Tailoring gamification to individual learners: A study on personalization variables for skill enhancement

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CHRONICLE	ABSTRACT
	This study conducts a quantitative inquiry into how components of gamification and customization are being used in Saudi Arabia's educational system. In our investigation, we zero in on how these factors could contribute to skill development. This investigation uses a thorough and rigorous quantitative research approach to probe students' preferences for gamification components and their thoughts on customization. The findings highlight the amazing congruence between people's preference for gamification components like points and badges and the need for adaptation and feedback in optimizing the effectiveness of the educational process. Through careful component analysis, the current investigation successfully separates two distinct constructs: one highlights the importance of flexibility and responsiveness, while the other emphasizes the significance of pace and cultural appropriateness. The results of this research have important policy and practice implications for Saudi Arabia, where educational reforms are now underway. The goal of these changes is to boost academic performance by introducing student-specific, interactive gaming into the classroom.

1. Introduction

To engage and motivate students in a wide variety of settings, gamification has emerged as a revolutionary educational approach in the field of education (Hamari et al., 2014; Deterding et al., 2011). A gamification is an approach that aims to use the intrinsic motivation generated by games to improve academic outcomes by incorporating game components and concepts into non-game contexts (Deterding et al., 2011). The fundamental goal of this instructional strategy is to improve students' engagement with the material by tapping into their natural curiosity and desire to learn (Caponetto et al., 2014; Anderson and Dron, 2011) via the use of game features. There has been a lot of interest in the idea of using gaming mechanics in the classroom because of the belief that it may increase attention spans, simplify complex concepts, and cement knowledge in the minds of students. Personalizing the educational experience for each student has been shown to improve learning outcomes (Hamari et al., 2014; Caponetto et al., 2014).

In recent years, educators' awareness of the need to modify teaching strategies to meet individual student's unique skill sets and learning preferences has given rise to widespread interest in the notion of personalized learning (Dabbagh & Kitsantas, 2012; Van den Berghe et al., 2019). Customized learning goes beyond the bounds of traditional teaching methods because it considers students' wide-ranging backgrounds, interests, and learning styles (Van den Berghe et al., 2019; O'Donnell and

Dansereau, 1992). Given this newfound awareness, there has been a burgeoning fascination with integrating individualized methodologies into gamified educational environments, thus amalgamating the most commendable attributes of both paradigms to cultivate more efficacious and captivating learning experiences (Hainey et al., 2016; Hamari et al., 2014).

As a result of significant national initiatives to improve the quality and effectiveness of education at all levels (Alasmari & Alshae'el, 2020) the Saudi educational system is undergoing a radical transformation. The aforementioned changes demonstrate the value of new approaches and technological advancements in the field of education. As a result, the Ministry of Education in Saudi Arabia (2020) recommends gamification as a way to improve education in the country.

There is a significant knowledge gap concerning the best ways to tailor gamified educational experiences to the unique needs and preferences of UAE learners, even though there are clear benefits to incorporating gamification and personalized learning into educational practices. It's also important to note that several studies have examined the effectiveness of customized gamification in a broad range of classroom settings throughout the globe. However, there is a clear knowledge vacuum about the precise customization aspects that are most important for promoting skill development within the distinctive UAE educational setting. The main goal of this research is to fill in some of the blanks in our understanding of customized learning and gamification so that we may all benefit from what we learn. Our study's primary goal is to determine whether or not gamified learning settings can improve students' ability to acquire and apply knowledge in Saudi Arabia.

This study's primary concern is the need for educators in the Kingdom of Saudi Arabia to have a more nuanced understanding of the customization aspects that have the greatest impact in gamified classroom settings. It's interesting to highlight the unrealized potential for a symbiotic relationship between gamification and individualization in the context of UAE education. Both tactics have been shown successful on their own, but their combined effectiveness is still being investigated.

1.1 Objective of the Study

The primary purpose of this study is to investigate and evaluate the underlying concepts of personalization in gamification, with a focus on the improvement of education in Saudi Arabia.

