Personalized Learning Strategies in Higher Education in Saudi Arabia: Identifying Common Approaches and Conditions for Effective Implementation

Abdullah Alenezi

Abstract - The aim of the study is to identify the most commonly used personalized learning strategies in higher education in Saudi Arabia and explore the conditions for effective implementation of these strategies. In this study, a mixed-methods approach was employed, which involved conducting a survey of 390 students and conducting interviews with 18 students across three universities in Saudi Arabia. The findings reveal that the most commonly used personalized learning strategies are tailoring instruction to individual needs and preferences, providing one-on-one support and guidance, and allowing for student choice and autonomy. Flexible pacing and learner agency were also identified as important strategies, while adaptive assessment was found to be the least commonly used strategy. The study suggests that adequate resources, training and support, collaboration and communication, flexibility and adaptability, assessment and feedback, and clear goals and expectations are necessary for effective implementation of personalized learning strategies. These findings provide insights into the prerequisites for the successful execution of personalized learning approaches in tertiary education in Saudi Arabia and can serve as a blueprint for formulating impactful policies and practices that improve student-learning results.

Keywords – Personalized learning, higher education, Saudi Arabia, flexible pacing, adaptive assessment, learner agency, student-centered learning.

1. Introduction

In recent years, higher education institutions have embraced personalized learning strategies to enhance student learning outcomes. This approach tailors educational experiences to individual students' needs and interests, promoting engagement and academic achievement. Leveraging technology and data analytics, institutions can offer customized content and support, empowering students to take charge of their learning journey. This study aims to explore the implementation of effective personalized learning strategies in higher education institutions in Saudi Arabia. By examining best practices, challenges, and outcomes within the Saudi Arabian context, this research seeks to contribute to the growing body of knowledge on personalized learning and inform institutions on how to optimize its potential benefits specifically in the Saudi Arabian higher education setting. Ultimately, understanding the impact of personalized learning in higher education in Saudi Arabia can lead to the design of more inclusive, engaging, and effective educational experiences for students.

1.1. Background and Context

In the past few years, Saudi Arabia has witnessed notable advancements in the growth and improvement of its higher education system. According to the Saudi Arabian Ministry of Education, the number of higher education institutions within the country has risen from 10 in 1975 to 29 in 2021. Additionally, the enrollment rates have experienced a substantial increase, with the number of students rising from 8,000 in 1975 to over 1.7 million in 2020.
However, despite the growth in the number of higher education institutions and students, there are concerns about the quality of education provided and the effectiveness of traditional teaching methods. Studies have shown that traditional lecture-based teaching methods may not be effective in promoting student engagement, motivation, and learning outcomes [1],[2].

To address these concerns, personalized learning strategies have gained attention as an approach that tailors teaching and learning to individual students' needs and preferences. The objective of personalized learning strategies is to adopt a student-centric approach to instruction, utilizing technology and data to customize learning experiences and facilitate student learning and achievement [3],[4].

While personalized learning strategies have gained popularity in higher education, there is limited research on their effectiveness in the Saudi Arabian context. The purpose of this study is to examine the influence of personalized learning strategies on student learning outcomes within the context of higher education in Saudi Arabia.

Education plays a pivotal role in the development of Saudi Arabia, as emphasized by the Vision 2030 initiative. This visionary plan strives to revolutionize the country's education system by focusing on improving the quality of education, fostering innovation, and equipping students with the skills required for the future job market [5]. To achieve these goals, it is crucial to identify effective teaching and learning strategies that can support student success.

Personalized learning strategies align perfectly with the objectives of Vision 2030 by offering a student-centric approach to teaching and learning. By examining the effectiveness of personalized learning strategies within the Saudi Arabian context, this study can make a valuable contribution to the country's endeavors in improving the quality of education and equipping students for the future.

1.2. Significance of the Study

The significance of this study rests in its ability to provide valuable insights that can guide the development and implementation of effective personalized learning strategies in higher education institutions in Saudi Arabia. Saudi Arabia has set ambitious objectives for its education system, prioritizing the enhancement of education quality and equipping students with the skills necessary to tackle the demands of the 21st century. Personalized learning strategies have been identified as a promising approach to achieving these goals, but there is a lack of research on their effectiveness in the Saudi Arabian context.

By examining the influence of personalized learning strategies on student learning outcomes in higher education institutions in Saudi Arabia, this study can provide insights into the conditions under which these strategies are most effective. The findings of this study can provide valuable insights for designing personalized learning interventions that are specifically customized to meet the distinct needs and contexts of Saudi Arabian students. Furthermore, these findings can also contribute to the broader body of knowledge on personalized learning in higher education, which has primarily concentrated on Western settings.

The introduction of effective personalized learning strategies in higher education within Saudi Arabia holds great potential for impacting the country's economic and social development in significant ways. The country's Vision 2030 plan emphasizes the importance of education in developing a knowledge-based economy and preparing Saudi Arabian youth for the future workforce. Effective personalized learning strategies can help achieve these goals by improving student learning outcomes, increasing retention rates, and preparing students for the demands of a rapidly changing job market.

Furthermore, this study can make a valuable contribution to the broader global discourse surrounding the role of personalized learning in tackling the challenges confronting higher education. The COVID-19 pandemic has underscored the importance of flexible and adaptable learning approaches capable of accommodating diverse student needs and preferences [6]. Personalized learning strategies have the potential to meet this need, but there is a lack of research on their effectiveness and implementation in higher education. Through its investigation of the impact of personalized learning strategies in Saudi Arabia, this study can play a crucial role in advancing the development of evidence-based practices that have broader applicability across different educational contexts.

Overall, the significance of this study lies in its potential to advance the development of effective personalized learning strategies in higher education, not only in Saudi Arabia but also in other contexts. The findings derived from this study can serve as valuable guidance for designing and implementing interventions that enhance student learning outcomes and prepare them for the challenges of the 21st-century workforce. This aligns with Saudi Arabia's Vision 2030 plan and the broader global agenda for education, emphasizing the importance of equipping learners with the necessary skills for success in a rapidly changing world.
1.3. Research Questions

1. What types of personalized learning strategies are implemented in higher education institutions in Saudi Arabia?
2. What is the influence of different personalized learning strategies on student learning outcomes in higher education in Saudi Arabia?
3. What are the conditions under which different personalized learning strategies are most effective in higher education in Saudi Arabia?

2. Literature Review

The literature review section delves into the concept of personalized learning in higher education, examining its various definitions and conceptualizations. It explores different types of personalized learning strategies, including mastery learning, differentiated instruction, personal learning plans, adaptive learning systems, and self-regulated learning, among others. The section also addresses the effectiveness of personalized learning strategies in higher education, discussing findings from meta-analyses and individual studies. Moreover, it highlights the importance of considering specific conditions for the successful implementation of personalized learning strategies, such as alignment with learning objectives, quality of instructional design and content, effective use of technology, instructor training and support, instructor flexibility, and student characteristics. By synthesizing existing literature, this section lays the foundation for understanding the scope and significance of personalized learning strategies in the context of higher education, with a focus on identifying common approaches and conditions for effective implementation, particularly within the unique setting of Saudi Arabia.

2.1. Definition and Conceptualization of Personalized Learning

The literature offers multiple definitions of personalized learning. According to Vygotsky's socio-cultural theory, personalized learning involves tailoring instruction to the zone of proximal development (ZPD) of individual learners [7]. In this context, personalized learning refers to the process of adapting the level of challenge in instruction to match a learner's current level of knowledge and skill, with the goal of promoting optimal learning outcomes.

Similarly, personalized learning has been defined as an approach that seeks to tailor instruction and learning experiences to the unique needs, interests, and preferences of individual learners [8]. In this sense, personalized learning entails granting learners increased autonomy and control over their learning experience, enabling them to determine the pace, mode, and content that best aligns with their needs and preferences.

Another definition of personalized learning is the utilization of technology to facilitate individualized learning experiences [9]. In this particular context, personalized learning refers to the application of digital tools and resources that assist in creating adaptive learning pathways, providing real-time feedback, and offering personalized content recommendations tailored to a learner's performance and preferences.

Overall, personalized learning can be understood as a comprehensive concept that encompasses various dimensions, including instructional strategies, learning experiences, and the integration of technology to facilitate individualized learning. It places emphasis on addressing the distinct needs, interests, and preferences of learners, ultimately aiming to enhance learning outcomes to their fullest potential.

2.2. Different Types of Personalized Learning Strategies

The literature suggests that there are several types of personalized learning strategies that can be employed to customize instruction based on individual learners' needs and preferences. Some of these strategies are summarized below:

1. Mastery learning: Mastery learning is an approach that involves breaking learning into small, sequential units and ensuring that students have mastered each unit before moving on to the next. Mastery learning can be personalized by enabling students to progress through the material at their preferred pace, offering feedback and assistance to address areas of challenge, and adjusting teaching methods based on individual students' performance and needs [10].

2. Differentiated instruction: Differentiated instruction encompasses tailoring instruction to accommodate students' varying needs and abilities. This can be achieved through practices such as flexible grouping, adapting the pace of instruction, and offering alternative pathways for students to access and demonstrate their learning.
By providing different levels of challenge or support, differentiated instruction aims to cater to the diverse learning profiles of students [11].

3. Personal learning plans: Personal learning plans are individualized plans that outline a student's goals, strengths, weaknesses, and learning preferences, and guide their learning pathway. Personal learning plans can be used to tailor instruction, provide feedback and support, and promote student ownership and agency in the learning process [12].

4. Adaptive learning systems: Adaptive learning systems use technology to personalize instruction by adapting the content, pace, and feedback based on a student's performance and preferences. Adaptive learning systems can provide real-time feedback and support, track student progress, and adjust instruction based on areas of weakness [13].

5. Self-regulated learning: Self-regulated learning involves teaching students strategies to monitor, control, and direct their own learning. In this context, personalized self-regulated learning involves guiding students to set goals, develop plans, track their progress, and engage in reflective practices to enhance their learning. By assisting students in identifying their unique strengths and weaknesses, personalized self-regulated learning also involves teaching them strategies and techniques to address areas of weakness. This approach empowers students to take ownership of their learning process and fosters a personalized learning experience that promotes individual growth and achievement [14].

Recent studies have also highlighted the potential of social personalized learning strategies, which involve collaborative and peer-to-peer learning activities [15]. Social personalized learning refers to an approach that emphasizes social interaction, cooperation, and knowledge sharing among learners. It can be particularly valuable for students who may encounter challenges with individualized learning strategies. By creating opportunities for collaboration, discussion, and group activities, social personalized learning fosters an inclusive and supportive learning environment. It encourages students to engage in meaningful interactions, share ideas, and learn from their peers. This approach acknowledges the importance of social dynamics in the learning process and leverages social interactions to enhance learning outcomes.

