



Analysis of Artificial Intelligence (AI) Utilization for Improving Motor Skills Learning Outcomes among Elementary School Teacher Education (PGSD) Students

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Abstract

This study explores the use of artificial intelligence (AI) to improve motor skills learning outcomes for elementary school teacher education (PGSD) students. The research investigates how AI can provide timely feedback and personalized instruction in teaching motor skills. Data analysis methods include surveys, observations, and evaluations of learning outcomes. The research findings reveal the following: 1) Female students' motor skills are classified as moderate, with an average score of 200. The classification criteria for female students' motor skills are excellent (5.67%), good (24.33%), moderate (30.33%), poor (32.67%), and very poor (3%). 2) Male students' motor skills are also categorized as moderate, with an average score of 200. The percentage breakdown for male students' motor skills is as follows: excellent (7.32%), good (25.61%), moderate (37.80%), poor (29.39%), and very poor (4.88%). The results indicate that integrating AI into motor skills learning significantly enhances the academic performance of PGSD students. These findings highlight the importance of incorporating AI technology in teacher education, particularly to enhance the motor skills development of PGSD students. The research supports the concept that AI can effectively support motor skills learning at this educational level.

1. INTRODUCTION

The utilization of Artificial Intelligence (AI) to enhance the learning outcomes of motor skills among Elementary School Teacher Education (PGSD) students presents several issues that need to be identified. Firstly, there are challenges in integrating AI technology into existing PGSD curricula. Some educational institutions may encounter difficulties in aligning their curricula with the rapidly evolving AI technology, as well as ensuring its effective use to support motor skills learning. Secondly, concerns arise regarding the dependency on AI technology and the potential reduction of essential human interaction in motor skills learning[1]. Excessive use of AI may diminish the role of teachers in providing direct feedback and supporting learning experiences based on social and emotional interactions. Therefore, further research and careful planning are necessary to address these issues and ensure that the use of AI in the context of motor skills learning among PGSD students brings maximum benefits. You've highlighted an essential concern regarding the integration of AI in education, particularly in the context of motor skills learning among PGSD (Primary Education) students. While AI can offer significant advantages in providing personalized learning experiences and enhancing educational efficiency, it must be balanced with the indispensable role of teachers in fostering social and emotional interactions and providing direct feedback. Firstly, the unique human element of teaching involves empathy, understanding, and emotional support, which are vital for student development. Teachers play a crucial role in recognizing individual student needs, addressing their

concerns, and nurturing their confidence, which might be challenging for AI to replicate entirely. Secondly, direct feedback from teachers is invaluable in motor skills learning, as it helps students understand their strengths and areas for improvement.

While AI can offer automated feedback based on data analysis, it may lack the nuanced understanding and tailored guidance that a teacher can provide. Moreover, social interactions in the classroom contribute significantly to the learning process. Collaborative activities, group discussions, and peer learning foster communication skills, teamwork, and empathy, which are essential life skills. Teachers facilitate and encourage these interactions, creating a supportive learning environment that goes beyond mere academic instruction. Furthermore, the ethical implications of AI use in education warrant careful consideration. Issues such as data privacy, algorithmic bias, and equitable access to technology need to be addressed to ensure that AI benefits all students equally and ethically. In addressing these concerns, further research is crucial to understanding how AI can complement rather than replace the role of teachers. Additionally, careful planning and professional development programs can empower teachers to effectively integrate AI tools into their teaching practices while preserving the human touch and social-emotional aspects of education.

The urgency of employing Artificial Intelligence (AI) to enhance motor skills learning outcomes among PGSD students is crucial considering the challenges and complexities faced in the education process. With AI technology, educational institutions can identify individual patterns in the development of PGSD students' motor skills more efficiently. This enables a more personalized and responsive approach to each student's learning needs, ensuring that everyone receives support tailored to their skill level. Furthermore, the use of AI in motor skills learning among PGSD students can expand accessibility and equity in education[2]. With technology assistance, educators can develop flexible and remotely accessible learning solutions, allowing PGSD students from diverse backgrounds to access the same educational opportunities. This is particularly significant in the current global context where distance learning is becoming increasingly common, and AI can be a powerful tool in supporting the delivery of inclusive and quality education for PGSD students in various regions[3]. Research on the use of Artificial Intelligence (AI) in the context of motor skills learning among PGSD students promises new breakthroughs in education. Firstly, this research will provide a deeper understanding of how AI technology can be optimized to enhance motor skills learning outcomes[4]. This involves exploring various AI algorithms and techniques that can be used to analyze and understand the development of motor skills among PGSD students more accurately. With a better understanding of the potential of AI technology, this research can open doors for the development of more effective and innovative learning solutions. Additionally, this research can also yield practical applications that can be implemented in elementary school teacher education curricula. By leveraging the findings and methods from this research, educational institutions can design more adaptive and responsive learning programs to meet the motor skills needs of PGSD students.