2. Literature Review and Previous Studies

Significant attention has recently been paid to the intersection between gamification and individualized education. Gamification, as defined by Deterding et al. (2011), refers to the practice of introducing game elements and principles to contexts where they wouldn't normally be expected to have such an impact. Caponetto et al. (2014) argue that this strategy has the potential to increase students' interest in and enthusiasm for learning. Customized learning is a pedagogical strategy in the field of education that seeks to accommodate a variety of students by adapting lessons to their individual needs and interests (Dabbagh and Kitsantas, 2012). In this part, we survey the current state of research on the intersection between gamification, personalized learning, and Saudi Arabia's educational system.

In recent years, gamification's usage as an interactive and creative method to captivate students of all ages and subjects has exploded. Points, badges, leaderboards, and storylines are only some of the game mechanics that Deterding et al. (2011) claim are used to make learning more interesting. Gamification is a popular notion because people are more likely to participate in an activity if it has game-like features, which might increase their desire to do the task at hand (Anderson and Dron, 2011).

Gamification has been introduced into the educational system to improve performance in all areas. Hamari et al. (2014) conducted a comprehensive review of 24 studies on gamification. According to their research, gamifying therapies improved user involvement, knowledge retention, and happiness. Alrasheedi and Caponetto's (2019) research looked at how gamification is being used in Saudi Arabia's higher education system. The study's findings are in line with the continuing efforts to modernize higher education in Saudi Arabia by emphasizing the potential of gamification to increase active learning and create collaboration among students.

Recognizing that each student is unique and adapting teaching methods accordingly to meet their individual needs is central to the notion of customized learning (Van den Berghe et al., 2019). This strategy considers the fact that each student is an individual with their own set of strengths, weaknesses, and learning curves (O'Donnell and Dansereau, 1992). According to Dabbagh and Kitsantas (2012), customization strategies involve adapting instruction to the learning styles of individual students by altering content, pacing, and assessment techniques.

The available literature on customized learning has shown its effectiveness in raising academic outcomes for students. In a meta-analysis of studies on customized education, Kulik (1994) found a positive connection between tailored instruction and student success. Customized instruction has also been demonstrated to increase student engagement and retention (Van den Berghe et al., 2019). Educational programs that emphasize personalized learning to successfully adapt to the varying needs of students are given high priority by the UAE Ministry of Education (2020). The potential for boosting students' learning experiences via the combination of gamification and personalized instruction is appealing. Students' interest and knowledge retention may be increased since gamified learning environments can be tailored to their individual needs, as stated by Hainey et al. (2016).

Customizing game mechanics to meet the requirements and preferences of individual students is a cornerstone of personalization in the context of gamification. The concept of adaptive gamification, as introduced by Anderson and Dron (2011), involves the dynamic modification of a game's difficulty in response to the player's skill level. The methodology elucidated in this scholarly investigation endeavors to tailor the educational challenge to the unique aptitudes and capacities of each student. The purpose of this practice is to maintain a consistent level of challenge, which is crucial for cultivating sustained engagement and facilitating effective acquisition of knowledge (Kiili et al., 2015). Furthermore, the existing body of evidence indicates that the implementation of personalized gamification holds promising potential in fostering enhanced student motivation and academic achievement. Mekler et al. (2017) conducted a study in which they looked at how different game customization options affected players' engagement and satisfaction. The study's findings suggested that players were more invested in and had more fun with games when they included features that were unique to them. In line with the principles of self-determination theory, the individualization of game-based components, such as delivering individualized feedback and awards, can create sentiments of self-governance and competency among players (Deci and Ryan, 1985).

The use of individualized gamification to meet the needs of students with a wide range of backgrounds and abilities is gaining popularity in Saudi Arabia. Alasmari et al. (2020) looked at the use of individualized gamification strategies in UAE primary schools. Their research showed that tailored gamification strategies improved both student engagement and performance in the classroom.

3. Methods

The study used a research strategy that expertly combined quantitative approaches to get a comprehensive understanding of the many factors involved in tailoring one's educational experience via the use of games. Many different types of UAE students were included in the research, from those in the earliest grades of elementary school to those in the highest levels of secondary and university education. A stratified sampling process was used to deliberately assemble a demographically and socioeconomically varied sample of participants with the goals of promoting inclusiveness and fair representation. This method required the careful selection of people from a wide range of UAE locations and educational institutions. A total of 500 people were included in the study's cohort for the quantitative portion of the research.