Overall, personalized learning encompasses various strategies that can be employed to customize instruction according to the unique needs and preferences of individual learners. These strategies can involve a combination of instructional approaches, technology integration, and collaborative learning activities. By leveraging these diverse strategies, educators can create a more tailored and engaging learning experience that supports student growth and achievement.

2.3. Effectiveness of Personalized Learning Strategies in Higher Education

Personalized learning strategies have gained popularity in higher education as an approach that tailors teaching and learning to individual students' needs and preferences. However, the effectiveness of personalized learning strategies in higher education has been a subject of discussion and inquiry within the educational community and among researchers. Several studies have examined the effectiveness of personalized learning strategies in higher education, providing valuable insights into their impact on student outcomes. The study conducted by Sereno [16] revealed a significant positive effect of personalized learning on students' academic achievement. Similarly, the meta-analysis by Ogwari et al. [17] found that personalized learning had positive effects on student achievement, engagement, and motivation.

Similarly, a study by Makhambetova et al. [18] found that personalized learning improved students' academic performance and motivation. The authors concluded that personalized learning could be an effective approach to teaching and learning in higher education. Additionally, the study conducted by Kryshko et al. [19] revealed that personalized learning had positive effects on students' motivation, engagement, and satisfaction.

However, it is important to acknowledge that not all studies have shown consistent positive effects of personalized learning strategies in higher education. The study conducted by Apriza et al. [20] found no significant effect of personalized learning on students' academic achievement. Similarly, the study by Iqbal et al. [21] reported that while personalized learning had positive impacts on students' motivation and engagement, it did not lead to improvements in their academic performance. These mixed findings highlight the complexity and variability in the effectiveness of personalized learning strategies across different contexts and implementation approaches. It is crucial to consider these varying results and delve deeper into the specific factors that may influence the outcomes of personalized learning interventions in higher education.
Further research is needed to explore the conditions under which personalized learning is most effective and to identify best practices for its successful implementation.

Overall, the effectiveness of personalized learning strategies in higher education appears to be influenced by several factors, including the type of personalized learning strategy used, the context in which it is implemented, and the students' characteristics and preferences. Therefore, further research is necessary to gain a deeper understanding of the conditions and factors that contribute to the effectiveness of different personalized learning strategies in higher education.

It is worth noting that the majority of previous studies conducted on the effectiveness of personalized learning strategies have primarily focused on educational contexts in Western countries. As a result, there is a need to expand the research to encompass different cultural and educational settings, including Saudi Arabia. By investigating the impact of personalized learning strategies in the specific context of Saudi Arabian higher education, this study aims to bridge the gap in existing research and provide valuable insights into the effectiveness and applicability of these strategies in a non-Western context. This research can contribute to a more comprehensive understanding of personalized learning and its implications for student learning outcomes, helping to inform educational practices and policies not only in Saudi Arabia but also in other similar cultural and educational contexts.

2.4. Conditions for Effective Implementation of Personalized Learning Strategies

The literature highlights various factors that are considered crucial for the effective implementation of personalized learning strategies. Among these factors, alignment between the personalized learning strategy and the learning objectives of the course has been recognized as a key element for success [22]. This implies that the personalized learning strategy should be carefully designed to align with and support the specific learning objectives of the course. By ensuring this alignment, the personalized learning approach can effectively facilitate students' progress and help them achieve the intended learning outcomes. It is essential to consider the learning objectives as a guiding principle when designing and implementing personalized learning strategies, as this alignment can enhance the relevance and effectiveness of the personalized learning experience for students.

Another important factor is the quality of the instructional design and the content [23]. The instructional design should be engaging and motivating for students and the content should be relevant and meaningful. In addition to aligning with learning objectives, the effective use of technology can significantly enhance the impact of personalized learning strategies. Technology can provide valuable support by offering immediate feedback to students, allowing them to gauge their progress and make timely adjustments to their learning approach. Furthermore, technology can facilitate communication and collaboration among students, enabling them to engage in meaningful interactions, share ideas, and collaborate on projects. These digital tools and platforms create opportunities for personalized learning experiences that are dynamic, interactive, and adaptable to individual student needs and preferences. By leveraging technology effectively, personalized learning strategies can be enhanced, promoting engagement, collaboration, and deeper understanding among students [24].

The role of instructors is indeed crucial in the successful implementation of personalized learning strategies. To effectively implement personalized learning, instructors should receive appropriate training and support. This includes training in the pedagogical approaches and instructional strategies associated with personalized learning, as well as guidance on how to leverage technology to support individualized learning experiences [24]. Moreover, instructors need to be flexible in their approach and willing to adapt to the needs and preferences of individual students [22].

Finally, the characteristics of the students themselves can influence the effectiveness of personalized learning strategies. For example, students who are self-directed and motivated may be more successful in a personalized learning environment [24]. However, students who are less self-directed or who require more structure and guidance may struggle in a personalized learning environment. Overall, the literature suggests that effective implementation of personalized learning strategies requires careful consideration of several factors, including alignment with learning objectives, quality of instructional design and content, use of technology, instructor training and support, instructor flexibility, and student characteristics.

3. Methodology

The methodology section outlines the research design and approach employed in this study on Personalized Learning Strategies in Higher Education in Saudi Arabia.
The study adopts a mixed-methods approach, combining both quantitative survey data and qualitative semi-structured interviews. This comprehensive approach allows for a thorough examination of personalized learning strategies in higher education, capturing both broader trends and specific implementation factors. The survey collects quantitative data on the prevalence, effectiveness, and barriers to personalized learning strategies, while the interviews delve deeper into participants' experiences and perceptions. By combining these methods, the study aims to provide a robust understanding of personalized learning in the Saudi Arabian higher education context, offering valuable insights into common approaches and conditions for effective implementation.

### 3.1. Research Design

The research methodology employed in this study adopted a mixed-methods approach, combining both survey data collection and semi-structured interviews. This approach was selected to ensure a comprehensive and in-depth examination of the various personalized learning strategies utilized in higher education. By employing surveys, quantitative data can be gathered to assess the effectiveness of these strategies. Additionally, semi-structured interviews allow for a deeper exploration of the conditions that facilitate their effectiveness. By incorporating both quantitative and qualitative data, this study aims to provide a holistic understanding of personalized learning strategies in higher education and the factors influencing their efficacy.

The survey was utilized as a data collection tool to obtain information regarding the different types of personalized learning strategies used in higher education in Saudi Arabia and their perceived effectiveness by students. The survey also collected data on student learning outcomes and the perceived barriers to effective implementation of personalized learning strategies.

Semi-structured interviews were conducted to gain a deeper and more comprehensive understanding of the conditions under which different personalized learning strategies are most effective in a higher education setting. The interviews involved students exploring their experiences with personalized learning strategies, including successes and challenges.

This mixed-methods approach is appropriate for investigating the research questions outlined in this study as it allows for the triangulation of data from multiple sources and the verification of findings across different methods [25].

Both the survey and semi-structured interviews will collectively contribute to a comprehensive understanding of personalized learning strategies in higher education, encompassing both the broader landscape and specific implementation aspects. The survey will provide a broad overview by gathering quantitative data from a larger sample, allowing for generalizations and statistical analysis. It will offer insights into the prevalence, frequency, and types of personalized learning strategies used in higher education, as well as their perceived effectiveness and impact on learning outcomes.

### 3.2. Participants

For this study, a total of 390 undergraduate students were recruited from three Saudi universities. The universities selected for this study were chosen through a purposive sampling approach. The primary considerations in the selection process were the willingness of the universities to participate in the study and their accessibility to the researcher. Additionally, efforts were made to ensure diversity among the selected universities in terms of size, location, and academic programs offered.

To recruit participants, the researcher contacted the universities' administration and explained the study's purpose, design, and ethical considerations. The participants in this study were presented with an informed consent form, which outlined the details of the research project and the expectations for participation. The researcher ensured the confidentiality of the participants' data and complied with the ethical guidelines for research involving human subjects.

The participants were undergraduate students from different disciplines and backgrounds. The selection of participants for this study followed specific criteria to ensure that the data collected aligns with the research objectives. The criteria used for participant selection were as follows: (1) currently enrolled as an undergraduate student at one of the participating universities, (2) willingness to participate voluntarily, (3) have not participated in any other personalized learning studies in the past year.

The sample size of 130 students was selected randomly from each participating university, with a total of 390 participants. The participants were selected to represent a range of academic disciplines, gender, age, and cultural backgrounds. By including participants from various academic disciplines, the study sought to capture a broad perspective on the implementation and impact of personalized learning strategies across different fields of study, to ensure the generalizability of the study's findings.
The researcher aimed to recruit a sufficient number of participants to ensure the study's statistical power and validity. The sample size for the interview phase was 6 students from each university, totaling 18 students. Overall, the sample of participants represented a broad range of the undergraduate student population in Saudi Arabia, and the study's findings can be applied to similar contexts.

3.3. Data Collection

Data for this study was collected using a combination of quantitative and qualitative methods. The quantitative data was gathered through surveys, which allowed for the collection of numerical data that could be analyzed statistically. On the other hand, qualitative data was obtained through interviews, enabling a deeper exploration of participants’ experiences, perspectives, and insights. This mixed-methods approach provides a comprehensive understanding of the research topic by combining both quantitative and qualitative data, allowing for a more robust analysis and interpretation of the findings.

3.4. Survey

In this study, a survey was employed to gather data from the participants regarding their perceptions of personalized learning strategies in higher education. The survey was carefully constructed to encompass various important aspects related to personalized learning, such as individual preferences for personalized learning, self-regulated learning practices, perceived learning outcomes, effectiveness of personalized learning strategies, and potential barriers to their successful implementation. By including these constructs in the survey questions, the study aimed to obtain a comprehensive understanding of the participants’ perspectives on personalized learning strategies and their associated factors.

The survey was developed based on existing research on personalized learning strategies and their impact on student learning outcomes in higher education. Each construct included a number of items that were designed to capture participants' perceptions of the construct. For example, to measure the construct of personalized learning preferences, the survey included questions that assessed the extent to which teaching and learning were customized to meet individual students' needs and preferences. These questions aimed to capture participants' perceptions of the level of personalization in their learning experiences.

On the other hand, the construct of self-regulated learning was measured through questions that explored the extent to which students were encouraged to take ownership of their learning, make independent choices, and set goals for themselves. These questions aimed to gauge participants' perceptions of their autonomy and self-directedness in the learning process. By including these constructs in the survey, the study sought to capture participants' perspectives on key aspects of personalized learning and their role in the educational context.

To ensure the survey's validity and reliability, a group of experts in the field of education and assessment carefully examined and validated the survey items.

A pilot study was also conducted to test the survey's functionality, identify any potential issues or ambiguities in the questions, and make necessary revisions based on the pilot feedback.

Furthermore, the survey utilized established measurement scales and validated instruments wherever possible. This helped ensure the reliability of the survey by using well-tested and standardized measures to assess the constructs of interest.

Overall, these steps aimed to enhance the validity and reliability of the survey, ensuring that it effectively measured participants' perceptions of personalized learning strategies in higher education.

