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Discovering Teachers' Perception of Adaptive Environments in Contemporary Education

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Abstract

Contemporary education is characterized by its adaptability to the changing needs of society, its promotion of diversity and sustainability, and its utilization of both traditional and digital teaching methods to equip students with the necessary skills to face the challenges of the 21st century. Adaptive learning is a crucial implementation that teachers must comprehend to facilitate student-centered learning. This study aimed to investigate the perceptions of 17 randomly selected teachers from Wahid Hasyim Middle School regarding their experience of adaptive environmental management in their teaching, using factor analysis techniques. The results indicate that video and audio media are predominantly used in educational interactions, reflecting the adaptation to digital technology trends in teaching. Furthermore, course delivery, lesson planning, teaching strategies, teaching methods, learning media, and educational resources emerged as highly significant factors. The discovery and organization of content revealed a preference for student-centered approaches and student-oriented teaching strategies. Finally, supporting teacher collaboration highlights the importance of team collaboration, community engagement, and professional networks in contemporary educational development. However, this study has limitations in terms of its specific context, variable focus, and lack of causality analysis. Therefore, future research may aim to diversify the data, delve deeper into causal factors, and update the data regularly to maintain relevance in an ever-changing educational context. Thus, these findings provide valuable insights into dealing with contemporary educational dynamics.

Keywords: Adaptive Environment, Teachers' Perception, Contemporary Education

INTRODUCTION

The field of education is continuously expanding, and the rapid advancement of technology has brought about revolutionary transformations in the way we learn and teach. Despite these changes, fundamental questions persist regarding the perceptions of educators towards these profound changes and how they evaluate the worth of adaptive environments that are increasingly becoming the focal point of modern education. It is imperative to explore the attitudes of educators towards these transformations and to assess the efficacy of adaptive environments in enhancing the learning experience. Such an investigation will provide valuable insights into the future of education and inform the development of effective pedagogical strategies.

The heightened emphasis on research in the field of education has resulted in a shift in the priorities of academics, which has been met with criticism from students across various nations. These countries have placed greater emphasis on research in their allocation of resources, prioritized research in the recruitment and promotion of faculty members, and actively sought out academics who are productive in their research endeavors. Consequently,

academics have developed a preference for research, dedicating more time to this pursuit and, as a result, allocating less time to teaching activities (Cummings & Shin, 2014). The primary approach of contemporary education ought to prioritize the independent engagement of students, the establishment of self-directed learning environments, and the provision of experimental and practical instruction, wherein students are afforded the opportunity to exercise their discretion and initiative. Additionally, flexible instructional programs that enable students to learn at a comfortable pace should be implemented (Yakovleva & Yakovlev, 2014). It is reasonable to anticipate that the correlation between teaching and research may fluctuate based on the institution, field of study, and the individuals involved, taking into account their career progression (Galaz-Fontes et al., 2014).

In contemporary times, education has emerged as a crucial policy priority for numerous states, closely linked to the restructuring of welfare services and the pursuit of economic development. Education has expanded its reach into novel domains and stages of the lifecourse, as individuals strive to attain social and economic advantages and confront the demands of flexible labor markets. In this context, educational systems, institutions, and practices have become indispensable foundations for a diverse range of theory-building endeavors (Thiem, 2009). Contemporary issues in education encompass a wide range of challenges and concerns that are currently affecting the educational system. These issues include student migration and mobility, inequality and access to quality education, the internationalization of higher education, the integration of educational technology, the promotion of inclusive education, the focus on mental health and well-being, the need for curriculum reform, and the importance of teacher training and professional development. These issues require ongoing research, policy development, and collaborative efforts to ensure equitable and quality education for all students (Waters & Brooks, 2021).

The task of enhancing learning and performance is contingent upon the accurate identification of the unique attributes of an individual learner. In order to optimize the efficacy of instruction, it is imperative to leverage these learner characteristics when disseminating educational content. The integration of embedded assessments into the learning process can serve to enhance instructional outcomes. These assessments can facilitate the diagnosis of learner needs and inform subsequent instruction, including the provision of additional content on the same topic, remediation of the current topic, or introduction of a new topic (Shute & Towle, 2018). Adaptive learning environments, characterized by their ability to tailor educational content and strategies to the unique needs of individual learners, represent a promising approach to education. The incorporation of personalization within

these environments is essential for effectively addressing learner diversity and optimizing engagement and learning outcomes (Graf, 2023).