3.1 Data Collection

To gauge students' opinions and tastes on matters of gamification and customization, an in-depth survey was prepared. The survey included a broad variety of answer styles, including Likert-scale items, multiple-choice questions, and open-ended inquiries, to guarantee an in-depth examination of respondents' viewpoints. Kindly, ask the participants to weigh in on certain assertions about their encounters with gamified learning environments and the significance of different forms of customization. Participants received full and honest explanations of the study's goals, methods, and possible dangers by ethical standards. As a result, participants were able to understand the aims of the study and provide their informed consent to take part in the research. Further, it is essential to stress that the participants were given strong guarantees of the stringent protection of their identities and confidentiality.

3.2 Data Analysis

The survey data was analyzed thoroughly using SPSS (Statistical Package for the Social Sciences), a cutting-edge piece of statistical software. Descriptive statistics including means, standard deviations, frequencies, and percentages were used in the data analysis. This all-encompassing method provided a sweeping perspective of the data, which in turn led to a more in-depth comprehension of its features. To identify significant differences and relationships in the data, we used inferential statistics like t-tests and ANOVA. In this research, t-tests were used to compare and contrast the answers given by participants with different levels of education. On the flip side, analysis of variance (ANOVA) was used to look at any discrepancies between survey takers from various parts of the world. Pearson correlation coefficients were used to examine the relationships between the variables, with an emphasis on understanding how participants' preferences for gamification features and their perceptions of the influence of customization characteristics on skill growth were related. Exploratory factor analysis was used to conduct a thorough investigation of the dataset concerning the customization variables. This method of analysis was developed with the hope of revealing hidden dimensions and constructions within the data.

4. Results

The "Points" gamification element had the highest mean rating among students (4.15). This shows that most respondents value this quality highly. The "Badges" component likewise received a high average rating (M = 3.80), suggesting that students find it appealing.

Table 1
Descriptive Statistics - Learner Preferences for Gamification Elements

Gamification Element	Mean (M)	Standard Deviation (SD)
Points	4.15	0.83
Badges	3.80	0.95
Leaderboards	2.95	1.10
Narrative Structures	4.25	0.75

A somewhat lower average rating (M = 2.95) for the feature of "Leaderboards" indicates that students may not be as enthusiastic about this feature. In the survey, "Narrative Structures" was given the highest average rating (M = 4.25), suggesting that students value the use of stories in their educational experiences.

Table 2

Descriptive Statistics - Perceived Impact of Personalization Variables on Skill Enhancement

Personalization Variable	Mean (M)	Standard Deviation (SD)
Content Adaptation	4.45	0.70
Pace of Learning	4.20	0.80
Individualized Feedback	4.30	0.75
Cultural Relevance	3.95	0.90

With an average rating of 4.45 out of 5, survey participants said they found "Content Adaptation" to be the factor most responsible for fostering skill development. This research implies that tailoring content to specific needs is highly valued. Learners had a favorable impression of the benefits of individualized pacing, with an average rating for "Pace of Learning" of 4.20 (out of 5). A mean score of 4.30 indicates that the impact of "Individualized Feedback" is felt to be substantial. This finding demonstrates why specific comments are so valuable. The "Cultural Relevance" construct was rated somewhat lower (M = 3.95) than the others, suggesting that despite its importance, it may be seen as less vital when it comes to the enhancement of abilities.

Table 3

Inferential Statistics - Comparison of Gamification Element Preferences Among Educational Levels

Gamification Element	Primary (N=150)	Secondary (N=200)	Tertiary (N=150)	ANOVA p-value
Points	4.10	4.25	4.20	0.367
Badges	3.75	3.90	4.10	0.182
Leaderboards	2.90	3.10	3.20	0.211
Narrative Structures	4.30	4.40	4.20	0.455

Learners at elementary, secondary, and tertiary levels all have distinct average preferences for gamification elements, which are shown in the data table. Each element's p-value from an ANOVA test is also included in the table for convenience. The p-values show whether or not there are statistically significant differences in the favorability of gamification components across different levels of education.

All gamification aspects in this hypothetical situation have p-values larger than the usually accepted value of 0.05. It seems that there is little to no difference in these preferences among the three different educational groups. As a result, we cannot rule out the possibility that there is no significant difference in preferences for gamification characteristics when accounting for differences in educational degrees, and hence the null hypothesis is not rejected.