Table 1. Cronbach's alpha coefficient

<table>
<thead>
<tr>
<th>Construct</th>
<th>Number of items</th>
<th>Cronbach's alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personalized learning preferences</td>
<td>10</td>
<td>0.82</td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>8</td>
<td>0.78</td>
</tr>
<tr>
<td>Learning outcomes</td>
<td>9</td>
<td>0.83</td>
</tr>
<tr>
<td>Perceived effectiveness of personalized learning strategies</td>
<td>7</td>
<td>0.75</td>
</tr>
<tr>
<td>Barriers to effective implementation of personalized learning strategies</td>
<td>6</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Table 1 displays the data pertaining to the internal consistency reliability of the constructs employed in the survey. The Cronbach's alpha coefficient, serving as a measure of internal consistency, was utilized to assess the items' reliability. A high coefficient signifies consistent measurement of the construct.
Regarding the construct of "Personalized learning preferences," consisting of 10 items, a Cronbach's alpha coefficient of 0.82 was observed, indicating strong internal consistency. This construct gauges students' inclinations toward personalized learning strategies, such as individualized instruction and adaptive assessment. Similarly, the construct of "Self-regulated learning" comprised 8 items, yielding a Cronbach's alpha coefficient of 0.78, reflecting high internal consistency. This construct assesses students' capacity to assume responsibility for their own learning and regulate their learning processes. Furthermore, the construct of "Learning outcomes" encompassed 9 items, attaining a Cronbach's alpha coefficient of 0.83, signifying high internal consistency. This construct evaluates the influence of personalized learning strategies on student learning outcomes, such as academic achievement and engagement. Additionally, the construct of "Perceived effectiveness of personalized learning strategies" encompassed 7 items, yielding a Cronbach's alpha coefficient of 0.75, indicating high internal consistency. This construct captures students' perceptions of the efficacy of personalized learning strategies in enhancing their learning experience. Lastly, the construct of "Barriers to effective implementation of personalized learning strategies" consisted of 6 items, exhibiting a Cronbach's alpha coefficient of 0.70, indicating moderate internal consistency. This construct examines the obstacles and challenges encountered by students when implementing personalized learning strategies effectively. Overall, the notable Cronbach's alpha coefficients for most constructs suggest that the survey items consistently and reliably measure the constructs they aim to assess, bolstering the validity and credibility of the study's findings.

Students' perceptions of how effective personalized learning strategies are in promoting their learning.

Finally, the construct of "Barriers to effective implementation of personalized learning strategies" had 6 items, and the Cronbach's alpha coefficient was 0.70, indicating moderate internal consistency. This construct measures the challenges and obstacles that students face in implementing personalized learning strategies effectively.

Overall, the high Cronbach's alpha coefficients for most constructs indicate that the survey items are consistent and reliable measures of the constructs they aim to assess, which adds to the validity and credibility of the study's findings.

3.5. Semi-Structured Interview

In addition to the survey, a subset of participants was chosen for semi-structured interviews to gain a more profound insight into their perceptions of personalized learning strategies. A purposive sampling technique was employed to select participants based on their survey responses, with a specific focus on those who expressed either strong positive or negative attitudes towards personalized learning strategies.

The interviews were conducted face-to-face and had an average duration of 30-45 minutes. Each interview was audio recorded and transcribed verbatim to facilitate analysis. The interview questions were carefully crafted to delve into the participants' firsthand experiences with personalized learning strategies. Topics covered included aspects they found beneficial or challenging about the approach and any recommendations they had for enhancing its implementation.

To enhance the validity of the interviews, the questions underwent a rigorous review process by experts specializing in the field of personalized learning. Additionally, a pilot test was conducted with a small group of participants to gather feedback on the clarity and relevance of the questions. The input received from the pilot testing phase was instrumental in refining the interview questions and ensuring they effectively elicited the desired information from the participants.

To enhance the reliability of the interviews, the researcher followed a standardized interview protocol. This protocol provided a set of consistent procedures and guidelines for conducting the interviews, ensuring that all participants were asked the same questions in a similar manner. By adhering to this standardized approach, the researcher aimed to minimize variations in the administration of the interviews, thereby increasing the reliability of the data collected. The data obtained from the interviews underwent a thematic analysis, which involved a systematic examination of the transcribed interviews. The researcher read through the transcriptions multiple times to identify recurring themes and patterns within the data. These themes were then coded to assign labels or categories that captured the essence of each theme. By grouping similar themes together, overarching categories were developed, enabling the identification of commonalities and differences in participants' experiences and perceptions of personalized learning strategies. This analysis approach allowed for a comprehensive exploration of the qualitative data and facilitated the identification of key findings and insights.

By employing both interviews and surveys, this study achieves a more comprehensive understanding of participants' perspectives on personalized learning strategies. While surveys provide valuable quantitative data, interviews delve deeper into the intricacies and subtleties of participants' experiences, offering a more nuanced and comprehensive dataset.
This combination of quantitative and qualitative data strengthens the validity of the study by triangulating findings and offering multiple perspectives on the research questions. The integration of both data sources enables a more thorough analysis, enriches the interpretation of results, and provides a more holistic understanding of personalized learning strategies in higher education.

4. Results

The results section presents the findings of the study on Personalized Learning Strategies in Higher Education in Saudi Arabia. The results are divided into two parts: quantitative analysis and qualitative analysis. The quantitative analysis examines the influence of personalized learning strategies on student learning outcomes using descriptive and inferential statistics. The qualitative analysis explores the conditions under which different personalized learning strategies are most effective.

Quantitative analysis of the influence of personalized learning strategies on student learning outcomes

The study employed a quantitative analysis to examine the impact of personalized learning strategies on student learning outcomes. This analysis involved the use of both descriptive and inferential statistics to analyze the survey data collected from participants. The Statistical Package for the Social Sciences software (SPSS) was utilized for data analysis.

Initially, descriptive statistics were conducted to summarize and present an overview of the collected data. This involved calculating measures such as means, standard deviations, and frequencies to describe the central tendency, variability, and distribution of the data. The results of these descriptive statistics are presented in Table 2, providing key summary information about the variables related to personalized learning strategies and student learning outcomes.

Table 2. Descriptive statistics for constructs related to personalized learning strategies

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personalized learning preferences</td>
<td>3.85</td>
<td>0.78</td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>3.71</td>
<td>0.89</td>
</tr>
<tr>
<td>Learning outcomes</td>
<td>3.92</td>
<td>0.76</td>
</tr>
<tr>
<td>Perceived effectiveness of personalized learning strategies</td>
<td>3.63</td>
<td>0.88</td>
</tr>
<tr>
<td>Barriers to effective implementation of personalized learning strategies</td>
<td>2.98</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Table 2 shows the mean scores for all constructs related to personalized learning strategies were above 3, indicating that the participants perceived the constructs positively. The construct with the highest mean score was learning outcomes, with a mean score of 3.92, indicating that the participants believed that personalized learning strategies positively impacted their learning outcomes. The construct with the lowest mean score was barriers to effective implementation of personalized learning strategies, with a mean score of 2.98, indicating that the participants perceived barriers to implementing personalized learning strategies.

Next, the study conducted inferential statistics to examine the relationships between the constructs related to personalized learning strategies and student learning outcomes. The results of the inferential statistics are presented in Table 3.

Table 3. Correlations between constructs related to personalized learning strategies and student learning outcomes

<table>
<thead>
<tr>
<th>Construct</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personalized learning preferences</td>
<td>0.537</td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>0.481</td>
</tr>
<tr>
<td>Perceived effectiveness of personalized learning strategies</td>
<td>0.604</td>
</tr>
<tr>
<td>Barriers to effective implementation of personalized learning strategies</td>
<td>0.352</td>
</tr>
</tbody>
</table>

Table 3 shows all constructs related to personalized learning strategies were significantly correlated with student learning outcomes at p < 0.05. The construct with the strongest correlation was perceived effectiveness of personalized learning strategies, with a correlation coefficient of 0.604, indicating a moderate positive correlation between perceived effectiveness of personalized learning strategies and student learning outcomes. The construct with the weakest correlation was barriers to effective implementation of personalized learning strategies, with a correlation coefficient of -0.352, indicating a weak negative correlation between barriers to effective implementation of personalized learning strategies and student learning outcomes.

Overall, the results of the quantitative analysis suggest that personalized learning strategies have a positive impact on student learning outcomes in higher education. The constructs related to personalized learning strategies were positively perceived by the participants, and all constructs were significantly correlated with student learning outcomes. These results support the effectiveness of personalized learning strategies in improving student learning outcomes in higher education.
Qualitative analysis of the conditions under which different personalized learning strategies are most effective

Table 4. Themes and subthemes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subthemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individualized instruction</td>
<td>1.1 Tailoring instruction to individual needs and preferences</td>
</tr>
<tr>
<td></td>
<td>1.2 Providing one-on-one support and guidance</td>
</tr>
<tr>
<td></td>
<td>1.3 Allowing for student choice and autonomy</td>
</tr>
<tr>
<td>Flexible pacing</td>
<td>2.1 Allowing for self-paced learning</td>
</tr>
<tr>
<td></td>
<td>2.2 Providing opportunities for acceleration or remediation</td>
</tr>
<tr>
<td>Adaptive assessment</td>
<td>3.1 Providing immediate and targeted feedback</td>
</tr>
<tr>
<td></td>
<td>3.2 Allowing for multiple attempts or alternative forms of assessment</td>
</tr>
<tr>
<td>Learner agency</td>
<td>4.1 Encouraging self-reflection and goal setting</td>
</tr>
<tr>
<td></td>
<td>4.2 Fostering a growth mindset and self-efficacy</td>
</tr>
<tr>
<td></td>
<td>4.3 Providing opportunities for student voice and choice</td>
</tr>
</tbody>
</table>

Table 4 presents the different themes and subthemes that were identified as part of the study's analysis of personalized learning strategies in higher education in Saudi Arabia.

The first theme is "individualized instruction," which includes three subthemes: tailoring instruction to individual needs and preferences, providing one-on-one support and guidance, and allowing for student choice and autonomy. These subthemes emphasize the importance of personalized instruction that is tailored to each student's unique learning needs, providing individualized support and guidance to students, and allowing students to have more control over their own learning through choices and autonomy.

The second theme is "flexible pacing," which includes two subthemes: allowing for self-paced learning and providing opportunities for acceleration or remediation.

These subthemes highlight the importance of allowing students to learn at their own pace, providing opportunities for students to move through course materials at a speed that suits them and offering opportunities for students to accelerate their learning or receive additional support if needed.

The third theme is "adaptive assessment," which includes two subthemes: providing immediate and targeted feedback and allowing for multiple attempts or alternative forms of assessment. These subthemes highlight the significance of providing students with feedback that is timely and pertinent, customized to their unique knowledge and abilities. Additionally, they emphasize the value of allowing students to have multiple attempts or alternative forms of assessment to showcase their comprehension of course material.

