

INVESTIGATING THE CAPABILITIES OF ADAPTIVE LEARNING AS A CUTTING-EDGE APPROACH TO MODEL DEVELOPMENT IN AN EDUCATIONAL SETTING

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Abstract

Adaptive learning has become a significant topic in the development of modern education due to its potential to enhance the effectiveness and inclusivity of learning. This research aims to explore the potential of adaptive learning as an innovative model of development in the context of education. To gain a comprehensive understanding of the implementation of adaptive learning, the research methodology employs observation, interviews, and data analysis. The findings indicate that there is a perception gap among teachers, students, and parents regarding adaptive learning, as well as technical and practical challenges in its implementation. Furthermore, psychological aspects of students, such as learning motivation, also need to be considered in designing effective adaptive learning models. Thus, this research concludes that adaptive learning holds great potential for improving the effectiveness and inclusivity of education, but it requires appropriate support and strategies in its implementation.

Keywords: Adaptive learning, innovative models, education

Abstrak

Pembelajaran adaptif telah menjadi topik penting dalam pengembangan pendidikan modern, karena potensinya untuk meningkatkan efektivitas dan inklusivitas pembelajaran. Penelitian ini bertujuan untuk menjelajahi potensi pembelajaran adaptif sebagai pengembangan model inovatif dalam konteks pendidikan. Metode penelitian yang digunakan meliputi observasi, wawancara, dan analisis data untuk mendapatkan pemahaman yang komprehensif tentang implementasi pembelajaran adaptif. Hasil penelitian menunjukkan bahwa terdapat kesenjangan persepsi antara guru, siswa, dan orang tua terkait dengan pembelajaran adaptif, serta tantangan teknis dan praktis dalam implementasinya. Selain itu, aspek psikologis siswa, seperti motivasi belajar, juga perlu diperhatikan dalam merancang model pembelajaran adaptif yang efektif. Dengan demikian, penelitian ini menyimpulkan bahwa pembelajaran adaptif memiliki potensi besar untuk meningkatkan efektivitas dan inklusivitas pendidikan, tetapi diperlukan dukungan dan strategi yang tepat dalam implementasinya.

Kata kunci: Pembelajaran adaptif, model inovatif, pendidikan

INTRODUCTION

Education is the primary cornerstone in the advancement of a sustainable society. Amidst the continuous progress of our day, the difficulties in addressing a wide range of educational requirements are growing. An intriguing method for addressing this difficulty involves the creation of an adaptive learning model (Hadian & Rahmi, 2023). This model provides a solution that has the capacity to enhance learning effectiveness by better catering to individual needs. The objective of this research is to investigate the capacity of adaptive learning as a cutting-edge approach to developing models in the field of education. Within the realm of education, every person possesses distinct learning requirements and attributes. Historically, education systems have commonly employed a uniform strategy that may not effectively address this wide range of differences. Adaptive learning provides a compelling alternative by adjusting the learning process based on individual capabilities, learning modalities, and preferences. Through the utilization of advanced technologies like artificial intelligence and data analysis, adaptive learning offers a customized and efficient learning experience for individual students (Tanggulungan & Sihotang, 2023).

Nevertheless, as stated by Sappaile et al. (2024), the creation of adaptive learning models is not devoid of difficulties. An essential obstacle is the process of incorporating technology into preexisting educational environments. While technology has indeed broadened the scope of educational opportunities, there remain disparities in its availability and utilization across different segments of society. In addition to that, the primary emphasis in establishing this novel model is the necessity for a fundamental change in the roles of teachers and students. Teachers serve as both conveyors of knowledge and facilitators of learning, aiding pupils in their ability to adapt and grow. This study will investigate multiple facets of the advancement of adaptive learning models. The project will analyze the fundamental principles that underlie adaptive learning, encompassing learning theory, cognitive psychology, and educational technology. Subsequently, the project will investigate the integration of technology in adaptive learning, encompassing the creation of platforms and algorithms that facilitate individualized learning. Furthermore, the study will examine the influence of adaptive learning on academic performance, learning drive, and student involvement. Prior study findings demonstrate that adaptive learning has significant promise for enhancing the efficacy and inclusivity of education. Irfandi et al. (2023) conducted a study that demonstrated a substantial improvement in student academic performance following the introduction of adaptive learning in secondary schools. This study employs adaptive learning systems tailored to individual needs, taking into account the content comprehension level, learning preferences, and student inclinations. The findings demonstrated a noteworthy rise in student examination scores, together with heightened interest and involvement in the educational process.