Adaptive learning is a form of adaptive teaching that utilizes computer algorithms and artificial intelligence to facilitate interaction and communication with learners, with the aim of designing and delivering customized learning activities and resources that cater to the unique needs of each individual within a professional learning context (Kem, 2022). This approach draws upon a range of disciplines, including AI, psychology, brain science, psychometrics, education, and computer science (Speech Buddies, 2021). The essence of adaptive learning lies in the development of customized learning environments that are tailored to the unique differences and requirements of individual learners. This approach entails the adaptation of teaching methods and techniques to effectively address the diverse learning needs of students (Burak & Gultekin, 2022).

Adaptive environment in learning refers to an educational setting that adjusts to the needs and preferences of individual learners. This type of environment can be achieved through the use of technology, such as adaptive e-learning platforms that personalize the learning experience based on the learner's learning style (El-Sabagh, 2021). Adaptive learning environments can have the following features: diversity, interactivity, adaptability, feedback, performance, and predictability (Scerri et al., 2020).

The implementation of adaptive environment in teaching has been explored in various studies, including the development of an adaptive system for mathematical training of students within eLearning environment (Toktarova, 2022) and the creation of an adaptive teaching framework for teaching music online (Merrick, 2020).

The adaptive system for mathematical training of students within eLearning environment proposed a systematic set of scientific, theoretical, and methodological provisions and approaches that determine the design of the model. The algorithm of adaptive learning of students within the system involves a sequence of operations and actions focused on achieving the learning outcomes, including diagnostics and detailing of personal student’s characteristics, designing a student model based on personal student’s characteristics and preferences, differentiation and selection of educational technologies, resources, and teaching methods depending on personal student’s characteristics and preferences, formation and provision of an individual learning path to a student, and assessment and analysis of student’ performance (Toktarova, 2022).

On the other hand, the adaptive teaching framework (ATF) for teaching music online was developed as part of a graduate music teaching program (MTP) across more than 20

tertiary subjects. It involves a series of reflections, descriptions, discussion points, and suggestions, which specifically reference related learning theory, content review, modification of learning design, and pedagogy that were considered during the implementation of a new learner management system (LMS) platform (Canvas) at the start of 2020. The ATF was developed in response to the mandated changes brought about by the implementation of the LMS platform and the sudden shift to a fully online learning environment due to the COVID-19 pandemic. The methodology employed in the development of the ATF includes a series of reflections, discussions, and suggestions that were considered during the implementation of the new LMS platform (Merrick, 2020).

The present writing is based on the research findings discussed, which reveal several research gaps, state of the art, and novelty. Firstly, a research gap exists in terms of the integration between adaptive systems for mathematics training and adaptive teaching frameworks for online music teaching. While both approaches pertain to adaptation in educational contexts, it remains unclear whether there is potential to combine these approaches or leverage specific elements of each to enhance the overall learning experience. Secondly, the state of the art in this article could encompass advancements in educational technology, particularly the sudden shift to online learning prompted by the COVID-19 pandemic. This represents a significant transformation in educational approaches and raises questions regarding how educators perceive adaptation to such environments. Finally, novelty in the article could involve the development of a new framework or methodology for exploring teachers' perceptions of adaptive environments in contemporary education, as well as the exploration of possible collaborations between different disciplines in the context of adaptive learning. Consequently, the proposed article has the potential to make a valuable contribution to the understanding and enhancement of adaptive environments in education today.

METHOD

This study employs quantitative research methods as the means of implementation. This approach involves the utilization of mathematical models and quantitative analyses to guide the design process (Chang & Chang, 2001). The identification of a trend suggests that the research inquiry can be best addressed through a study that aims to ascertain the general inclination of responses from individuals and to observe the extent to which this inclination varies among individuals. This methodology is particularly advantageous when attempting to detect patterns or changes in behavior or attitudes over time. By analyzing the overall trend, valuable insights can be gained into the underlying factors that contribute to the observed

phenomenon, and more nuanced and accurate explanations of the observed patterns can be developed (Creswell, 2019).

The present study employed a survey methodology to collect the data. Surveys are a versatile tool that can be administered through diverse means, including online questionnaires, phone interviews, or face-to-face interviews. The primary objective of a survey is to collect information pertaining to a specific topic or population, and the resultant data can be utilized for a range of purposes (Ponto, 2015). Within this particular context, a representative sample of 17 teachers from Wahid Hasyim Junior High School was utilized to collect data through an online survey. The questionnaire was distributed randomly to the entire population of teachers at the school, employing a random sampling technique.

Upon the collection of the data, we proceeded to conduct an analysis using factor analysis. Factor analysis is a statistical method that allows for the reduction of a large number of variables into a smaller number of clusters, referred to as factors. This technique involves calculating the correlations among all the variables and identifying groups of variables that display strong inter-correlations but weak correlations with other variables. The resulting factors are then treated as variables themselves, rather than the individual items within the factors. By generating a more manageable number of factor variables, factor analysis facilitates the examination of complex data sets. This approach is widely employed in various disciplines, such as psychology, sociology, and marketing research (Gay et al., 2011). In the present study, we applied factor analysis in the field of education.