The fourth and final theme is "learner agency," which includes three subthemes: encouraging self-reflection and goal setting, fostering a growth mindset and self-efficacy, and providing opportunities for student voice and choice. These subthemes emphasize the significance of empowering students to take ownership of their learning. They highlight the importance of encouraging students to reflect on their learning progress and set goals, fostering a positive mindset and self-confidence in their abilities. Additionally, they stress the value of providing students with opportunities for voice and choice, allowing them to have more control over their learning experiences.

In terms of linking these personalized learning strategies with Blackboard tools, there are several ways that Blackboard can support the implementation of these strategies. For example, Blackboard can provide tools that allow instructors to tailor instruction to individual student needs, such as adaptive release, which allows instructors to control when and how content is released to students based on their performance or progress. Blackboard can also offer self-paced learning tools that support personalized learning. For instance, it may include adaptive learning modules or personalized pathways that enable students to progress through course materials at their preferred pace. These tools allow students to tailor their learning experience to their individual needs, enabling them to advance through the content at a speed that suits their learning style and level of understanding.

Additionally, Blackboard can provide tools for adaptive assessment, such as adaptive quizzes or personalized feedback tools that allow instructors to provide targeted feedback and support to students.
Table 5. Frequency of themes and subthemes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subthemes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individualized</td>
<td>1.1</td>
<td>14</td>
</tr>
<tr>
<td>instruction</td>
<td>1.2</td>
<td>8</td>
</tr>
<tr>
<td>1.3</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Flexible</td>
<td>2.1</td>
<td>10</td>
</tr>
<tr>
<td>pacing</td>
<td>2.2</td>
<td>7</td>
</tr>
<tr>
<td>Adaptive</td>
<td>3.1</td>
<td>9</td>
</tr>
<tr>
<td>assessment</td>
<td>3.2</td>
<td>6</td>
</tr>
<tr>
<td>Learner</td>
<td>4.1</td>
<td>12</td>
</tr>
<tr>
<td>agency</td>
<td>4.2</td>
<td>9</td>
</tr>
<tr>
<td>4.3</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 provides the frequency with which the different subthemes of the four main themes related to personalized learning strategies were identified in the data collected from the study. The frequencies indicate the number of participants who mentioned each subtheme in response to the survey questions.

Based on the table, the most frequently mentioned subtheme related to individualized instruction was "tailoring instruction to individual needs and preferences", which was mentioned by 14 participants. This suggests that students in higher education in Saudi Arabia value instruction that is tailored to their individual needs and preferences.

The subtheme "providing one-on-one support and guidance" was mentioned by 8 participants, indicating that personalized support and guidance are also important for students.

The subtheme of "allowing for self-paced learning" was mentioned by 10 participants, reflecting their desire for personalized learning that accommodates individual pacing. These participants expressed the importance of having the freedom to work at their own speed, enabling them to delve deeper into challenging topics or move ahead quickly in areas where they excel.

Similarly, the subtheme of "providing opportunities for acceleration or remediation" was mentioned by 7 participants, highlighting the need for personalized learning that allows students to advance or receive additional support based on their specific learning needs.

This flexibility in pacing fosters a more tailored learning experience, catering to the diverse abilities and progress of students.

Regarding adaptive assessment, the subtheme "providing immediate and targeted feedback" was mentioned by 9 participants, indicating that students in higher education in Saudi Arabia value personalized assessment that provides them with immediate feedback. The subtheme "allowing for multiple attempts or alternative forms of assessment" was mentioned by 6 participants, suggesting that personalized assessment that allows for flexibility in the way students demonstrate their learning is also important.

The subtheme of "encouraging self-reflection and goal setting" was mentioned by 12 participants, indicating that students in higher education in Saudi Arabia value personalized learning that promotes their agency in taking ownership of their learning journey. These participants emphasized the importance of activities and strategies that foster self-reflection, helping them assess their progress, identify areas for improvement, and set meaningful goals.

Additionally, the subtheme of "fostering a growth mindset and self-efficacy" was mentioned by 9 participants. This indicates that students appreciate personalized learning approaches that nurture a mindset focused on growth, resilience, and the belief in their ability to overcome challenges. It highlights the significance of creating a supportive learning environment that cultivates self-confidence and self-belief in students' capabilities to succeed.

Furthermore, the subtheme of "providing opportunities for student voice and choice" was mentioned by 8 participants, suggesting that students value personalized learning that allows them to have a voice in their educational experiences. They emphasized the importance of being able to express their preferences, interests, and learning styles, and having choices in how they engage with the learning content and activities. This subtheme emphasizes the significance of student agency and empowerment in the learning process.

Overall, these subthemes illustrate the students' desire for personalized learning strategies that promote learner agency, self-reflection, goal setting, growth mindset, self-efficacy, and opportunities for student voice and choice. It highlights their aspiration to be active participants in their education and have a sense of control and autonomy over their learning experiences.
Table 6 compares the frequency of each subtheme across the four main themes in the study: individualized instruction, flexible pacing, adaptive assessment, and learner agency. Based on the table, it can be observed that the subtheme “tailoring instruction to individual needs and preferences” has a high frequency under the individualized instruction theme, while it has a low frequency in the other themes. This indicates that individualized instruction is primarily associated with tailoring instruction to the individual’s needs and preferences.

Similarly, the subtheme “allowing for self-paced learning” has a high frequency under the flexible pacing theme, but a low frequency in the other themes. The findings suggest that flexible pacing within personalized learning is primarily connected to the idea of allowing students to learn at their own individualized speed. This aligns with the subtheme “allowing for self-paced learning” mentioned by participants, indicating a desire for personalized learning that accommodates varying learning speeds and preferences.

On the other hand, the subtheme “providing immediate and targeted feedback” appears to have a higher frequency specifically within the theme of adaptive assessment, but a lower frequency in relation to the other themes. This indicates that adaptive assessment, which tailors assessments based on individual student needs, is primarily associated with the provision of immediate and specific feedback to students. This subtheme suggests that adaptive assessment approaches are perceived as particularly effective in providing timely and personalized feedback that helps students gauge their progress and make improvements in their learning.

These findings highlight the specific associations between certain subthemes and particular aspects of personalized learning. Flexible pacing is closely linked to self-paced learning, while adaptive assessment is closely connected to the provision of immediate and targeted feedback. Understanding these associations can inform the design and implementation of personalized learning strategies that effectively address students’ needs and preferences in Saudi Arabia.

Lastly, under the learner agency theme, the subthemes “encouraging self-reflection and goal setting,” “fostering a growth mindset and self-efficacy,” and “providing opportunities for student voice and choice” all have a high frequency. These findings suggest that learner agency, a key aspect of personalized learning, is closely associated with providing opportunities for students to take control of their own learning experiences.

<table>
<thead>
<tr>
<th>Theme/Subtheme</th>
<th>Individuated Instruction</th>
<th>Flexible Pacing</th>
<th>Adaptive Assessment</th>
<th>Learner Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Tailoring instruction to individual needs and preferences</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>1.2 Providing one-on-one support and guidance</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>1.3 Allowing for student choice and autonomy</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>2.1 Allowing for self-paced learning</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>2.2 Providing opportunities for acceleration or remediation</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>3.1 Providing immediate and targeted feedback</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>3.2 Allowing for multiple attempts or alternative forms of assessment</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>4.1 Encouraging self-reflection and goal setting</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>4.2 Fostering a growth mindset and self-efficacy</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>4.3 Providing opportunities for student voice and choice</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 6. A matrix for Effectiveness of personalized learning strategies in different conditions
The subtheme "encouraging self-reflection and goal setting" mentioned by participants indicates a desire for personalized learning approaches that empower students to actively engage in their own learning process by reflecting on their progress and setting personal learning goals.

Additionally, the subthemes "fostering a growth mindset and self-efficacy" and "providing opportunities for student voice and choice" further underscore the importance of learner agency. Participants expressed the need for personalized learning strategies that foster a growth mindset, instilling a belief in students' ability to learn and improve. Moreover, they emphasized the value of having opportunities to exercise their voice and make choices in their educational journey, indicating a desire for more autonomy and ownership in the learning process.

Overall, these findings highlight the significance of learner agency within personalized learning, emphasizing the importance of supporting students in taking responsibility for their own learning, setting goals, and having a sense of control over their educational experiences. Incorporating these elements of learner agency can enhance students' engagement and motivation, ultimately leading to more meaningful and effective learning outcomes.

In summary, the table shows that each theme is associated with distinct subthemes, and each subtheme has varying degrees of importance across the four themes. This information can be used to better understand how personalized learning strategies are being implemented in higher education in Saudi Arabia, and to identify areas for further research and development.

5. Discussion

The findings of this study reveal that the most commonly used personalized learning strategies in higher education in Saudi Arabia are tailoring instruction to individual needs and preferences (1.1), providing one-on-one support and guidance (1.2), and allowing for student choice and autonomy (1.3). These results are consistent with previous research that has identified these strategies as effective for promoting personalized learning [28], [29].

Flexible pacing (2.1 and 2.2) and learner agency (4.1, 4.2, and 4.3) were also identified as important personalized learning strategies in this study, although they were less frequently used than individualized instruction strategies. These findings are consistent with previous research that has highlighted the importance of providing flexible pacing and promoting learner agency for personalized learning [26], [27].

Adaptive assessment strategies (3.1 and 3.2) were found to be the least commonly used personalized learning strategies in this study. This finding is somewhat surprising given that adaptive assessments have been identified as a key component of personalized learning in previous research [28], [29]. However, it is possible that the use of adaptive assessments is still relatively new in higher education in Saudi Arabia and may become more widespread in the future.

Overall, these findings suggest that higher education institutions in Saudi Arabia are employing a range of personalized learning strategies, with a particular emphasis on individualized instruction and learner agency. However, there is still room for growth in the use of adaptive assessment strategies. The analysis of both the quantitative and qualitative data provided insights into the conditions for effective implementation of personalized learning strategies. Based on the findings, the following conditions are recommended for effective implementation:

1. Adequate resources: The availability of adequate resources, such as technology, instructional materials, and personnel, is crucial for the successful implementation of personalized learning strategies.

2. Training and support: Teachers and students need training and ongoing support to effectively implement personalized learning strategies. Professional development opportunities and technical support should be provided to teachers to help them develop the necessary skills and knowledge to implement personalized learning.

3. Collaboration and communication: Collaboration and communication among teachers, students, and other stakeholders are essential for effective implementation. Teachers should work together to share best practices and support each other in the implementation process. Students should also be encouraged to communicate with their peers and teachers to enhance their learning experience.

4. Flexibility and adaptability: Personalized learning strategies should be flexible and adaptable to accommodate the diverse needs and preferences of students. Teachers should be willing to adjust their teaching methods and materials based on the individual needs of their students.

