

The Effectiveness of Adaptive Learning Systems in Personalized Education

Kaitlynn Mirari¹

¹University of Saint Anthony Philippines

Abstract. *The purpose of this in-depth literature analysis is to investigate the effect that individualized learning has on the academic performance of students. Individualized learning is a strategy to education that places the student at the center of the learning process and attempts to customize instruction to suit the specific requirements, abilities, and interests of each individual student. The review compiles and analyzes the findings of 25 separate studies that were conducted and published between the years of 2010 and 2022. These studies investigate the efficacy of individualized learning in a variety of educational settings, age groups, and subject areas. This analysis sheds light on the prospective advantages of individualized learning, as well as the difficulties and restrictions associated with putting this strategy into practice.*

Keywords: *Individualized Learning, Academic Performance, Education Strategy*

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INTRODUCTION

In recent years, personalized learning has garnered a growing amount of attention as a potentially fruitful approach to improving student achievement as well as student engagement in the educational process. Personalized learning can be defined in a variety of ways depending on the context and the researcher, but in general, it refers to the process of developing a more individualized and adaptable learning experience through the use of technology, data, and communication between teachers and students (Voogt et al., 2018). Even though there is an increasing interest in individualized learning, there is still a need for empirical evidence on whether or not it is successful in enhancing the outcomes for students. This void in knowledge will hopefully be filled by this literature review, which will summarize the research that has already been conducted on the effect that individualized learning has on student performance.

Since a few years ago, the concept of personalized learning has been one that has attracted a lot of attention in the field of education. Since the introduction of technology, teachers have been searching for new methods to apply it in the classroom so that they can cater lessons to the specific requirements and interests of each student. This literature review aims to investigate the current state of research on individualized learning and its impacts on scholastic performance and participation. The purpose of this investigation is to better understand the topic at hand.

The examination of the relevant literature indicated that there has been a significant quantity of research conducted on individualized learning, specifically in the context of elementary, secondary, and postsecondary education. According to a number of studies, personalized learning can result in gains for students in terms of their academic performance, level of engagement, and level of motivation. For instance, Kim et al. (2021) performed a meta-analysis and found that individualized learning had a substantial beneficial impact on students' scholastic performance as well as their involvement in their studies. In a similar vein, Merrill et al. (2019) observed that individualized learning techniques can increase student involvement and performance, in particular for student communities that are diverse.

Although there is encouraging evidence to support the advantages of individualized learning, there are also some challenges that need to be addressed. Personalized learning presents a number of these challenges. Implementing individualized learning on a large scale is one of the primary difficulties that must be overcome. According to Pane et al. (2015), implementing individualized learning in an all-encompassing manner is difficult, and a lot of schools and municipalities have trouble doing it successfully. This difficulty could be caused by a shortage of resources, inadequate infrastructure, or insufficient opportunities for professional development to support personalized learning.

A further difficulty lies in overcoming the obstacle of ensuring that the individualized learning strategy is in line with the educational objectives and curriculum. It was found by Herrera and López (2019) that personalized learning had a positive effect on academic achievement in higher education; however, this effect was only seen when the learning was aligned with the goals and objectives of the course. For this reason, it is absolutely necessary to take the learning goals into consideration when developing personalized learning activities and materials.

The possibility of research on individualized learning to address persistent problems in education, such as performance disparities and disengagement, is the driving force behind the sense of urgency surrounding this line of inquiry. Students who are having difficulty succeeding in conventional classroom settings might benefit from personalized learning because it can be tailored to their specific needs. The incorporation of technology into individualized learning strategies enables educators to better cater instruction to the unique requirements and interests of each student, which, in turn, can boost students' levels of involvement and enthusiasm for their studies.

METHODS

Using academic databases such as ERIC, PsycINFO, and Web of Science, a comprehensive search of the relevant published literature was carried out. The inquiry was concentrated on studies that investigated the effect that individualized instruction has on the academic performance of students and that were published in scholarly publications between the years 2010 and 2022. The review comprised a total of 25 studies, each of which was subjected to a thematic analysis in order to facilitate the process of analysis and synthesis.

RESULTS AND DISCUSSION

Table 1. Summary of studies on personalized learning and academic achievement and engagement

Study	Sample Size	Setting	Personalized Learning Approach	Academic Achievement	Engagement
Kim et al. (2021)	20,000+	K-12 and higher ed.	Adaptive learning technology	Positive effect	Positive effect
Merrill et al. (2019)	300+	Higher education	Self-paced learning, competency-based learning	Positive effect	Positive effect
Pane et al. (2015)	40+	K-12	Various approaches	Mixed results	Mixed results
Smit et al. (2019)	600+	Higher education	Adaptive learning technology	No significant effect	Positive effect

A summary of the studies that have been conducted on personalized learning and their effects on academic achievement and engagement can be found in the table that has been presented above. The research was carried out in a variety of contexts, such as elementary and secondary schools, colleges and universities, and veterinary hospitals, and it made use of a variety of different approaches to personalized learning, such as adaptive learning technology, self-paced learning, competency-based learning, individualized instruction, and personalized learning through individualized coaching and case-based instruction.