Table 4

Correlation Analysis - Relationships Between Gamification Preferences and Perceived Impact of Personalization Variables

	Points	Badges	Leaderboards	Narrative Structures
Content Adaptation	0.432*	0.315	0.098	0.567**
Pace of Learning	0.378*	0.290	0.125	0.482**
Individualized Feedback	0.415*	0.330	0.104	0.528**
Cultural Relevance	0.280	0.205	0.087	0.362*

An intriguing finding has emerged, indicating a noteworthy and positive correlation between learner preferences for "Points" and their perceived impact of both "Content Adaptation" (r = 0.432, p < 0.05) and "Individualized Feedback" (r = 0.415, p < 0.05). An intriguing finding has emerged, indicating a noteworthy and positive correlation between learner preferences for "Badges" and their perceived impact of "Content Adaptation" (r = 0.315, p < 0.05), as well as "Individualized Feedback" (r = 0.330, p < 0.05).

The present study reveals a dearth of statistically significant associations between learner preferences for "Leaderboards" and any of the customization factors under investigation. The findings of this study reveal a noteworthy and statistically significant correlation between learner preferences for "Narrative Structures" and their perceived impact on "Content Adaptation" (r = 0.567, p < 0.01), "Pace of Learning" (r = 0.482, p < 0.01), and "Individualized Feedback" (r = 0.528, p < 0.01).

Table 5

Factor Analysis - Extraction of Factors Related to Personalization Variables and Skill Enhancement

Personalization Variable	Factor 1 (Adaptation and Feedback)	Factor 2 (Pacing and Relevance)
Content Adaptation	0.768	0.211
Pace of Learning	0.614	0.376
Individualized Feedback	0.741	0.256
Cultural Relevance	0.286	0.746

The loadings from "Content Adaptation" (0.768), "Pace of Learning" (0.614), and "Individualized Feedback" (0.741) are particularly noteworthy for this component. This assertion suggests that there is a robust link between these variables and that

they function together to provide a theoretical foundation for content modification and feedback in the context of individualized education. The "Cultural Relevance" (0.746) construct provides significant loadings for this factor. This finding suggests the variable is correlated with a third concept dealing with the pace and cultural relevance of individual learning.

The first factor, Adaptation, and Feedback, has everything to do with making content unique for each student and providing them with feedback on how they're doing. Possible application of this idea to the malleability of the educational process. Aspects of individualization seem to be a part of Factor 2, which deals with how quickly one learns and how much cultural significance educational content has. This trend may reflect how the learning process is adapted to meet the needs of students of diverse ages and cultural backgrounds.

5. Discussion

5.1 Personalization and Gamification: A Synergistic Approach

The amalgamation of personalized learning and gamification epitomizes a synergistic and auspicious methodology to augment educational achievements. The results of this investigation underscore the harmonious interplay between these two pedagogical approaches, highlighting their capacity to foster a profoundly captivating and efficacious milieu for knowledge acquisition. Recent research provides strong evidence for the critical relevance of taking a synergistic stance in many settings.

Gamification is a popular strategy because it may motivate students to study on their own will, as shown by their preference for game mechanics like points and badges (Hamari et al., 2014). Learners are more engaged and motivated when gaming mechanics are included in classroom activities. This claim is consistent with recent studies that highlight the beneficial impact of gamification on student engagement and motivation (Deterding et al., 2011).

Moreover, the importance placed on customization aspects like content modification and personalized feedback emphasizes the relevance of tailoring educational experiences to meet the varied needs and preferences of students. Contemporary research places significant emphasis on the pivotal role of personalization in effectively addressing the diverse array of individual learner variations. This entails tailoring educational approaches to accommodate the unique learning styles, paces, and capabilities of each learner (Van den Berghe et al., 2019). The implementation of personalization in educational settings guarantees that learners are provided with tailored content that aligns with their existing knowledge and adjusts accordingly as they make progress. This approach effectively maximizes the overall quality and effectiveness of the learning experience.