5. Assessment and feedback: Personalized learning strategies should include ongoing assessment and feedback to help students monitor their progress and identify areas for improvement.
Teachers are encouraged to employ a diverse range of assessment methods to gauge student learning and offer prompt feedback to facilitate their progress.

6. Clear goals and expectations: Personalized learning strategies should be aligned with clear goals and expectations to guide the implementation process. It is crucial for both teachers and students to establish a common understanding of the learning objectives and the criteria for achieving success. By considering these conditions for effective implementation, institutions and educators can enhance the effectiveness of personalized learning strategies and improve student learning outcomes.

The findings of this study are in line with previous research that has demonstrated the effectiveness of personalized learning strategies in enhancing student learning outcomes in higher education [8], [30]. These results also align with the broader trend towards student-centered and personalized approaches to education [31].

It is important to acknowledge that the findings of this study are specific to higher education in Saudi Arabia and may not be applicable to other contexts. Further research is necessary to examine the implementation and impact of personalized learning strategies in different regions and educational levels.

6. Conclusion

The study aimed to address three research questions pertaining to personalized learning strategies in higher education in Saudi Arabia. The first question focused on identifying the types of personalized learning strategies being utilized. The second question examined the impact of these strategies on student learning outcomes. Lastly, the third question explored the conditions under which personalized learning strategies are most effective.

The findings highlight the importance of implementing personalized learning strategies and provide insights into their impact on student learning outcomes. The study also sheds light on the conditions necessary for effective implementation, which can help inform policy and practice in higher education. Based on the findings, it is recommended that higher education institutions in Saudi Arabia consider implementing personalized learning strategies, particularly individualized instruction and flexible pacing. It is also recommended that institutions provide technology and training support to facilitate effective implementation. Further research is needed to investigate the long-term impact of personalized learning strategies and to explore the perspectives of different stakeholders, including students, teachers, and administrators.

References:


However, despite the growth in the number of higher education institutions and students, there are concerns about the quality of education provided and the effectiveness of traditional teaching methods. Studies have shown that traditional lecture-based teaching methods may not be effective in promoting student engagement, motivation, and learning outcomes [1],[2].

To address these concerns, personalized learning strategies have gained attention as an approach that tailors teaching and learning to individual students' needs and preferences. The objective of personalized learning strategies is to adopt a student-centric approach to instruction, utilizing technology and data to customize learning experiences and facilitate student learning and achievement [3],[4].

While personalized learning strategies have gained popularity in higher education, there is limited research on their effectiveness in the Saudi Arabian context. The purpose of this study is to examine the influence of personalized learning strategies on student learning outcomes within the context of higher education in Saudi Arabia.

Education plays a pivotal role in the development of Saudi Arabia, as emphasized by the Vision 2030 initiative. This visionary plan strives to revolutionize the country's education system by focusing on improving the quality of education, fostering innovation, and equipping students with the skills required for the future job market [5]. To achieve these goals, it is crucial to identify effective teaching and learning strategies that can support student success.

Personalized learning strategies align perfectly with the objectives of Vision 2030 by offering a student-centric approach to teaching and learning. By examining the effectiveness of personalized learning strategies within the Saudi Arabian context, this study can make a valuable contribution to the country's endeavors in improving the quality of education and equipping students for the future.

1.2. Significance of the Study

The significance of this study rests in its ability to provide valuable insights that can guide the development and implementation of effective personalized learning strategies in higher education institutions in Saudi Arabia. Saudi Arabia has set ambitious objectives for its education system, prioritizing the enhancement of education quality and equipping students with the skills necessary to tackle the demands of the 21st century. Personalized learning strategies have been identified as a promising approach to achieving these goals, but there is a lack of research on their effectiveness in the Saudi Arabian context.

By examining the influence of personalized learning strategies on student learning outcomes in higher education institutions in Saudi Arabia, this study can provide insights into the conditions under which these strategies are most effective. The findings of this study can provide valuable insights for designing personalized learning interventions that are specifically customized to meet the distinct needs and contexts of Saudi Arabian students. Furthermore, these findings can also contribute to the broader body of knowledge on personalized learning in higher education, which has primarily concentrated on Western settings.

The introduction of effective personalized learning strategies in higher education within Saudi Arabia holds great potential for impacting the country's economic and social development in significant ways. The country's Vision 2030 plan emphasizes the importance of education in developing a knowledge-based economy and preparing Saudi Arabian youth for the future workforce. Effective personalized learning strategies can help achieve these goals by improving student learning outcomes, increasing retention rates, and preparing students for the demands of a rapidly changing job market.

Furthermore, this study can make a valuable contribution to the broader global discourse surrounding the role of personalized learning in tackling the challenges confronting higher education. The COVID-19 pandemic has underscored the importance of flexible and adaptable learning approaches capable of accommodating diverse student needs and preferences [6]. Personalized learning strategies have the potential to meet this need, but there is a lack of research on their effectiveness and implementation in higher education. Through its investigation of the impact of personalized learning strategies in Saudi Arabia, this study can play a crucial role in advancing the development of evidence-based practices that have broader applicability across different educational contexts.

Overall, the significance of this study lies in its potential to advance the development of effective personalized learning strategies in higher education, not only in Saudi Arabia but also in other contexts. The findings derived from this study can serve as valuable guidance for designing and implementing interventions that enhance student learning outcomes and prepare them for the challenges of the 21st-century workforce. This aligns with Saudi Arabia's Vision 2030 plan and the broader global agenda for education, emphasizing the importance of equipping learners with the necessary skills for success in a rapidly changing world.
1.3. Research Questions

1. What types of personalized learning strategies are implemented in higher education institutions in Saudi Arabia?
2. What is the influence of different personalized learning strategies on student learning outcomes in higher education in Saudi Arabia?
3. What are the conditions under which different personalized learning strategies are most effective in higher education in Saudi Arabia?

2. Literature Review

The literature review section delves into the concept of personalized learning in higher education, examining its various definitions and conceptualizations. It explores different types of personalized learning strategies, including mastery learning, differentiated instruction, personal learning plans, adaptive learning systems, and self-regulated learning, among others. The section also addresses the effectiveness of personalized learning strategies in higher education, discussing findings from meta-analyses and individual studies. Moreover, it highlights the importance of considering specific conditions for the successful implementation of personalized learning strategies, such as alignment with learning objectives, quality of instructional design and content, effective use of technology, instructor training and support, instructor flexibility, and student characteristics. By synthesizing existing literature, this section lays the foundation for understanding the scope and significance of personalized learning strategies in the context of higher education, with a focus on identifying common approaches and conditions for effective implementation, particularly within the unique setting of Saudi Arabia.

2.1. Definition and Conceptualization of Personalized Learning

The literature offers multiple definitions of personalized learning. According to Vygotsky's socio-cultural theory, personalized learning involves tailoring instruction to the zone of proximal development (ZPD) of individual learners [7]. In this context, personalized learning refers to the process of adapting the level of challenge in instruction to match a learner's current level of knowledge and skill, with the goal of promoting optimal learning outcomes.

Similarly, personalized learning has been defined as an approach that seeks to tailor instruction and learning experiences to the unique needs, interests, and preferences of individual learners [8]. In this sense, personalized learning entails granting learners increased autonomy and control over their learning experience, enabling them to determine the pace, mode, and content that best aligns with their needs and preferences.

Another definition of personalized learning is the utilization of technology to facilitate individualized learning experiences [9]. In this particular context, personalized learning refers to the application of digital tools and resources that assist in creating adaptive learning pathways, providing real-time feedback, and offering personalized content recommendations tailored to a learner's performance and preferences.

Overall, personalized learning can be understood as a comprehensive concept that encompasses various dimensions, including instructional strategies, learning experiences, and the integration of technology to facilitate individualized learning. It places emphasis on addressing the distinct needs, interests, and preferences of learners, ultimately aiming to enhance learning outcomes to their fullest potential.

2.2. Different Types of Personalized Learning Strategies

The literature suggests that there are several types of personalized learning strategies that can be employed to customize instruction based on individual learners' needs and preferences. Some of these strategies are summarized below:

1. Mastery learning: Mastery learning is an approach that involves breaking learning into small, sequential units and ensuring that students have mastered each unit before moving on to the next. Mastery learning can be personalized by enabling students to progress through the material at their preferred pace, offering feedback and assistance to address areas of challenge, and adjusting teaching methods based on individual students' performance and needs [10].

2. Differentiated instruction: Differentiated instruction encompasses tailoring instruction to accommodate students' varying needs and abilities. This can be achieved through practices such as flexible grouping, adapting the pace of instruction, and offering alternative pathways for students to access and demonstrate their learning.
By providing different levels of challenge or support, differentiated instruction aims to cater to the diverse learning profiles of students [11].

3. Personal learning plans: Personal learning plans are individualized plans that outline a student’s goals, strengths, weaknesses, and learning preferences, and guide their learning pathway. Personal learning plans can be used to tailor instruction, provide feedback and support, and promote student ownership and agency in the learning process [12].

4. Adaptive learning systems: Adaptive learning systems use technology to personalize instruction by adapting the content, pace, and feedback based on a student’s performance and preferences. Adaptive learning systems can provide real-time feedback and support, track student progress, and adjust instruction based on areas of weakness [13].

5. Self-regulated learning: Self-regulated learning involves teaching students strategies to monitor, control, and direct their own learning. In this context, personalized self-regulated learning involves guiding students to set goals, develop plans, track their progress, and engage in reflective practices to enhance their learning. By assisting students in identifying their unique strengths and weaknesses, personalized self-regulated learning also involves teaching them strategies and techniques to address areas of weakness. This approach empowers students to take ownership of their learning process and fosters a personalized learning experience that promotes individual growth and achievement [14].

Recent studies have also highlighted the potential of social personalized learning strategies, which involve collaborative and peer-to-peer learning activities [15]. Social personalized learning refers to an approach that emphasizes social interaction, cooperation, and knowledge sharing among learners. It can be particularly valuable for students who may encounter challenges with individualized learning strategies. By creating opportunities for collaboration, discussion, and group activities, social personalized learning fosters an inclusive and supportive learning environment. It encourages students to engage in meaningful interactions, share ideas, and learn from their peers. This approach acknowledges the importance of social dynamics in the learning process and leverages social interactions to enhance learning outcomes.

Overall, personalized learning encompasses various strategies that can be employed to customize instruction according to the unique needs and preferences of individual learners. These strategies can involve a combination of instructional approaches, technology integration, and collaborative learning activities. By leveraging these diverse strategies, educators can create a more tailored and engaging learning experience that supports student growth and achievement.

2.3. Effectiveness of Personalized Learning Strategies in Higher Education

Personalized learning strategies have gained popularity in higher education as an approach that tailors teaching and learning to individual students’ needs and preferences. However, the effectiveness of personalized learning strategies in higher education has been a subject of discussion and inquiry within the educational community and among researchers. Several studies have examined the effectiveness of personalized learning strategies in higher education, providing valuable insights into their impact on student outcomes. The study conducted by Sereno [16] revealed a significant positive effect of personalized learning on students’ academic achievement. Similarly, the meta-analysis by Ogwari et al. [17] found that personalized learning had positive effects on student achievement, engagement, and motivation.