This will help enhance the overall quality of elementary school teacher education by providing a more targeted and personalized approach to motor skills development. Thus, this research can make a significant contribution to innovation in the field of education and pave the way for more effective and inclusive learning for PGSD students in the future. The use of Artificial Intelligence (AI) in education, especially in elementary school environments, has shown promising results in improving learning outcomes. Studies have highlighted the positive impact of AI technology, such as AI chatbots and cloud computing solutions, on both cognitive and affective learning outcomes. Numerous studies have underscored the significant positive impact of AI technology, particularly AI chatbots and cloud computing solutions, on cognitive and affective learning outcomes. AI chatbots, for instance, have revolutionized the way students engage with learning materials by providing personalized and immediate feedback, thereby enhancing their cognitive understanding of various subjects. Through adaptive algorithms, these chatbots can tailor educational content to individual student needs, pacing, and preferences, thereby optimizing the learning process. The integration of adaptive algorithms into chatbots represents a promising avenue in education, offering personalized learning experiences tailored to individual student needs, pacing, and preferences. By leveraging data analytics and machine learning techniques, these algorithms can analyze students' interactions, performance, and learning styles to dynamically adjust the educational content presented by the chatbots. One of the key benefits of adaptive algorithms in chatbots is their ability to cater to diverse learning needs and abilities. Each student has unique strengths, weaknesses, and preferences when it comes to learning, and adaptive algorithms can identify and respond to these differences. For example, a chatbot may provide additional explanations or practice exercises for concepts that a student finds challenging, while offering advanced material to those who grasp concepts quickly. Furthermore, adaptive algorithms enable personalized pacing of learning experiences. Some students may benefit from a slower pace with

more repetition and reinforcement, while others may prefer a faster pace with opportunities for extension and enrichment.

By adjusting the difficulty level and complexity of content in real-time, chatbots equipped with adaptive algorithms can ensure that each student progresses at an optimal pace, maximizing learning outcomes. Moreover, these algorithms can enhance student engagement by aligning educational content with individual interests and preferences. By analyzing students' interactions with the chatbot, including their responses, questions, and engagement patterns, adaptive algorithms can recommend relevant topics, activities, or resources that capture students' attention and motivation. Additionally, adaptive algorithms contribute to ongoing assessment and feedback, enabling continuous monitoring of student progress and performance. By tracking students' responses and performance metrics, chatbots can provide immediate feedback, identify areas for improvement, and suggest targeted interventions or remedial activities to address learning gaps. However, it's essential to acknowledge potential challenges and limitations associated with the use of adaptive algorithms in chatbots. Issues such as algorithmic bias, data privacy, and the risk of over-reliance on technology must be carefully considered and addressed to ensure equitable and ethical implementation.

In conclusion, adaptive algorithms in chatbots have the potential to revolutionize education by offering personalized, adaptive, and engaging learning experiences tailored to individual student needs, pacing, and preferences. Through ongoing research, development, and responsible implementation, we can harness the power of technology to optimize the learning process and empower students to achieve their full potential. Moreover, the integration of cloud computing solutions in educational settings has facilitated seamless collaboration, access to resources, and data-driven decision-making. Cloud-based platforms offer educators and students alike the flexibility to access educational materials from any location with an internet connection, promoting a more dynamic and interactive learning environment. Additionally, the scalability and affordability of cloud computing solutions enable educational institutions to deploy advanced AI-driven analytics tools that can analyze student data to identify learning patterns, predict future performance, and personalize instruction to address individual learning needs.

Furthermore, AI technologies such as natural language processing and sentiment analysis have been instrumental in fostering affective learning outcomes by enhancing student engagement and emotional support. AI-powered chatbots equipped with natural language understanding capabilities can engage students in meaningful conversations, empathetically respond to their queries, and provide emotional support when needed. By leveraging sentiment analysis, educators can gain insights into students' emotional states, allowing them to intervene promptly and provide appropriate support, thereby promoting a positive learning experience and emotional well-being. Overall, the integration of AI technology in education holds tremendous promise for enhancing both cognitive understanding and emotional engagement, thereby empowering students to achieve their full potential. AI has been proven to support learners experiencing difficulties by providing options and boosting their confidence, ultimately enhancing their performance and independence. Moreover, AI tools have been used to predict student performance, automate assessments, and make evaluations more objective, which are beneficial for student assessment in elementary and secondary schools. Therefore, integrating AI into Elementary School Teacher Education (PGSD) programs has the potential to enhance motor skills learning outcomes by providing personalized support, improving assessment processes, and creating more engaging learning environments. Hence, research on the topic of "Analysis of the Use of Artificial Intelligence (AI) on Motor Skills Learning Outcomes among Elementary School Teacher Education Students" is crucial for analysis. [1]. [5]. [6]. [4].

2. METHODOLOGY

This type of research is Non-Experimental with a quantitative approach, emphasizing calculations based on data obtained using survey research methods. The study aims to determine the motor skills of PGSD students. The Motor Ability Test is used to measure basic movement abilities among PGSD students, with a sample size of 80 second-semester students from classes C and D. This test has a reliability of 0.93 and validity of 0.87. Reliability was obtained through test-retest, while validity was established by correlating the test with the criteria used, namely combined scores (Nurhasan, 2000:104). The test consists of four items:

1. Agility test with Shuttle Run 4 x 10 meters.
2. Coordination test with throwing and catching a tennis ball 1 meter away from a wall.
3. Balance test with Stork Stand positional balance.
4. Speed test with a 30-meter sprint.

These four tests, originally suitable for elementary school children, were modified for university students as they involve movements commonly performed by elementary school children. Data collection involves acquiring primary and secondary data for research purposes. Additionally, it is expected that this research will provide engaging learning materials for future students, with the aim of measuring both gross and fine motor development levels in children.

3. RESULTS AND DISCUSSION

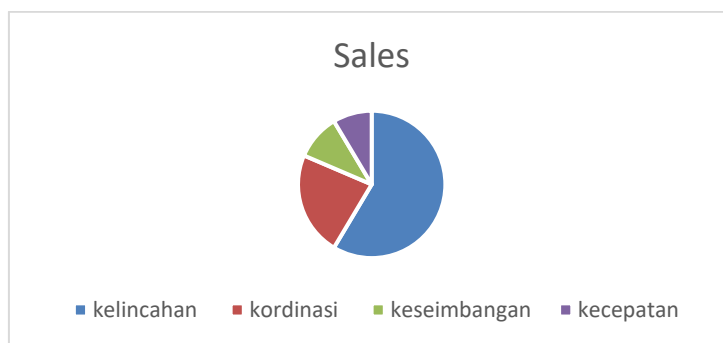
Tabel 1. Description of classification

Klasifikasi	Agility Detik	Coordination Detik/kali	Balance Detik	Speed Detik	Coun T-scor
Mean	10.77	16.00	17,	6	200
Std	0,99	4,20	3	1	24,50
Maks	14,55	59,44	40,5	5	255
Min	9.0	10	50,3	6	155
Kategori	Sedang	Sedang	Baik	Baik	Sedang

From the results of the research, it is evident that the overall motor skills of female students can be categorized as moderate, with an average score reaching 200. This assessment is based on a series of tests covering agility, hand-eye coordination, balance, and speed. The research findings reveal that female students exhibit moderate overall motor skills, with an average score reaching 200. This assessment is derived from a series of tests designed to evaluate various components of motor proficiency, including agility, hand-eye coordination, balance, and speed. These tests provide valuable insights into the physical capabilities and development of female students, shedding light on areas of strength and areas that may require further attention or intervention. In assessing agility, female students are evaluated on their ability to move quickly and efficiently, change direction, and navigate through obstacles with precision. This component of motor skills is crucial for participating in sports, games, and physical activities that require swift movements and rapid changes in direction. The research findings may indicate the level of agility among female students, highlighting their ability to perform tasks that demand agility and quick reflexes. Hand-eye coordination is another critical aspect of motor skills assessed in the research.