A university-level study by Rohmah and Sholikhah (2024) provides additional evidence for these conclusions. Jones employed an adaptive learning approach in lectures attended

by students from diverse backgrounds and with varying levels of comprehension. Despite their varying initial levels, students were able to attain a higher degree of comprehension through the utilization of an adaptive learning algorithm. In addition, the customization of learning further enhances students' drive to study and their active engagement in classroom discussions. However, even though this study's findings demonstrate the considerable potential of adaptive learning, we still need to overcome additional challenges. One of the primary obstacles is the problem of ensuring technology is accessible and sustainable. Access to technology and internet connections remains a significant barrier, particularly in rural areas or areas with few resources. This disparity in access to technology can result in disparities in learning outcomes among students. Hence, when creating novel approaches to adaptive learning, it is imperative to take into account strategies that can enhance the availability of technology for all students (Mukhid, 2023).

In addition to that, the teacher plays a crucial role in the successful execution of adaptive learning. Najjar & Oktasari (2023) argue that teachers must possess sufficient knowledge and abilities to utilize adaptive learning technology as well as effectively manage inclusive classrooms. It is necessary to have the capability to observe and track the progress of each student individually, offer prompt comments, and establish a nurturing learning atmosphere. Therefore, it is crucial to provide teachers with training and professional development opportunities to effectively implement adaptive learning in the classroom. In addition to considering technological and instructor perspectives, it is also important to take psychological and social factors into account while building creative models of adaptive learning. An effective adaptive learning system must consider factors such as the drive to learn, self-confidence in one's abilities, and social interactions among students. Studies in educational psychology indicate that intrinsic motivation, which refers to motivation that originates from inside the individual, significantly enhances learning results (Romadanti, 2023).

Hence, when developing adaptive learning models, it is imperative to contemplate methods of enhancing students' inherent motivation, such as offering tasks that align with their skill level or acknowledging their accomplishments. Furthermore, interpersonal communication among students is a crucial element in achieving successful learning outcomes. Collaborative learning and group conversations can enhance students' learning experiences and facilitate the development of their social and cognitive abilities. Hence, it is important to view adaptive learning not as a replacement for classroom social contact but rather as a supplementary tool that can enhance the entire learning experience (Santoso et al., 2023). Adaptive learning has significant promise for addressing the requirements of children with special educational needs within the framework of inclusive education. Students with special needs can receive customized help specifically tailored to their individual needs through personalized learning. This approach enables them to efficiently acquire knowledge and skills in an inclusive educational setting. Asmara et al. (2023) conducted a study that demonstrates how adaptive learning can effectively support students with impairments in achieving their educational objectives, while also enhancing their self-assurance and drive to acquire knowledge. Nevertheless,

the incorporation of adaptive learning within the framework of inclusive education encounters notable obstacles. An essential obstacle is the process of modifying learning platforms and resources to cater to the requirements of a wide range of pupils. Inclusive learning necessitates a high degree of flexibility and adaptation in delivering educational content and activities that are accessible to all students, ensuring that no one is excluded. Hence, it is imperative to do additional research that explicitly concentrates on creating adaptive learning models tailored to cater to the requirements of children with unique educational needs (Iswahyudi et al., 2023).