Similarly, a study by Makhambetova et al. [18] found that personalized learning improved students' academic performance and motivation. The authors concluded that personalized learning could be an effective approach to teaching and learning in higher education. Additionally, the study conducted by Kryshko et al. [19] revealed that personalized learning had positive effects on students’ motivation, engagement, and satisfaction.

However, it is important to acknowledge that not all studies have shown consistent positive effects of personalized learning strategies in higher education. The study conducted by Apriza et al. [20] found no significant effect of personalized learning on students’ academic achievement. Similarly, the study by Iqbal et al. [21] reported that while personalized learning had positive impacts on students’ motivation and engagement, it did not lead to improvements in their academic performance. These mixed findings highlight the complexity and variability in the effectiveness of personalized learning strategies across different contexts and implementation approaches. It is crucial to consider these varying results and delve deeper into the specific factors that may influence the outcomes of personalized learning interventions in higher education.
Further research is needed to explore the conditions under which personalized learning is most effective and to identify best practices for its successful implementation.

Overall, the effectiveness of personalized learning strategies in higher education appears to be influenced by several factors, including the type of personalized learning strategy used, the context in which it is implemented, and the students' characteristics and preferences. Therefore, further research is necessary to gain a deeper understanding of the conditions and factors that contribute to the effectiveness of different personalized learning strategies in higher education.

It is worth noting that the majority of previous studies conducted on the effectiveness of personalized learning strategies have primarily focused on educational contexts in Western countries. As a result, there is a need to expand the research to encompass different cultural and educational settings, including Saudi Arabia. By investigating the impact of personalized learning strategies in the specific context of Saudi Arabian higher education, this study aims to bridge the gap in existing research and provide valuable insights into the effectiveness and applicability of these strategies in a non-Western context. This research can contribute to a more comprehensive understanding of personalized learning and its implications for student learning outcomes, helping to inform educational practices and policies not only in Saudi Arabia but also in other similar cultural and educational contexts.

2.4. Conditions for Effective Implementation of Personalized Learning Strategies

The literature highlights various factors that are considered crucial for the effective implementation of personalized learning strategies. Among these factors, alignment between the personalized learning strategy and the learning objectives of the course has been recognized as a key element for success [22]. This implies that the personalized learning strategy should be carefully designed to align with and support the specific learning objectives of the course. By ensuring this alignment, the personalized learning approach can effectively facilitate students' progress and help them achieve the intended learning outcomes. It is essential to consider the learning objectives as a guiding principle when designing and implementing personalized learning strategies, as this alignment can enhance the relevance and effectiveness of the personalized learning experience for students.

Another important factor is the quality of the instructional design and the content [23]. The instructional design should be engaging and motivating for students and the content should be relevant and meaningful. In addition to aligning with learning objectives, the effective use of technology can significantly enhance the impact of personalized learning strategies. Technology can provide valuable support by offering immediate feedback to students, allowing them to gauge their progress and make timely adjustments to their learning approach. Furthermore, technology can facilitate communication and collaboration among students, enabling them to engage in meaningful interactions, share ideas, and collaborate on projects. These digital tools and platforms create opportunities for personalized learning experiences that are dynamic, interactive, and adaptable to individual student needs and preferences. By leveraging technology effectively, personalized learning strategies can be enhanced, promoting engagement, collaboration, and deeper understanding among students [24].

The role of instructors is indeed crucial in the successful implementation of personalized learning strategies. To effectively implement personalized learning, instructors should receive appropriate training and support. This includes training in the pedagogical approaches and instructional strategies associated with personalized learning, as well as guidance on how to leverage technology to support individualized learning experiences [24]. Moreover, instructors need to be flexible in their approach and willing to adapt to the needs and preferences of individual students [22].

Finally, the characteristics of the students themselves can influence the effectiveness of personalized learning strategies. For example, students who are self-directed and motivated may be more successful in a personalized learning environment [24]. However, students who are less self-directed or who require more structure and guidance may struggle in a personalized learning environment.

Overall, the literature suggests that effective implementation of personalized learning strategies requires careful consideration of several factors, including alignment with learning objectives, quality of instructional design and content, use of technology, instructor training and support, instructor flexibility, and student characteristics.

3. Methodology

The methodology section outlines the research design and approach employed in this study on Personalized Learning Strategies in Higher Education in Saudi Arabia.
The study adopts a mixed-methods approach, combining both quantitative survey data and qualitative semi-structured interviews. This comprehensive approach allows for a thorough examination of personalized learning strategies in higher education, capturing both broader trends and specific implementation factors. The survey collects quantitative data on the prevalence, effectiveness, and barriers to personalized learning strategies, while the interviews delve deeper into participants' experiences and perceptions. By combining these methods, the study aims to provide a robust understanding of personalized learning in the Saudi Arabian higher education context, offering valuable insights into common approaches and conditions for effective implementation.

3.1. Research Design

The research methodology employed in this study adopted a mixed-methods approach, combining both survey data collection and semi-structured interviews. This approach was selected to ensure a comprehensive and in-depth examination of the various personalized learning strategies utilized in higher education. By employing surveys, quantitative data can be gathered to assess the effectiveness of these strategies. Additionally, semi-structured interviews allow for a deeper exploration of the conditions that facilitate their effectiveness. By incorporating both quantitative and qualitative data, this study aims to provide a holistic understanding of personalized learning strategies in higher education and the factors influencing their efficacy.

The survey was utilized as a data collection tool to obtain information regarding the different types of personalized learning strategies used in higher education in Saudi Arabia and their perceived effectiveness by students. The survey also collected data on student learning outcomes and the perceived barriers to effective implementation of personalized learning strategies.

Semi-structured interviews were conducted to gain a deeper and more comprehensive understanding of the conditions under which different personalized learning strategies are most effective in a higher education setting. The interviews involved students exploring their experiences with personalized learning strategies, including successes and challenges.

This mixed-methods approach is appropriate for investigating the research questions outlined in this study as it allows for the triangulation of data from multiple sources and the verification of findings across different methods [25].

Both the survey and semi-structured interviews will collectively contribute to a comprehensive understanding of personalized learning strategies in higher education, encompassing both the broader landscape and specific implementation aspects. The survey will provide a broad overview by gathering quantitative data from a larger sample, allowing for generalizations and statistical analysis. It will offer insights into the prevalence, frequency, and types of personalized learning strategies used in higher education, as well as their perceived effectiveness and impact on learning outcomes.

3.2. Participants

For this study, a total of 390 undergraduate students were recruited from three Saudi universities. The universities selected for this study were chosen through a purposive sampling approach. The primary considerations in the selection process were the willingness of the universities to participate in the study and their accessibility to the researcher. Additionally, efforts were made to ensure diversity among the selected universities in terms of size, location, and academic programs offered.

To recruit participants, the researcher contacted the universities' administration and explained the study's purpose, design, and ethical considerations. The participants in this study were presented with an informed consent form, which outlined the details of the research project and the expectations for participation. The researcher ensured the confidentiality of the participants' data and complied with the ethical guidelines for research involving human subjects.

The participants were undergraduate students from different disciplines and backgrounds. The selection of participants for this study followed specific criteria to ensure that the data collected aligns with the research objectives. The criteria used for participant selection were as follows: (1) currently enrolled as an undergraduate student at one of the participating universities, (2) willingness to participate voluntarily, (3) have not participated in any other personalized learning studies in the past year.

The sample size of 130 students was selected randomly from each participating university, with a total of 390 participants. The participants were selected to represent a range of academic disciplines, gender, age, and cultural backgrounds. By including participants from various academic disciplines, the study sought to capture a broad perspective on the implementation and impact of personalized learning strategies across different fields of study, to ensure the generalizability of the study's findings.
The researcher aimed to recruit a sufficient number of participants to ensure the study's statistical power and validity. The sample size for the interview phase was 6 students from each university, totaling 18 students. Overall, the sample of participants represented a broad range of the undergraduate student population in Saudi Arabia, and the study's findings can be applied to similar contexts.

### 3.3. Data Collection

Data for this study was collected using a combination of quantitative and qualitative methods. The quantitative data was gathered through surveys, which allowed for the collection of numerical data that could be analyzed statistically. On the other hand, qualitative data was obtained through interviews, enabling a deeper exploration of participants' experiences, perspectives, and insights. This mixed-methods approach provides a comprehensive understanding of the research topic by combining both quantitative and qualitative data, allowing for a more robust analysis and interpretation of the findings.

#### 3.4. Survey

In this study, a survey was employed to gather data from the participants regarding their perceptions of personalized learning strategies in higher education. The survey was carefully constructed to encompass various important aspects related to personalized learning, such as individual preferences for personalized learning, self-regulated learning practices, perceived learning outcomes, effectiveness of personalized learning strategies, and potential barriers to their successful implementation. By including these constructs in the survey questions, the study aimed to obtain a comprehensive understanding of the participants' perspectives on personalized learning strategies and their associated factors.

The survey was developed based on existing research on personalized learning strategies and their impact on student learning outcomes in higher education. Each construct included a number of items that were designed to capture participants' perceptions of the construct. For example, to measure the construct of personalized learning preferences, the survey included questions that assessed the extent to which teaching and learning were customized to meet individual students' needs and preferences. These questions aimed to capture participants' perceptions of the level of personalization in their learning experiences.

On the other hand, the construct of self-regulated learning was measured through questions that explored the extent to which students were encouraged to take ownership of their learning, make independent choices, and set goals for themselves. These questions aimed to gauge participants' perceptions of their autonomy and self-directedness in the learning process. By including these constructs in the survey, the study sought to capture participants' perspectives on key aspects of personalized learning and their role in the educational context.

To ensure the survey's validity and reliability, a group of experts in the field of education and assessment carefully examined and validated the survey items. A pilot study was also conducted to test the survey's functionality, identify any potential issues or ambiguities in the questions, and make necessary revisions based on the pilot feedback. Furthermore, the survey utilized established measurement scales and validated instruments wherever possible. This helped ensure the reliability of the survey by using well-tested and standardized measures to assess the constructs of interest.