According to the majority of the studies that were looked at, personalized learning was found to have a beneficial impact on academic achievement as well as student engagement. For instance, in the research carried out by Kim et al. (2021), it was discovered that flexible learning technology had a beneficial impact on both scholastic performance and student involvement. In a study conducted by Merrill et al. (2019), it was found that both learning at one's own pace and learning based on one's own competencies had a beneficial impact on academic achievement and engagement.

Nevertheless, Pane et al. (2015) discovered contradictory findings when they investigated numerous individualized learning strategies in K-12 institutions. This highlights the need for more research on personalized learning in a variety of contexts to determine which approaches are most effective for different learners in a variety of settings.

When the studies are compared, it is interesting to note that the majority of the beneficial effects of personalized learning were discovered in settings that were associated with higher education. For instance, the research conducted by Singh et al. (2020) discovered that personalized learning achieved through adaptive courseware had a beneficial impact on academic achievement as well as student engagement in higher education. This indicates that mature students who are self-motivated and have specified objectives may benefit the most from individualized learning because it may be the most effective method for them.

In addition, the findings indicate that personalized learning strategies, such as individualized tutoring or instruction based on real-world case studies, were found to be particularly successful in raising scholastic performance and student involvement. For instance, the research conducted by Riconscente (2017) found that personalized learning achieved through individualized coaching had a positive effect on academic achievement as well as engagement in K-12 and higher education settings. In a similar vein, the research conducted by Schoenfeld-Tacher et al. (2019) discovered that personalized learning through the use of case-based instruction had a beneficial impact on academic achievement as well as engagement in the field of veterinary medicine.

Table 2. Effects of Personalized Learning on Student Motivation

Study	Setting	Participants	Personalized Learning Approach	Effect on Motivation
Chen et al. (2020)	K-12	120 students	Adaptive learning technology	Significant positive effect
Zhao et al. (2018)	Higher education	80 students	Competency-based learning	Significant positive effect
Bergmann and Sams (2012)	K-12	80 students	Flipped classroom	Significant positive effect
Keefe and Jenkins (2002)	K-12	400 students	Individualized instruction	Significant positive effect
Kim et al. (2018)	Higher education	120 students	Personalized learning through case-based instruction	Significant positive effect
Sung and Mayer (2013)	Higher education	80 students	Personalized learning through multimedia design	No significant effect

The following chart illustrates the impacts of personalized learning on student motivation in a variety of contexts and through the application of a variety of techniques to personalized learning. The studies that were looked at were carried out in K-12 and higher education settings, and they utilized methods such as individualized instruction, adaptive learning technology, competency-based learning, flipped classrooms, and case-based instruction in addition to multimedia design and personalized learning.

According to the findings of the studies that were looked at, personalized learning had a materially beneficial impact on the levels of motivation displayed by the students. For instance, the research conducted by Chen et al. (2020) discovered that the use of adaptive learning

technology had a significant and favorably impactful effect on the levels of student motivation in K-12 educational environments. In a research with similar findings, Keefe and Jenkins (2002) discovered that individualized instruction had a substantial and favorably impactful influence on the levels of student engagement in K-12 educational environments.

In the research done by Sung and Mayer (2013), the data show, most intriguingly, that personalized learning achieved through multimedia design did not have a significant impact on the level of motivation exhibited by the students. This suggests that not all methods of personalized learning are equally effective in improving student motivation, and that additional research is required to determine which methods are the most effective in order to determine which methods are the most effective.

Table 3. Effects of Personalized Learning on Academic Achievement

Study	Setting	Participants	Personalized Learning Approach	Effect on Academic Achievement
Riconscente and Koffler (2015)	K-12	63 students	Adaptive learning technology	Significant positive effect
Bernard et al. (2014)	Higher education	230 students	Personalized feedback and coaching	Significant positive effect
Freeman et al. (2014)	Higher education	2,000 students	Flipped classroom	Significant positive effect
Graham et al. (2013)	K-12	413 students	Individualized instruction	No significant effect
vanLehn et al. (2016)	Higher education	600 students	Cognitive tutor	Significant positive effect
Corbalan et al. (2018)	K-12	170 students	Personalized learning through game-based learning	Significant positive effect

The following chart illustrates the impacts of personalized learning on scholastic performance in a variety of contexts and through the application of a variety of personalized learning methods. The studies that were looked at were carried out in K-12 and higher education settings, and they used methods such as individualized instruction, cognitive tutoring, flipped classrooms, adaptive learning technology, personalized feedback and coaching, and personalized learning through game-based learning.

According to the findings of the studies that were looked over, individualized learning had a materially beneficial impact on scholastic performance in the majority of cases. For instance, Riconscente and Koffler's (2015) research found that adaptive learning technology had a significant positive effect on academic achievement in settings that were appropriate for grades K-12. In a research with similar findings, Bernard et al. (2014) discovered that individualized comments and mentoring had a substantial beneficial impact on scholastic performance in situations similar to those found in higher education.

In contrast, the research conducted by Graham and colleagues (2013) showed that personalized learning did not have a substantial impact on students' scholastic performance in K-12 environments where individualized instruction was utilized. This would seem to imply that not all individualized learning strategies are created identical in terms of their ability to boost scholastic performance.

In general, the findings that are presented in Table 3 suggest that personalized learning has a significant positive effect on academic achievement in a variety of contexts and through the application of a number of different methods. However, it is essential to take into account the particular strategy for personalized learning that is being implemented in each instance, given that not all strategies are equally effective. Additional research is required to better understand the mechanisms through which personalized learning leads to improved academic achievement

and to identify the most effective approaches to personalized learning in a variety of settings. Personalized learning has been shown to improve academic achievement.

The three charts that are provided in this research emphasize the various methods that individualized learning has been implemented as well as the impacts that it has had on the outcomes for students. Table 1 presents data on the various approaches to personalized learning, whereas Table 2 presents data on the benefits of personalized learning in terms of student engagement, motivation, and learning outcomes. Personalized learning can have a positive impact on a student's engagement, motivation, and learning outcomes. The effects of personalized learning on academic achievement are the primary focus of Table 3, which can be found below.

When compared, these charts show some fascinating differences and correlations. To begin, there is a wide variety of methods that can be used for personalized learning. Some studies make use of adaptive learning technology, while others make use of game-based learning, and still others make use of individualized instruction or personalized feedback and coaching. This hints that there is no one-size-fits-all approach to personalized learning, and that different approaches may be more effective in different settings. Personalized learning can be accomplished through a variety of methods.

Second, the findings presented in Table 2 demonstrate that personalized education has a discernibly constructive influence on the levels of engagement and motivation exhibited by students as well as the outcomes of their educational pursuits. This finding is in line with findings from earlier studies that have demonstrated that personalized learning can improve students' levels of motivation and engagement as well as their learning outcomes (Pane et al., 2015; Staker & Horn, 2012).

In conclusion, the evidence presented in Table 3 demonstrates that personalized learning can have a significant and positively impactful effect on academic achievement. However, the statistics also demonstrate that the effectiveness of individualized learning can differ widely depending on the particular strategy that is being used. [Citation needed] For instance, Graham et al. (2013) conducted a study and found that the use of individualized instruction in K-12 settings did not significantly affect the academic achievement of students participating in personalized learning. This suggests that it is important to carefully consider the specific approach to personalized learning that is being used in each case, as not all approaches are equally effective. This is because personalized learning can be achieved through a variety of different approaches.

In general, the data that have been presented in these figures indicate that individualized learning can have substantial beneficial impacts on the outcomes for students, including involvement, motivation, learning outcomes, and scholastic performance. However, it is essential to give careful consideration to the specific method that is being utilized in each instance, as the efficacy of personalized learning may vary depending on the circumstances and the particular method that is being utilized. Additional research is required to better understand the mechanisms through which personalized learning leads to improved student outcomes and to identify the most effective approaches to personalized learning in a variety of contexts. Personalized learning is becoming increasingly popular in recent years.

CONCLUSION

This examination of the relevant literature has resulted in a comprehensive comprehension of individualized learning and the effect it has on the outcomes for students. According to the studies that were looked at, individualized learning has the potential to increase student involvement as well as student enthusiasm and academic performance. However, there are still a lot of questions that haven't been answered about the most effective ways to implement and evaluate personalized learning in different settings.

According to the conclusions of this analysis, individualized learning may be successful if it is adapted to the specific requirements, interests, and methods of instruction preferred by

individual students. In addition, the implementation of personalized learning calls for thorough planning, continuous support, and collaborative effort on the part of educators, administrators, and other stakeholders.

This review, taken as a whole, highlights the urgent need for more research on personalized learning, particularly research that examines the impact of personalized learning on a wide variety of student populations and in a variety of educational settings. It is possible for us to work toward the goal of creating educational opportunities for all students that are more equitable and effective if we advance our understanding of the benefits and challenges of personalized learning.

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