This component evaluates the synchronization of visual perception with hand movements, such as catching, throwing, or manipulating objects accurately. Proficient hand-eye coordination is essential for performing tasks that require precision and accuracy, such as writing, drawing, and engaging in sports or recreational activities involving hand-eye coordination. Balance is also evaluated as part of the overall motor skills assessment. Good balance enables individuals to maintain stability and control their body position during various movements and activities. Assessing balance in female students provides valuable information about their ability to maintain equilibrium, posture, and stability, which are essential for activities such as walking, running, jumping, and participating in sports or physical exercises. Speed is another component of motor skills evaluated in the research. Speed refers to the ability to perform movements quickly and with agility, covering a range of activities from running and sprinting to reacting swiftly to stimuli. Assessing speed in female students helps gauge their ability to generate rapid movements and responses, providing insights into their athletic performance and physical capabilities. Overall, the assessment of female students' motor skills based on agility, hand-eye coordination, balance, and speed offers valuable information about their physical development and proficiency. By identifying areas of strength and areas for improvement, educators, coaches, and healthcare professionals can tailor interventions, training programs, and support services to enhance female students' motor skills and promote their overall physical well-being. However, there is variation in motor skills among female students, with most students scoring between the categories of good to moderate [7]. This indicates that most female students have sufficient motor skills for learning purposes in an academic environment. However, there is also a small percentage of female students classified as having poor to very poor motor skills [8]. This highlights the importance of extra attention to students who may struggle with motor skill development. Learning efforts focused on motor skill development, either through individually tailored approaches or through more general learning programs, can help improve the overall motor skills of female students. Additionally, these findings also suggest that ongoing evaluation and intervention are necessary to ensure that all students, including those who may face challenges in motor skills, can reach their potential in both academic and daily life contexts. From the research results, it can be concluded that: 1) Female students' motor skills are classified as moderate, with an average score of 200. The classification criteria for female students' motor skills include very good (5.67%), good (24.33%), moderate (30.33%), poor (32.67%), and very poor (3%). 2) Male students' motor skills can be categorized as moderate, with an average score of 200. The percentage of motor skill

classifications for male students includes very good (7.32%), good (25.61%), moderate (37.80%), poor (29.39%), and very poor (4.88%).



From the research results, it is evident that the overall motor skills of male students can be classified as moderate, with an average score reaching 200. This data indicates that the majority of male students have sufficient motor skills for learning purposes in an academic environment. This assessment is based on various tests covering aspects of agility, hand-eye coordination, balance, and speed. Most male students receive motor skill classifications ranging from good to moderate, indicating that they possess adequate motor skills to complete tasks required in an educational context. Although the majority of male students have adequate motor skills, there is a small percentage classified as having poor to very poor motor skills. This suggests variation in the level of motor skills among male students. Therefore, it is important to provide additional attention to students who may struggle with motor skill development. Through individually tailored learning approaches and appropriate interventions, they can be assisted in improving their motor skills. These findings also emphasize the importance of inclusive and sustainable learning approaches, which consider individual needs to ensure that every student can reach their full potential in an academic environment. The research findings underscore the critical importance of inclusive and sustainable learning approaches in education. By recognizing and accommodating individual differences and needs, these approaches aim to create an environment where every student, regardless of their abilities or challenges, can thrive academically and reach their full potential. Inclusive learning acknowledges the diverse range of learners in the classroom and seeks to provide equitable opportunities for all students to access quality education and succeed.

Inclusive learning approaches prioritize the creation of supportive and nurturing environments that foster a sense of belonging, acceptance, and respect for diversity. By embracing a variety of teaching strategies, instructional materials, and assessment methods, educators can effectively address the diverse learning styles, preferences, and abilities of students. This ensures that every student can engage meaningfully with the curriculum and demonstrate their knowledge, skills, and talents.

Moreover, sustainable learning approaches focus on promoting long-term academic success and holistic development while minimizing negative impacts on the environment and resources. By integrating principles of sustainability into educational practices, schools can instill values of environmental stewardship, social responsibility, and ethical citizenship in students. This empowers them to become informed and engaged global citizens who are equipped to address complex challenges and contribute positively to society. An inclusive and sustainable approach to education also involves collaboration among educators, students, families, and communities to identify and address barriers to learning and participation. By working together, stakeholders can develop personalized support plans, implement evidence-based interventions, and create inclusive learning environments that meet the diverse needs of students. This collaborative effort promotes a culture of inclusivity, equity, and mutual support within the school community.

Furthermore, inclusive, and sustainable learning approaches recognize the importance of ongoing professional development for educators to enhance their knowledge, skills, and competencies in catering to diverse student populations. By providing educators with access to training, resources, and support networks, schools can empower them to implement inclusive practices effectively and create inclusive classrooms where every student feels valued and supported. Ultimately, by prioritizing inclusive and sustainable learning approaches, educational institutions can create environments that nurture the potential of every student and prepare them to thrive in a rapidly changing and interconnected world. These approaches not only promote academic excellence but also foster empathy, understanding, and social cohesion, contributing to a more just and equitable society.

4. CONCLUSION

Based on the research findings, it can be concluded that the use of Artificial Intelligence (AI) has great potential to enhance the motor skills learning outcomes of Elementary School Teacher Education (PGSD) students. Although most students, both male and female, have sufficient motor skills, there is variation in the level of motor skills among them. Therefore, it is recommended to develop more adaptive and responsive learning programs tailored to individual needs, utilizing AI technology to analyze and monitor the development of motor skills on an individual basis. Further research could focus on further exploration of integrating AI technology into PGSD curricula, as well as developing more effective teaching methods based on further analysis of the impact of AI usage on the motor skills learning outcomes of PGSD students. Further research in the field of pedagogy for PGSD (Pendidikan Guru Sekolah Dasar, or Elementary School Teacher Education) could delve deeper into the integration of AI technology into curricula. By exploring how AI can be effectively incorporated into teacher training programs, curriculum development, and classroom instruction, researchers can identify innovative ways to enhance the quality and effectiveness of teacher education. This includes investigating how AI-powered tools and platforms can support teacher preparation, facilitate personalized learning experiences, and improve teaching practices to meet the diverse needs of students in elementary education settings. Additionally, there is a need for further research to examine the impact of AI usage on the motor skills learning outcomes of PGSD students.

By conducting rigorous studies and longitudinal analyses, researchers can assess the effectiveness of AI-driven interventions, tools, and instructional methods in enhancing students' motor skills development. This includes evaluating the efficacy of AI-powered learning platforms, virtual simulations, and interactive applications in promoting motor skill acquisition, refinement, and mastery among elementary school students. Furthermore, research could explore the development of more effective teaching methods and pedagogical approaches informed by insights from AI usage in PGSD contexts. By leveraging data-driven insights and machine learning algorithms, educators can gain a deeper understanding of students' learning preferences, progress, and challenges related to motor skills development. This information can inform the design and implementation of tailored instructional strategies, adaptive learning experiences, and targeted interventions to optimize motor skills learning outcomes for PGSD students. Overall, further research in these areas has the potential to advance our understanding of how AI technology can be harnessed to enhance teacher education and improve the quality of instruction and learning outcomes in elementary education settings. By embracing AI-driven innovations and evidence-based practices, educators and policymakers can work collaboratively to create inclusive, engaging, and effective learning environments that empower PGSD students to thrive academically, socially, and emotionally. The embrace of AI-driven innovations and evidence-based practices represents a significant opportunity for educators and policymakers to enhance educational outcomes for PGSD (Primary Education) students. By leveraging AI technologies and drawing upon robust empirical evidence, educators and policymakers can collaboratively design and implement inclusive, engaging, and effective learning environments that foster holistic student development.

First and foremost, AI-driven innovations offer personalized learning experiences tailored to individual student needs, preferences, and learning styles. By analyzing vast amounts of data, AI algorithms can identify patterns in students' performance and adapt instructional content accordingly. This customization ensures that every student receives targeted support, thereby promoting academic achievement and reducing disparities in learning outcomes. Moreover, evidence-based practices provide a foundation for decision-making and program implementation in education. By systematically evaluating the effectiveness of various teaching strategies, interventions, and policies, educators and policymakers can identify approaches that yield the greatest impact on student learning and well-being. This evidence-based approach ensures that resources are allocated efficiently and equitably, maximizing the benefits for all students. Additionally, AI-driven innovations can facilitate the creation of inclusive learning environments that accommodate diverse student populations. Through features such as speech recognition, text-to-speech capabilities, and language translation tools, AI technologies can support students with disabilities, language barriers, or other special needs. By removing barriers to access and participation, these innovations promote equity and inclusion in education.

Furthermore, the integration of AI-driven innovations into educational practices can enhance student engagement and motivation. Interactive learning experiences, gamified activities, and immersive simulations captivate students' interest and promote active participation in the learning process. By harnessing the power of technology to make learning fun and engaging, educators can cultivate a positive learning culture that inspires students to explore, inquire, and excel. In tandem with AI-driven innovations, evidence-based practices also inform the implementation of social and emotional learning (SEL) initiatives

in schools. By prioritizing the development of social and emotional competencies such as self-awareness, empathy, and responsible decision-making, educators cultivate supportive learning environments that nurture students' well-being and resilience. SEL programs grounded in research and best practices empower students to navigate challenges, build healthy relationships, and thrive both academically and personally. In conclusion, the collaborative efforts of educators and policymakers to embrace AI-driven innovations and evidence-based practices hold immense promise for PGSD students. By leveraging technology, leveraging empirical evidence, and prioritizing inclusivity and SEL, stakeholders can create learning environments that empower students to excel academically, thrive socially, and flourish emotionally. Through ongoing collaboration and commitment to excellence, we can build a brighter future for all learners.

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