Overall, these steps aimed to enhance the validity and reliability of the survey, ensuring that it effectively measured participants' perceptions of personalized learning strategies in higher education.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Number of items</th>
<th>Cronbach's alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personalized learning preferences</td>
<td>10</td>
<td>0.82</td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>8</td>
<td>0.78</td>
</tr>
<tr>
<td>Learning outcomes</td>
<td>9</td>
<td>0.83</td>
</tr>
<tr>
<td>Perceived effectiveness of personalized learning strategies</td>
<td>7</td>
<td>0.75</td>
</tr>
<tr>
<td>Barriers to effective implementation of personalized learning strategies</td>
<td>6</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Table 1 displays the data pertaining to the internal consistency reliability of the constructs employed in the survey. The Cronbach's alpha coefficient, serving as a measure of internal consistency, was utilized to assess the items' reliability. A high coefficient signifies consistent measurement of the construct.
Regarding the construct of "Personalized learning preferences," consisting of 10 items, a Cronbach’s alpha coefficient of 0.82 was observed, indicating strong internal consistency. This construct gauges students' inclinations toward personalized learning strategies, such as individualized instruction and adaptive assessment. Similarly, the construct of "Self-regulated learning" comprised 8 items, yielding a Cronbach's alpha coefficient of 0.78, reflecting high internal consistency. This construct assesses students' capacity to assume responsibility for their own learning and regulate their learning processes. Furthermore, the construct of "Learning outcomes" encompassed 9 items, attaining a Cronbach's alpha coefficient of 0.83, signifying high internal consistency. This construct evaluates the influence of personalized learning strategies on student learning outcomes, such as academic achievement and engagement. Additionally, the construct of "Perceived effectiveness of personalized learning strategies" encompassed 7 items, yielding a Cronbach's alpha coefficient of 0.75, indicating high internal consistency. This construct captures students' perceptions of the efficacy of personalized learning strategies in enhancing their learning experience. Lastly, the construct of "Barriers to effective implementation of personalized learning strategies" consisted of 6 items, exhibiting a Cronbach's alpha coefficient of 0.70, indicating moderate internal consistency. This construct examines the obstacles and challenges encountered by students when implementing personalized learning strategies effectively. Overall, the notable Cronbach's alpha coefficients for most constructs suggest that the survey items consistently and reliably measure the constructs they aim to assess, bolstering the validity and credibility of the study's findings.

Students' perceptions of how effective personalized learning strategies are in promoting their learning.

Finally, the construct of "Barriers to effective implementation of personalized learning strategies" had 6 items, and the Cronbach's alpha coefficient was 0.70, indicating moderate internal consistency. This construct measures the challenges and obstacles that students face in implementing personalized learning strategies effectively.

Overall, the high Cronbach's alpha coefficients for most constructs indicate that the survey items are consistent and reliable measures of the constructs they aim to assess, which adds to the validity and credibility of the study's findings.

3.5. Semi-Structured Interview

In addition to the survey, a subset of participants was chosen for semi-structured interviews to gain a more profound insight into their perceptions of personalized learning strategies. A purposive sampling technique was employed to select participants based on their survey responses, with a specific focus on those who expressed either strong positive or negative attitudes towards personalized learning strategies.

The interviews were conducted face-to-face and had an average duration of 30-45 minutes. Each interview was audio recorded and transcribed verbatim to facilitate analysis. The interview questions were carefully crafted to delve into the participants' firsthand experiences with personalized learning strategies. Topics covered included aspects they found beneficial or challenging about the approach and any recommendations they had for enhancing its implementation.

To enhance the validity of the interviews, the questions underwent a rigorous review process by experts specializing in the field of personalized learning. Additionally, a pilot test was conducted with a small group of participants to gather feedback on the clarity and relevance of the questions. The input received from the pilot testing phase was instrumental in refining the interview questions and ensuring they effectively elicited the desired information from the participants.

To enhance the reliability of the interviews, the researcher followed a standardized interview protocol. This protocol provided a set of consistent procedures and guidelines for conducting the interviews, ensuring that all participants were asked the same questions in a similar manner. By adhering to this standardized approach, the researcher aimed to minimize variations in the administration of the interviews, thereby increasing the reliability of the data collected. The data obtained from the interviews underwent a thematic analysis, which involved a systematic examination of the transcribed interviews. The researcher read through the transcriptions multiple times to identify recurring themes and patterns within the data. These themes were then coded to assign labels or categories that captured the essence of each theme. By grouping similar themes together, overarching categories were developed, enabling the identification of commonalities and differences in participants' experiences and perceptions of personalized learning strategies. This analysis approach allowed for a comprehensive exploration of the qualitative data and facilitated the identification of key findings and insights.

By employing both interviews and surveys, this study achieves a more comprehensive understanding of participants' perspectives on personalized learning strategies. While surveys provide valuable quantitative data, interviews delve deeper into the intricacies and subtleties of participants' experiences, offering a more nuanced and comprehensive dataset.
This combination of quantitative and qualitative data strengthens the validity of the study by triangulating findings and offering multiple perspectives on the research questions. The integration of both data sources enables a more thorough analysis, enriches the interpretation of results, and provides a more holistic understanding of personalized learning strategies in higher education.

4. Results

The results section presents the findings of the study on Personalized Learning Strategies in Higher Education in Saudi Arabia. The results are divided into two parts: quantitative analysis and qualitative analysis. The quantitative analysis examines the influence of personalized learning strategies on student learning outcomes using descriptive and inferential statistics. The qualitative analysis explores the conditions under which different personalized learning strategies are most effective.

Quantitative analysis of the influence of personalized learning strategies on student learning outcomes

The study employed a quantitative analysis to examine the impact of personalized learning strategies on student learning outcomes. This analysis involved the use of both descriptive and inferential statistics to analyze the survey data collected from participants. The Statistical Package for the Social Sciences software (SPSS) was utilized for data analysis.

Initially, descriptive statistics were conducted to summarize and present an overview of the collected data. This involved calculating measures such as means, standard deviations, and frequencies to describe the central tendency, variability, and distribution of the data. The results of these descriptive statistics are presented in Table 2, providing key summary information about the variables related to personalized learning strategies and student learning outcomes.

Table 2. Descriptive statistics for constructs related to personalized learning strategies

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personalized learning preferences</td>
<td>3.85</td>
<td>0.78</td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>3.71</td>
<td>0.89</td>
</tr>
<tr>
<td>Learning outcomes</td>
<td>3.92</td>
<td>0.76</td>
</tr>
<tr>
<td>Perceived effectiveness of personalized learning strategies</td>
<td>3.63</td>
<td>0.88</td>
</tr>
<tr>
<td>Barriers to effective implementation of personalized learning strategies</td>
<td>2.98</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Table 2 shows the mean scores for all constructs related to personalized learning strategies were above 3, indicating that the participants perceived the constructs positively. The construct with the highest mean score was learning outcomes, with a mean score of 3.92, indicating that the participants believed that personalized learning strategies positively impacted their learning outcomes. The construct with the lowest mean score was barriers to effective implementation of personalized learning strategies, with a mean score of 2.98, indicating that the participants perceived barriers to implementing personalized learning strategies.

Next, the study conducted inferential statistics to examine the relationships between the constructs related to personalized learning strategies and student learning outcomes. The results of the inferential statistics are presented in Table 3.

Table 3. Correlations between constructs related to personalized learning strategies and student learning outcomes

<table>
<thead>
<tr>
<th>Construct</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personalized learning preferences</td>
<td>0.537</td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>0.481</td>
</tr>
<tr>
<td>Perceived effectiveness of personalized learning strategies</td>
<td>0.604</td>
</tr>
<tr>
<td>Barriers to effective implementation of personalized learning strategies</td>
<td>0.352</td>
</tr>
</tbody>
</table>

Table 3 shows all constructs related to personalized learning strategies were significantly correlated with student learning outcomes at p < 0.05. The construct with the strongest correlation was perceived effectiveness of personalized learning strategies, with a correlation coefficient of 0.604, indicating a moderate positive correlation between perceived effectiveness of personalized learning strategies and student learning outcomes. The construct with the weakest correlation was barriers to effective implementation of personalized learning strategies, with a correlation coefficient of -0.352, indicating a weak negative correlation between barriers to effective implementation of personalized learning strategies and student learning outcomes.

Overall, the results of the quantitative analysis suggest that personalized learning strategies have a positive impact on student learning outcomes in higher education. The constructs related to personalized learning strategies were positively perceived by the participants, and all constructs were significantly correlated with student learning outcomes. These results support the effectiveness of personalized learning strategies in improving student learning outcomes in higher education.
Qualitative analysis of the conditions under which different personalized learning strategies are most effective

Table 4. Themes and subthemes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subthemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individualized instruction</td>
<td>1.1 Tailoring instruction to individual needs and preferences</td>
</tr>
<tr>
<td></td>
<td>1.2 Providing one-on-one support and guidance</td>
</tr>
<tr>
<td></td>
<td>1.3 Allowing for student choice and autonomy</td>
</tr>
<tr>
<td>Flexible pacing</td>
<td>2.1 Allowing for self-paced learning</td>
</tr>
<tr>
<td></td>
<td>2.2 Providing opportunities for acceleration or remediation</td>
</tr>
<tr>
<td>Adaptive assessment</td>
<td>3.1 Providing immediate and targeted feedback</td>
</tr>
<tr>
<td></td>
<td>3.2 Allowing for multiple attempts or alternative forms of assessment</td>
</tr>
<tr>
<td>Learner agency</td>
<td>4.1 Encouraging self-reflection and goal setting</td>
</tr>
<tr>
<td></td>
<td>4.2 Fostering a growth mindset and self-efficacy</td>
</tr>
<tr>
<td></td>
<td>4.3 Providing opportunities for student voice and choice</td>
</tr>
</tbody>
</table>

These subthemes highlight the importance of allowing students to learn at their own pace, providing opportunities for students to move through course materials at a speed that suits them and offering opportunities for students to accelerate their learning or receive additional support if needed.

The third theme is "adaptive assessment," which includes two subthemes: providing immediate and targeted feedback and allowing for multiple attempts or alternative forms of assessment. These subthemes highlight the significance of providing students with feedback that is timely and pertinent, customized to their unique knowledge and abilities. Additionally, they emphasize the value of allowing students to have multiple attempts or alternative forms of assessment to showcase their comprehension of course material.

The fourth and final theme is "learner agency," which includes three subthemes: encouraging self-reflection and goal setting, fostering a growth mindset and self-efficacy, and providing opportunities for student voice and choice. These subthemes emphasize the significance of empowering students to take ownership of their learning. They highlight the importance of encouraging students to reflect on their learning progress and set goals, fostering a positive mindset and self-confidence in their abilities. Additionally, they stress the value of providing students with opportunities for voice and choice, allowing them to have more control over their learning experiences.

In terms of linking these personalized learning strategies with Blackboard tools, there are several ways that Blackboard can support the implementation of these strategies. For example, Blackboard can provide tools that allow instructors to tailor instruction to individual student needs, such as adaptive release, which allows instructors to control when and how content is released to students based on their performance or progress. Blackboard can also offer self-paced learning tools that support personalized learning. For instance, it may include adaptive learning modules or personalized pathways that enable students to progress through course materials at their preferred pace. These tools allow students to tailor their learning experience to their individual needs, enabling them to advance through the content at a speed that suits their learning style and level of understanding.

Additionally, Blackboard can provide tools for adaptive assessment, such as adaptive quizzes or personalized feedback tools that allow instructors to provide targeted feedback and support to students.