RESULTS AND DISCUSSION

The present study involved the collection of data from a sample of 17 teachers, comprising 8 male and 9 female teachers. The data was subjected to analysis to identify any discernible patterns or trends in the views and experiences of the participants with respect to modern education in the digital era, particularly in relation to adaptive environments. The aim of the study was to gain insights into the perceptions and experiences of teachers in this context, with a view to informing the development of effective strategies for enhancing the quality of education in the digital age.

This article examined the adaptive environment framework proposed by Paramythis & Loidl-Reisinger (2003). The framework consists of four main components: interaction, course delivery, content discovery and assembly, and collaboration support. Its purpose is to create effective and adaptive e-learning environments that can monitor user activities, interpret them using domain-specific models, infer user information based on interaction monitoring data, and automatically customize the interface for each user. The framework also emphasizes the

importance of standardization in e-learning, as it enables the transfer of adaptive learning material to new systems and facilitates adaptively supported, distributed learning activities (Laroussi, 2012; Vandewaetere et al., 2011).

In an adaptive learning setting, the way students interact with the learning environment is crucial. This includes how they engage with learning materials, instructors, and their peers. Paramythis & Loidl-Reisinger (2003) argue that adaptations made at the system interface are meant to facilitate user interaction with the system, without changing the actual learning content. The authors identify two aspects of interaction: communication and content. Communication can be seen from two angles: interactivity and personal proximity. On the other hand, content is experienced through multimedia elements, such as images, text, audio, video, and animation (Degeng et al., 2023; Wiggins & Shiffer, 1990).

Table 1 Interaction Level based on Eigenvalues

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	1.558	77.909	77.909
2	0.442	22.091	100.000

Table 2 Interaction Factor Analysis

	Factor
	1
Video	0.883
Audio	0.883

In this study, interaction indicators were examined through the analysis of seven variables, which were categorized into two aspects: communication and multimedia. The communication aspect was comprised of two variables, namely teacher-centered communication and student-centered communication, while the multimedia aspect consisted of five variables, namely text, images, video, audio, and animation. Through factor analysis, it was determined that only two variables, video and audio, were significant factors in interaction. The results of the analysis indicated that video and audio were more frequently utilized in interactions based on teacher perceptions, as opposed to other variables such as text, images, and animation. This suggests that the use of video and audio media is more dominant in the learning process. As such, these two variables, video and audio, appear to be the primary choices for teachers seeking to enhance interaction in the learning process.

Adaptive environments have emerged as a significant area of focus in the course delivery. These environments possess the capability to modify the delivery of course material based on a student's level of understanding and ability. For instance, if a student has already

grasped certain concepts, the adaptive environment can expedite or simplify the delivery of material to that student. The delivery of course material is structured and comprises various components, including designs, models, strategies, methods, media, and learning resources. Sanjaya (2015) has emphasized the importance of these components in the course delivery material. The present study is grounded in both teacher-centered and student-centered approaches. The teacher-centered approach is based on the behaviorist theory, which posits that behavior changes are caused by external stimuli (Skinner, 1976). According to this theory, students are passive and respond to environmental stimuli. In contrast, student-centered classrooms avoid the transmission of knowledge directly. Instead, students play an active role in the learning process by attempting "to make sense of what they are learning by relating it to prior knowledge and by discussing it with others" (Brophy, 1999). In student-centered learning, students are provided with opportunities to learn independently and are involved in the activities, materials, and content (Serin, 2018).

Table 3 Course Delivery Level based on Eigenvalues

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	3.599	71.983	71.983
2	.617	12.334	84.317
3	.448	8.958	93.275
4	.257	5.148	98.424
5	.079	1.576	100.000

Table 4 Course Delivery Factor Analysis

	Factor
	1
Instructional Design	0.827
Instructional Strategy	0.894
Instructional Method	0.871
Instructional Media	0.828
Learning Resource	0.820

In this context, the indicators for course delivery are explicated through six aspects, namely instructional design, instructional model, instructional strategy, instructional method, instructional media, and learning resources. One of these variables, specifically the instructional model, was excluded, resulting in the amalgamation of the remaining five variables into a single factor. The elimination of the instructional model variable led to the identification of five variables that were combined into one factor, indicating that the primary emphasis in the context of course delivery is on learning planning, teaching strategies,

teaching methods, learning media, and learning resources as factors that are more frequently utilized to influence the effectiveness of delivering learning materials to students.