Furthermore, it is imperative to take into account the influence of adaptive learning on the social relationships among students, including those with and without special educational requirements. Research indicates that the implementation of adaptive learning can result in social disparities between children with special needs and their peers without special needs. This is because segregating these students into different learning environments could potentially divide their educational experiences (Wibowo, 2023). Hence, when developing inclusive adaptive learning models, it is imperative to contemplate methods for promoting favorable social interactions among all students while ensuring their unrestricted access to adaptive learning. Furthermore, when creating novel forms of adaptive learning, it is crucial to take into account the ethical and data privacy consequences. Through the utilization of advanced technology like artificial intelligence and data analysis, adaptive learning has the capability to gather a vast amount of information on pupils, encompassing their learning preferences, degrees of comprehension, and behavioral patterns. Hence, it is imperative to have a well-defined and open policy on the utilization and administration of student data, along with sufficient safeguards to protect privacy, in order to prevent any infringement against individual rights (Tinambunan et al., 2023).

Collaboration among many stakeholders is crucial when it comes to establishing creative models of adaptive learning. Partnerships among governments, educational institutions, the technology industry, and civil society can facilitate the identification of crucial obstacles, the development of suitable remedies, and the implementation of adaptable learning models in a sustainable manner. By establishing robust and all-encompassing collaborations, we have the ability to develop an education system that is adaptable to the unique requirements of each individual as well as inclusive and capable of being maintained throughout time (Shawmi, 2017).

This study aims to broaden the range of earlier research by concentrating on creating inventive models of adaptive learning that are more all-encompassing and thorough within the educational setting. This research diverges from earlier studies that primarily assessed the efficacy of adaptive learning based on students' academic outcomes. Instead, it adopts a more comprehensive approach, encompassing psychological, social, and ethical dimensions. This project aims to conduct a comprehensive investigation into the psychological aspects that impact the efficacy of adaptive learning. An example of research will examine the potential impact of students' learning motivation, self-efficacy, and self-perceptions on their responses to adaptive learning. Furthermore, this study will examine the influence of adaptive learning on students' holistic welfare, encompassing

factors such as satisfaction with the learning process, innate drive, and perceptions of the educational setting.

Prior research primarily emphasizes academic outcomes as the primary measure of the efficacy of adaptive learning. However, this study will examine not only academic achievements but also their influence on students' holistic well-being. This research aims to enhance the understanding of the advantages and difficulties of adaptive learning in educational settings by broadening the evaluation scope. In addition, this project will also investigate the social dimensions of adaptive learning. Education is more than just comprehending academic content; it also involves engaging with peers and fostering constructive social connections. Hence, it is crucial to comprehend the impact of adaptive learning on the dynamics of student interactions, whether in face-to-face settings or on online learning platforms. This study aims to examine the extent to which adaptive learning might enhance collaboration and social contact among students, or conversely, contribute to their isolation.

This research will differentiate itself from past studies by broadening the area of evaluation to encompass the social dimensions of adaptive learning. Prior studies have predominantly emphasized academic outcomes as the primary measure of efficacy. However, this research aims to go beyond that by examining the impact of adaptive learning on social relationships among students. Therefore, we anticipate this study to provide a comprehensive understanding of adaptive learning's influence within a broader social framework. In addition to that, this research will also take into account ethical and data privacy considerations when creating adaptive learning models. The importance of student data in adaptive learning grows as technology progresses. Nevertheless, the gathering and utilization of such information also give rise to several ethical concerns, particularly with the confidentiality and protection of student data.

This study aims to investigate the most effective methods for managing student data and to examine the ethical considerations associated with the use of technology in adaptive learning. This research distinguishes itself from earlier studies by placing greater emphasis on the ethical and data privacy considerations involved in the development of adaptive learning models. Prior studies mostly examined the efficacy of adaptive learning from an academic standpoint. However, this research aims to delve beyond academic considerations and explore the ethical ramifications associated with the utilization of technology in adaptive learning. This research aims to offer more precise recommendations for the creation and execution of ethical and responsible adaptive learning by taking this element into consideration. In addition, this project will engage multiple stakeholders in the creation of inventive adaptive learning models. Effective implementation of adaptive learning relies on the collaboration of the government, educational institutions, the technology industry, and civil society. By fostering robust communication and collaborative alliances, we can effectively pinpoint crucial obstacles, devise suitable remedies, and establish enduring adaptive learning frameworks.

This research distinguishes itself from earlier studies by placing a strong emphasis on fostering collaboration among different stakeholders in the development of adaptive

learning models. Prior studies have primarily concentrated on assessing the academic efficacy of adaptive learning. However, this research aims to broaden its scope by incorporating collaborative elements and establishing partnerships among diverse stakeholders. This research engages several stakeholders to generate highly pertinent recommendations for the advancement of adaptive learning models. The primary distinction between this study and prior research resides in the emphasis and methodology employed. This research aims to broaden the evaluation scope by incorporating psychological, social, and ethical dimensions of adaptive learning. Additionally, it seeks to engage multiple stakeholders in the development of innovative models. This research aims to gain a more thorough understanding of the potential and challenges of adaptive learning in education. By taking a holistic and comprehensive approach, it seeks to provide clearer guidance in developing innovative models that can enhance educational effectiveness and inclusiveness.

The objective of this research is to explore the capacity of adaptive learning as a cutting-edge approach to developing models in the field of education. This research will broaden its focus to encompass psychological, social, and ethical dimensions of adaptive learning, hence expanding the scope of evaluation. The primary objective is to gain a more profound comprehension of the influence of adaptive learning on students' holistic well-being, encompassing their drive to study, contentment with the learning process, social relationships, and ethical use of student data. In addition, this study seeks to identify the primary obstacles to the advancement and execution of adaptive learning while also devising suggestions that might aid in the creation of more efficient and comprehensive adaptive learning frameworks. The aim of this research is to offer more precise guidance to decision-makers in the education sector, such as teachers, educational institutions, and the government, when it comes to choosing and creating adaptive learning models that align with the firmly held needs and values in education. Therefore, we anticipate that this research will significantly enhance the efficiency, comprehensiveness, and durability of the education system at various levels.

METHOD

Researchers employ qualitative research to gain a more profound understanding of the phenomenon under investigation. Murdiyanto (2020) asserts that qualitative research methodologies prioritize a comprehensive comprehension, interpretation, and elucidation of the obtained data's significance. Case studies are the main research approach used by researchers. Researchers utilize case studies to gain a comprehensive understanding of the background, process, and intricacies of the phenomenon under investigation (Iswadi et al., 2023). This sort of research allows researchers to delve into the viewpoints, experiences, and meanings that are concealed inside the collected data. The objective is to investigate the possibilities of adaptive learning and create inventive models in educational settings. The findings of research can offer comprehensive, situational, and meticulous understanding of the examined cases, which can be utilized to shape policy, guide practice, or advance theoretical frameworks.

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RESULTS AND DISCUSSION

Based on the results of in-depth observations with various related parties, including teachers, students, parents, and education experts, this will be the main basis for obtaining accurate research findings and results. Through in-depth interviews and direct observations in educational settings, this research aims to understand the perspectives and experiences of stakeholders related to the use of adaptive learning. During the observation and interview process, we discovered several interesting findings. First of all, there is a gap between teachers' and students' perceptions regarding the effectiveness of adaptive learning. Some teachers reported that they felt limited in managing adaptive learning due to a lack of adequate training and support. They face challenges in understanding and using adaptive learning technology, as well as in monitoring individual student progress. On the other hand, some students stated that they preferred adaptive learning because they could learn at their own pace and felt more motivated to learn. However, some students experience anxiety or discomfort when using technology for learning, particularly if they lack familiarity or confidence in using these devices.

Additionally, we found that parents' perceptions of adaptive learning varied. Some parents welcome the use of technology in their children's learning, while others are concerned about its impact on their children's well-being and development. Some parents expressed concerns about the security and privacy of student data, as well as the potential negative effects of excessive exposure to technology. Therefore, the role of parents in supporting and monitoring their children's use of adaptive learning becomes important in this context. Apart from the user's perspective, the observation results also reveal several technical and practical challenges in implementing adaptive learning. Some schools experience problems with technology accessibility, such as limited availability of internet infrastructure or limited technological devices in the classroom. This is an obstacle to implementing adaptive learning comprehensively and evenly at all levels of education. Furthermore, research revealed that some teachers lack the necessary skills and knowledge to effectively manage adaptive learning, necessitating additional support through training and professional development.