Table 4 presents the different themes and subthemes that were identified as part of the study's analysis of personalized learning strategies in higher education in Saudi Arabia. The first theme is "individualized instruction," which includes three subthemes: tailoring instruction to individual needs and preferences, providing one-on-one support and guidance, and allowing for student choice and autonomy. These subthemes emphasize the importance of personalized instruction that is tailored to each student's unique learning needs, providing individualized support and guidance to students, and allowing students to have more control over their own learning through choices and autonomy.

The second theme is "flexible pacing," which includes two subthemes: allowing for self-paced learning and providing opportunities for acceleration or remediation.
Table 5. Frequency of themes and subthemes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Subthemes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individualized</td>
<td>1.1</td>
<td>14</td>
</tr>
<tr>
<td>instruction</td>
<td>1.2</td>
<td>8</td>
</tr>
<tr>
<td>1.3</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Flexible</td>
<td>2.1</td>
<td>10</td>
</tr>
<tr>
<td>pacing</td>
<td>2.2</td>
<td>7</td>
</tr>
<tr>
<td>Adaptive</td>
<td>3.1</td>
<td>9</td>
</tr>
<tr>
<td>assessment</td>
<td>3.2</td>
<td>6</td>
</tr>
<tr>
<td>Learner</td>
<td>4.1</td>
<td>12</td>
</tr>
<tr>
<td>agency</td>
<td>4.2</td>
<td>9</td>
</tr>
<tr>
<td>4.3</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 provides the frequency with which the different subthemes of the four main themes related to personalized learning strategies were identified in the data collected from the study. The frequencies indicate the number of participants who mentioned each subtheme in response to the survey questions. Based on the table, the most frequently mentioned subtheme related to individualized instruction was "tailoring instruction to individual needs and preferences", which was mentioned by 14 participants. This suggests that students in higher education in Saudi Arabia value instruction that is tailored to their individual needs and preferences. The subtheme "providing one-on-one support and guidance" was mentioned by 8 participants, indicating that personalized support and guidance are also important for students.

The subtheme of "allowing for self-paced learning" was mentioned by 10 participants, reflecting their desire for personalized learning that accommodates individual pacing. These participants expressed the importance of having the freedom to work at their own speed, enabling them to delve deeper into challenging topics or move ahead quickly in areas where they excel. Similarly, the subtheme of "providing opportunities for acceleration or remediation" was mentioned by 7 participants, highlighting the need for personalized learning that allows students to advance or receive additional support based on their specific learning needs.

This flexibility in pacing fosters a more tailored learning experience, catering to the diverse abilities and progress of students.

Regarding adaptive assessment, the subtheme "providing immediate and targeted feedback" was mentioned by 9 participants, indicating that students in higher education in Saudi Arabia value personalized assessment that provides them with immediate feedback. The subtheme "allowing for multiple attempts or alternative forms of assessment" was mentioned by 6 participants, suggesting that personalized assessment that allows for flexibility in the way students demonstrate their learning is also important.

The subtheme of "encouraging self-reflection and goal setting" was mentioned by 12 participants, indicating that students in higher education in Saudi Arabia value personalized learning that promotes their agency in taking ownership of their learning journey. These participants emphasized the importance of activities and strategies that foster self-reflection, helping them assess their progress, identify areas for improvement, and set meaningful goals.

Additionally, the subtheme of "fostering a growth mindset and self-efficacy" was mentioned by 9 participants. This indicates that students appreciate personalized learning approaches that nurture a mindset focused on growth, resilience, and the belief in their ability to overcome challenges. It highlights the significance of creating a supportive learning environment that cultivates self-confidence and self-belief in students' capabilities to succeed.

Furthermore, the subtheme of "providing opportunities for student voice and choice" was mentioned by 8 participants, suggesting that students value personalized learning that allows them to have a voice in their educational experiences. They emphasized the importance of being able to express their preferences, interests, and learning styles, and having choices in how they engage with the learning content and activities. This subtheme emphasizes the significance of student agency and empowerment in the learning process.

Overall, these subthemes illustrate the students' desire for personalized learning strategies that promote learner agency, self-reflection, goal setting, growth mindset, self-efficacy, and opportunities for student voice and choice. It highlights their aspiration to be active participants in their education and have a sense of control and autonomy over their learning experiences.
Table 6 compares the frequency of each subtheme across the four main themes in the study: individualized instruction, flexible pacing, adaptive assessment, and learner agency.

Based on the table, it can be observed that the subtheme "tailoring instruction to individual needs and preferences" has a high frequency under the individualized instruction theme, while it has a low frequency in the other themes. This indicates that individualized instruction is primarily associated with tailoring instruction to the individual's needs and preferences.

Similarly, the subtheme "allowing for self-paced learning" has a high frequency under the flexible pacing theme, but a low frequency in the other themes. The findings suggest that flexible pacing within personalized learning is primarily connected to the idea of allowing students to learn at their own individualized speed. This aligns with the subtheme "allowing for self-paced learning" mentioned by participants, indicating a desire for personalized learning that accommodates varying learning speeds and preferences.

On the other hand, the subtheme "providing immediate and targeted feedback" appears to have a higher frequency specifically within the theme of adaptive assessment, but a lower frequency in relation to the other themes. This indicates that adaptive assessment, which tailors assessments based on individual student needs, is primarily associated with the provision of immediate and specific feedback to students. This subtheme suggests that adaptive assessment approaches are perceived as particularly effective in providing timely and personalized feedback that helps students gauge their progress and make improvements in their learning.

These findings highlight the specific associations between certain subthemes and particular aspects of personalized learning. Flexible pacing is closely linked to self-paced learning, while adaptive assessment is closely connected to the provision of immediate and targeted feedback. Understanding these associations can inform the design and implementation of personalized learning strategies that effectively address students' needs and preferences in Saudi Arabia.

Lastly, under the learner agency theme, the subthemes "encouraging self-reflection and goal setting," "fostering a growth mindset and self-efficacy," and "providing opportunities for student voice and choice" all have a high frequency. These findings suggest that learner agency, a key aspect of personalized learning, is closely associated with providing opportunities for students to take control of their own learning experiences.
The subtheme "encouraging self-reflection and goal setting" mentioned by participants indicates a desire for personalized learning approaches that empower students to actively engage in their own learning process by reflecting on their progress and setting personal learning goals.

Additionally, the subthemes "fostering a growth mindset and self-efficacy" and "providing opportunities for student voice and choice" further underscore the importance of learner agency. Participants expressed the need for personalized learning strategies that foster a growth mindset, instilling a belief in students' ability to learn and improve. Moreover, they emphasized the value of having opportunities to exercise their voice and make choices in their educational journey, indicating a desire for more autonomy and ownership in the learning process.

Overall, these findings highlight the significance of learner agency within personalized learning, emphasizing the importance of supporting students in taking responsibility for their own learning, setting goals, and having a sense of control over their educational experiences. Incorporating these elements of learner agency can enhance students' engagement and motivation, ultimately leading to more meaningful and effective learning outcomes.

Adaptive assessment strategies (3.1 and 3.2) were found to be the least commonly used personalized learning strategies in this study. This finding is somewhat surprising given that adaptive assessments have been identified as a key component of personalized learning in previous research [28], [29]. However, it is possible that the use of adaptive assessments is still relatively new in higher education in Saudi Arabia and may become more widespread in the future.

Overall, these findings suggest that higher education institutions in Saudi Arabia are employing a range of personalized learning strategies, with a particular emphasis on individualized instruction and learner agency. However, there is still room for growth in the use of adaptive assessment strategies. The analysis of both the quantitative and qualitative data provided insights into the conditions for effective implementation of personalized learning strategies. Based on the findings, the following conditions are recommended for effective implementation:

1. Adequate resources: The availability of adequate resources, such as technology, instructional materials, and personnel, is crucial for the successful implementation of personalized learning strategies.

2. Training and support: Teachers and students need training and ongoing support to effectively implement personalized learning strategies. Professional development opportunities and technical support should be provided to teachers to help them develop the necessary skills and knowledge to implement personalized learning.

3. Collaboration and communication: Collaboration and communication among teachers, students, and other stakeholders are essential for effective implementation. Teachers should work together to share best practices and support each other in the implementation process. Students should also be encouraged to communicate with their peers and teachers to enhance their learning experience.

4. Flexibility and adaptability: Personalized learning strategies should be flexible and adaptable to accommodate the diverse needs and preferences of students. Teachers should be willing to adjust their teaching methods and materials based on the individual needs of their students.

5. Assessment and feedback: Personalized learning strategies should include ongoing assessment and feedback to help students monitor their progress and identify areas for improvement.
Teachers are encouraged to employ a diverse range of assessment methods to gauge student learning and offer prompt feedback to facilitate their progress.

6. Clear goals and expectations: Personalized learning strategies should be aligned with clear goals and expectations to guide the implementation process. It is crucial for both teachers and students to establish a common understanding of the learning objectives and the criteria for achieving success.

By considering these conditions for effective implementation, institutions and educators can enhance the effectiveness of personalized learning strategies and improve student learning outcomes.

The findings of this study are in line with previous research that has demonstrated the effectiveness of personalized learning strategies in enhancing student learning outcomes in higher education [8], [30]. These results also align with the broader trend towards student-centered and personalized approaches to education [31].

It is important to acknowledge that the findings of this study are specific to higher education in Saudi Arabia and may not be applicable to other contexts. Further research is necessary to examine the implementation and impact of personalized learning strategies in different regions and educational levels.

6. Conclusion

The study aimed to address three research questions pertaining to personalized learning strategies in higher education in Saudi Arabia. The first question focused on identifying the types of personalized learning strategies being utilized. The second question examined the impact of these strategies on student learning outcomes. Lastly, the third question explored the conditions under which personalized learning strategies are most effective.

The findings of the study indicate that personalized learning strategies are moderately employed, with individualized instruction and flexible pacing being the most commonly utilized approaches. Moreover, the results highlight the significant positive impact of personalized learning strategies on student learning outcomes, particularly in the domains of personalized learning preferences, self-regulated learning, and the perceived effectiveness of these strategies. Additionally, the study revealed that certain conditions, such as the integration of technology and adequate teacher training, play a vital role in ensuring the effective implementation of personalized learning strategies. The study contributes to the growing body of research on personalized learning strategies in higher education, particularly in Saudi Arabia.

The findings highlight the importance of implementing personalized learning strategies and provide insights into their impact on student learning outcomes. The study also sheds light on the conditions necessary for effective implementation, which can help inform policy and practice in higher education. Based on the findings, it is recommended that higher education institutions in Saudi Arabia consider implementing personalized learning strategies, particularly individualized instruction and flexible pacing. It is also recommended that institutions provide technology and training support to facilitate effective implementation. Further research is needed to investigate the long-term impact of personalized learning strategies and to explore the perspectives of different stakeholders, including students, teachers, and administrators.

References:


