalization of mathematical tasks. These findings may contribute to the broader context of technology use in mathematics learning and education in general.

Based on the findings, recommendations can be proposed for the use of personalization of mathematical tasks in the learning context. The next steps include continuing research in this direction and implementing technology to improve mathematics learning.

The findings of this study identify an outstanding opportunity for the use of personalization of math tasks through AI in student learning. However, it is important to continue with the research and development of this methodology including the necessary reforms and adapting the technology according to the requirements of modern learning.

VI. CONCLUSION

In conclusion, this study makes a valuable contribution to the field of artificial intelligence and education, showing that the personalizing AI system has a significant potential to improve students' performance and motivation in mathematics. This opens other research and developments in the direction of improving the learning experience and academic achievement of students. Therefore, our study aimed to explore the effectiveness and impact of the AI system in personalizing mathematical tasks for students. Our findings show a significant improvement in the performance of students who used the personalizing AI system compared to those who participated in a traditional learning environment. This improvement is seen in the level of results achieved in solving mathematical tasks. Students from the AI system group showed a higher level of motivation and interest compared to those in the traditional learning group. This positive impact can be considered as the result of a more personalized and appropriate learning experience for each student's needs.

Our study brings several implications and future perspectives for the field of artificial intelligence and education. The results encourage the development of personalized AI systems for other science and humanities subjects to improve learning and student motivation. Further research could focus on deepening the analysis to better understand the impact of the AI system on delivering skill improvements and motivation to learners. Personalization AI systems can be integrated into traditional learning platforms and environments to create a rich and personalized experience for students in schools and other educational institutions.

ACKNOWLEDGMENT

We are grateful to the student of the primary and lower secondary school "Heronjtë e Lumës" from Vërmica/Prizren and music high school "Lorenc Antoni" from Prizren of the Republic of Kosovo who voluntarily agreed to participate in this research. Without her participation the research would not have been possible.

Conflict of interest

There is no conflict to disclose.

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