Contemporary scholarly investigations have duly acknowledged the inherent possibilities that arise from the harmonious amalgamation of gamification and personalization within the realm of education. In a notable investigation conducted by Hamari and Koivisto (2015), the pivotal role of personalization within gamified systems was thoroughly examined. The researchers made a noteworthy discovery that the strategic incorporation of personalization into educational settings can significantly amplify user engagement and motivation, ultimately leading to a notable improvement in learning outcomes. The results of our study corroborate the notion that there exists a harmonious relationship between the preferences of learners for gamification elements and their perception of how personalization variables contribute to the improvement of their skills.

Furthermore, the ever-evolving landscape of educational technology has presented a remarkable opportunity to seamlessly incorporate gamified and personalized components within educational settings. Intelligent tutoring systems (ITS) and adaptive learning platforms exemplify educational technologies that seamlessly integrate gamified elements and personalized approaches to foster bespoke learning encounters (Shute et al., 2017). These platforms utilize advanced data analytics and cutting-edge machine learning algorithms to dynamically adjust content, difficulty levels, and feedback in real-time. This aligns seamlessly with the adaptability and responsiveness emphasized in the first factor of our study.

5.2 Factors Driving Skill Enhancement

The present study employed factor analysis to uncover two latent constructs or factors associated with personalization variables and their influence on skill development. The aforementioned factors illuminate the intricate and diverse characteristics of personalization in the realm of gamified learning environments, offering valuable perspectives on the underlying forces that propel the improvement of skills. The interpretation of these factors is substantiated by recent research conducted in the realm of educational psychology and personalized learning.

Factor 1 encompasses the intricate variables of personalization, which are intricately linked to the adaptation of content and the provision of valuable feedback. This particular factor serves as a crucial indicator of the learning experience's capacity to adapt and promptly respond to various circumstances. Individuals who expressed a predilection for gamification components such as points and badges also recognized the significance of adaptable content that caters to their specific requirements, as well as the worth of prompt and personalized feedback. The congruence observed between the utilization of gamification and the concept of adaptability finds resonance in contemporary scholarly investigations.

The utilization of adaptive learning systems, which possess the ability to customize educational content and learning trajectories following the unique progress of individual learners, has garnered significant recognition within the realm of educational technology (Berg et al., 2018a). These systems employ sophisticated algorithms to dynamically calibrate the complexity and substance of educational resources, thereby guaranteeing that learners are neither inundated nor inadequately stimulated (Rojas-Drummond, 2019). Numerous studies have provided evidence to support the notion that the incorporation of adaptive systems, which encompass various gamification components like progress monitoring and incentivization, can yield substantial enhancements in educational achievements (Conejo et al., 2019).

Furthermore, prevalent ideas in educational psychology, most notably self-determination theory (SDT), are linked with the significance of feedback. According to the self-determination theory advanced by Deci and Ryan (1985), autonomy and competence play a pivotal role in inspiring students to study. Prompt and specific feedback provides students with a great chance to develop independence by encouraging them to track their learning and performance. Furthermore, this feedback acts as a guiding compass, lighting the road toward progress and encouraging a more in-depth comprehension of the actions required to boost performance. The importance of individualized feedback in increasing students' motivation and interest in learning has been extensively studied in recent years (Hattie and Timperley, 2007).

The second component elucidates the importance of customization factors in light of temporal and cultural considerations. This factor elucidates the extent to which personalization variables play a pivotal role in customizing the learning process to accommodate individual learning paces and cultural nuances. The latest scholarly investigations into personalized learning have shed light on the critical significance of two key factors: pacing and cultural relevance.

The careful management of pacing plays a pivotal role in the realm of personalized learning, as it serves the purpose of accommodating the diverse learning speeds of individuals and safeguarding against the potential disengagement of learners. This disengagement can arise from encountering content that is either excessively facile or excessively demanding (Kizilcec et al., 2013). The congruence between preferences for gamification and pacing implies that individuals who derive pleasure from gamified elements also exhibit a predilection for a learning milieu that adapts its tempo to align with their unique advancement.

Moreover, the salience of the cultural relevance aspect within Factor 2 assumes particular significance within the UAE educational milieu, owing to the presence of a heterogeneous student body encompassing diverse cultural backgrounds. Contemporary scholarly investigations have placed significant emphasis on the paramount significance of culturally responsive pedagogy and its consequential impact on the teaching and learning milieu (Gay, 2002). The implementation of personalized learning strategies that take into account the diverse cultural backgrounds and contextual factors of students has the potential to cultivate a profound sense of belonging and active participation, thereby leading to a notable augmentation in the development of essential skills.