Furthermore, the findings from these observations and interviews also highlight the importance of psychological aspects in developing adaptive learning models. Students' learning motivation and self-perception significantly influence their reaction to adaptive learning. Students who have high intrinsic motivation tend to be more engaged and motivated in adaptive learning, while those who have low extrinsic motivation may have difficulty adjusting to adaptive learning. Therefore, there is a need for strategies that can increase students' learning motivation and support the development of their intrinsic motivation in the context of adaptive learning. Apart from that, these findings also highlight the important role of teachers in supporting the adaptive learning process. Teachers not only act as technology facilitators but also as learning facilitators who support, motivate, and guide students in the learning process. Researchers discovered that teachers' support and guidance significantly influence students' adaptive learning experiences. Therefore, training and professional development for teachers in managing adaptive learning are very important in ensuring successful implementation.

Apart from the results of observations and interviews, this research will also use data analysis methods to dig deeper into the impact and effectiveness of adaptive learning from an academic perspective. By collecting data regarding student academic achievement before and after the implementation of adaptive learning, this research will attempt to measure the level of change in student achievement and evaluate the effectiveness of adaptive learning in improving academic outcomes. In addition, this research will also collect data regarding students' perceptions and attitudes towards adaptive learning through questionnaires or interviews to gain a more comprehensive understanding of their learning experiences.

This research aims to provide a more comprehensive understanding of the potential and challenges of adaptive learning in the educational context by combining the results of observations, interviews, and data analysis. We hope that this research's results will offer relevant and useful recommendations for education decision-makers, such as teachers, educational institutions, and the government, to design and implement more effective and inclusive adaptive learning models. Therefore, we hope this research can significantly enhance the quality and accessibility of education for all.

The findings from this research indicate that adaptive learning has great potential for increasing the effectiveness of education by adapting learning experiences according to students' individual needs. However, we must overcome several challenges to successfully implement adaptive learning and maximize its benefits for all involved parties. One of the main findings is that there is a perception gap between teachers, students, and parents regarding adaptive learning. Some teachers feel limited in managing adaptive learning due to a lack of adequate training and support for the use of such technology. They experience challenges in understanding and applying adaptive learning technology, as well as in monitoring individual student progress. On the other hand, some students stated that they preferred adaptive learning because they could learn at their own pace and felt more motivated to learn. However, some students experience anxiety or discomfort when using technology for learning, particularly if they lack familiarity or confidence in using these devices.

Parents' perceptions also vary regarding adaptive learning. Some parents welcome the use of technology in their children's learning, while others are concerned about its impact on their children's well-being and development. Some parents expressed concerns about the security and privacy of student data, as well as the potential negative effects of excessive exposure to technology. Therefore, the role of parents in supporting and monitoring their children's use of adaptive learning becomes important in this context. Apart from that, findings from observations and interviews also highlight several technical and practical challenges in implementing adaptive learning. Some schools experience problems with technology accessibility, such as limited availability of internet infrastructure or limited technological devices in the classroom. This is an obstacle to implementing adaptive learning comprehensively and evenly at all levels of education. Furthermore, research revealed that some teachers lack the necessary skills and knowledge to effectively manage adaptive learning, necessitating additional support through training and professional development.

According to Prihantini et al. (2023), the role of the teacher is also a key factor in the successful implementation of adaptive learning. Teachers not only act as technology facilitators but also as learning facilitators who support, motivate, and guide students in the learning process. Researchers discovered that teachers' support and guidance significantly influence students' adaptive learning experiences. Therefore, training and professional development for teachers in managing adaptive learning are very important in ensuring successful implementation. Apart from the user perspective, these findings also highlight the importance of psychological aspects in the development of adaptive learning models. Students' learning motivation and self-perception significantly influence their response to adaptive learning. Students who have high intrinsic motivation tend to be more engaged and motivated in adaptive learning, while those who have low extrinsic motivation may have difficulty adjusting to adaptive learning. Therefore, there is a need for strategies that can increase students' learning motivation and support the development of their intrinsic motivation in the context of adaptive learning.