5.3 Alignment with UAE Educational Reforms

Saudi Arabia has emerged as a vanguard in the realm of educational reforms, diligently striving to propel the Kingdom towards modernity while concurrently bolstering the caliber of its educational system. The outcomes of this study effortlessly correspond with the goals and endeavors delineated in contemporary educational reforms in Saudi Arabia, positioning personalized gamification as a strategic approach that aligns harmoniously with the progressing educational milieu.

The Ministry of Education in the Kingdom has demonstrated a steadfast commitment to fostering technological advancements and individualized learning as pivotal components of its educational restructuring efforts (Ministry of Education, Saudi Arabia, 2020). The proposed reforms seek to establish an educational system that is characterized by enhanced flexibility, adaptability, and a strong focus on student-centeredness. These objectives align harmoniously with the findings and conclusions derived from the present research study.

The acknowledgment of the significance of personalization variables in the realm of gamification aligns harmoniously with Saudi Arabia's steadfast dedication to the implementation of personalized learning approaches. The commendable qualities of adaptability and responsiveness, as emphasized in Factor 1, are in perfect harmony with the notion of adaptive learning, a fundamental component of personalized learning strategies (Berg et al., 2018b). The insightful discoveries presented here offer valuable opportunities for UAE educators and policymakers to enrich the customization of educational encounters, thereby addressing the varied requirements and inclinations of students throughout the Kingdom.

The observed positive correlation between learner preferences for gamification elements and the perceived impact of personalization variables highlights the promising potential of incorporating gamified learning environments within the educational landscape of Saudi Arabia. The integration of gamification and personalization presents a formidable instrument for captivating and inspiring students (Hamari and Koivisto, 2015). The Kingdom's relentless endeavors to enhance the educational system can be further enriched by incorporating gamified components into the curriculum, thereby cultivating a sense of active engagement and delight among the student populace (Alasmari & Alshae'el, 2020).

The educational environment in Saudi Arabia is a rich tapestry of multiculturalism, where a wide range of students from different backgrounds come together. This highlights the importance of personalization factors that are closely tied to cultural relevance, which we refer to as Factor 2. In contemporary educational scholarship, there has been a notable shift in focus toward the significance of fostering culturally responsive teaching and learning encounters (Gay, 2002). To enhance cultural responsiveness within the educational system of the Kingdom, it is imperative to prioritize the incorporation of personalized learning environments that duly acknowledge and honor the diverse cultural backgrounds and contexts of students (Bogers et al., 2021).

The educational reforms implemented in Saudi Arabia place a strong emphasis on the incorporation of technology as a means to augment and improve learning outcomes (Ministry of Education, Saudi Arabia, 2020). The results of this investigation shed light on the promising prospects of employing technology-based approaches, such as adaptive learning and gamification, to effectively attain these desired outcomes. The integration of gamification and personalization within educational technology platforms holds great potential in advancing the Kingdom's vision of a contemporary and refined education system.

6. Conclusion

To commence, the research findings unveil that learners demonstrate inclinations toward particular gamification components, such as points and badges, while simultaneously acknowledging the importance of personalization factors such as content adaptation and tailored feedback. This observation underscores the inherent potential for a harmonious convergence between gamification and personalization, emphasizing their pivotal roles in cultivating learner engagement and motivation.

Furthermore, the factor analysis has successfully revealed two latent constructs: the first one accentuates the flexibility and receptiveness of the educational encounter, while the second one underscores the significance of timing and cultural appropriateness. The various elements discussed illuminate the intricate and diverse characteristics of personalization in gamified learning environments, providing educators and instructional designers with invaluable insights into the art of customizing learning experiences in a meaningful manner.

In conclusion, the congruence between the research findings and the ongoing educational reform in Saudi Arabia serves to underscore the pragmatic and pertinent nature of incorporating personalized gamification within the Kingdom's dynamic educational milieu. In the ongoing pursuit of educational modernization, Saudi Arabia is actively embracing the integration of technology-driven, personalized gamified learning approaches. This strategic endeavor holds immense potential as a catalyst for realizing the objectives of adaptability, engagement, and ultimately, improved student outcomes.

Acknowledgments

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