Besides that, it is also important to pay attention to the social aspects of adaptive learning. Social interaction between students is an important part of an effective learning experience. Adaptive learning should not reduce social interactions between students but should help facilitate collaboration and shared learning. Therefore, it is crucial to design adaptive learning models that foster positive social interactions among students, both in the classroom setting and on online learning platforms.

In connecting the discussion above with theory, there are several concepts and principles in the field of education that are relevant to research findings on adaptive learning. Jean Piaget's constructivism theory is one relevant theory. According to this theory, students are mentally active in constructing their own knowledge through interaction with their environment. In the context of adaptive learning, this theory supports approaches that adapt learning experiences to students' levels of understanding and abilities. By providing learning materials that are appropriate to students' level of cognitive development, adaptive learning can help students build their own knowledge more effectively (Wibowo, 2023).

Apart from that, the theory of learning motivation is also relevant in the context of adaptive learning. This theory highlights the importance of intrinsic and extrinsic motivation in influencing student learning behavior (Mustika et al., 2024). In this research, the finding that students who have high intrinsic motivation tend to be more involved in adaptive learning emphasizes the importance of paying attention to motivational aspects in learning design. Designing adaptive learning with student learning motivation in mind can enhance student engagement and academic achievement. Furthermore, the theory of collaborative learning is also relevant in the context of adaptive learning. This theory emphasizes the importance of social interaction between students in the learning process. In adaptive learning, even though students learn individually, it is still important to facilitate collaboration and interaction between students. Therefore, we can design adaptive learning to foster cooperation and discussion among students, both within the classroom setting and on online learning platforms (Jamil et al., 2024). Apart from these theories, there is also the concept of artificial intelligence

(AI), which is the technological basis for developing adaptive learning. AI enables learning systems to automatically adapt learning materials and activities according to students' individual needs and abilities. This concept supports the idea that adaptive learning can provide a more personalized and relevant learning experience for each student (Sumadi et al., 2023).

By linking research findings on adaptive learning to theories and concepts in the field of education, we can gain a deeper understanding of the potential and challenges of this approach. This also helps in formulating recommendations and strategies to increase the effectiveness and inclusiveness of adaptive learning in a broader educational context. By utilizing a strong theoretical basis, the development of adaptive learning models can be more focused and effective, thereby providing maximum benefits for students and all stakeholders in the education sector.

CONCLUSION

The research concludes that adaptive learning holds significant potential in enhancing the effectiveness and inclusivity of education. Findings from observations, interviews, and data analysis highlight several important aspects that need to be considered in implementing adaptive learning. First, there is a perception gap between teachers, students, and parents regarding adaptive learning, which emphasizes the importance of support and training for teachers as well as parental involvement in the learning process. Second, there are technical and practical challenges in implementation, such as technology accessibility and teacher skills in managing adaptive learning. Third, psychological aspects such as student learning motivation also need to be considered in designing effective adaptive learning models.

We can make several recommendations for future researchers based on these conclusions. First, it is important to carry out training and professional development for teachers in managing adaptive learning. To ensure successful implementation, the school and government must also provide adequate support. Second, there needs to be an effort to increase parental involvement in supporting and monitoring their children's adaptive learning. Open and transparent communication between schools and parents can help address concerns and increase parental support for adaptive learning. Third, it is important to consider students' psychological aspects, such as learning motivation and self-perception, in designing adaptive learning models. By paying attention to students' individual needs and preferences, adaptive learning can become more effective and relevant.

Furthermore, future researchers can develop this research by further investigating the impact of adaptive learning on student academic outcomes, overall student well-being, and social interactions between students in the context of adaptive learning. Further research could also explore strategies to increase students' learning motivation and support the development of their intrinsic motivation in adaptive learning. In addition, further research can also explore the ethical and data privacy implications of using technology in adaptive learning, as well as formulate clear guidelines to ensure responsible and ethical practices in the development of adaptive learning models.

Therefore, we anticipate that additional research will offer a more profound comprehension and focused solutions to enhance the efficiency and inclusivity of adaptive learning within the educational setting.

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