Adaptive environments possess the potential to facilitate students in discovering content that is customized to their individual needs (Surahman, Kuswandi, Wedi, Degeng, et al., 2019; Surahman, Kuswandi, Wedi, Thaariq, et al., 2019; Thaariq & Wedi, 2020). This may encompass recommendations for supplementary content, assignments, or resources that are relevant to the subject matter being studied by the student. Moreover, the learning material can be dynamically generated or personalized in accordance with the student's progress. Content discovery generally refers to the process of locating and identifying pertinent content, while content assembly involves organizing and presenting that content in a meaningful manner. These terms are frequently employed in the context of digital content creation and curation (Despotović-Zrakić et al., 2012). This particular instance comprises three distinct elements, namely educational content, teaching materials, and instructional techniques (Paramythis & Loidl-Reisinger, 2003). Learning material that is engaging and contextualized can enhance students' engagement and comprehension of the subject matter. Contextualized learning material refers to content that is relevant to students' lives and experiences, making it easier for them to connect with and apply the concepts they are learning (Napiah, 2022; Rizaldi et al., 2021; Saptiyah et al., 2023; Syarif et al., 2023). Engaging educational resources have the ability to captivate students' interest and inspire their motivation to acquire knowledge (Basit et al., 2022; Novrida & Refelita, 2021; Saptiyah et al., 2023). Moreover, it is crucial to maximize the utilization and integration of developed teaching materials with digital technology. This will facilitate the effective dissemination and accessibility of educational resources to a broader range of individuals. By incorporating digitalization, the delivery of teaching materials can be enhanced, resulting in a more interactive and engaging learning experience for students. It is imperative for educators to embrace the integration of technology in the classroom in order to adapt to the constantly evolving educational environment. Hence, the utilization and integration of developed teaching materials with digitalization play a pivotal role in the progression of education (Annuš et al., 2023; Zavodchikova & Bykova, 2021). In order to optimize learning outcomes and motivation, it is imperative for instructional techniques to incorporate elements of satisfaction and interactivity for students. Extensive research has demonstrated that various approaches, such as learner-centered instruction, multimodal presentation systems, serious gaming and gamification instructions, collaborative learning techniques, and blended teaching strategies and materials,

have proven to be effective in enhancing learning effectiveness, satisfaction, and motivation (García, 1991; Haruna et al., 2021; Kuo et al., 2013; Yang et al., 2022).

Table 5 Content Discovery and Assembly Level based on Eigenvalues

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	2.844	71.088	71.088
2	.618	15.454	86.541
3	.359	8.975	95.516
4	.179	4.484	100.000

Table 6 Content Discovery and Assembly Factor Analysis

	Factor
	1
Student-centered Content	0.871
Teacher-centered Material	0.936
Student-centered Material	0.768
Teacher-centered Technique	0.788

The present study reports the findings of a factor analysis conducted to investigate teacher perceptions regarding content discovery and assembly. The results indicate the existence of a single group of factors comprising four dimensions, namely, (1) student-centered content, (2) teacher-centered material, (3) student-centered material, and (4) teacher-centered technique. However, the variables "teacher-centered content" and "student-centered technique" were excluded from the analysis. The elimination of these variables revealed that teachers tend to prioritize aspects of student-centered content and teaching strategies that are student-centered, rather than those that are teacher-centered (teacher-centered material) or student-centered (student-centered material), in the context of discovering and compiling learning materials.

Collaboration among students can be a valuable strategy for enhancing the learning experience in specific educational contexts. Adaptive environments can further support and promote collaboration by providing a variety of tools and features that facilitate interaction and cooperation among students. These tools may include discussion forums, collaborative projects, or other resources that enable students to work together towards achieving their learning goals. By utilizing these adaptive technologies, educators can create a more dynamic and engaging learning environment that encourages collaboration and teamwork among students, ultimately leading to improved learning outcomes. The current study focuses on three distinct forms of collaboration: team collaboration, community collaboration, and network collaboration. Each of these forms has unique characteristics and methods of operation. Team collaboration, for example, can be facilitated through the use of collaboration software, project management tools, and team-building activities (Xinlanemily, 2022).

Furthermore, the adoption of team-based competencies for interprofessional collaboration can effectively support the collective endeavors of team members in delivering optimal care within intricate settings (McLaney et al., 2022). Community collaboration entails the collaboration of individuals and organizations in addressing issues or attaining shared objectives within a specific community. This type of collaboration can manifest in diverse contexts, including community development projects, healthcare initiatives, or environmental conservation endeavors (Calancie et al., 2021; Jang et al., 2009; Susilo, 2022; Xinlanemily, 2022; Zhang et al., 2020). On the other hand, network collaboration involves the cooperation of individuals or organizations across different networks or systems. This form of collaboration can occur in various settings, such as research collaborations, supply chain management, or disaster response efforts (Diederichs, 2022; Lerner & Hâncean, 2023; Song et al., 2019; Xinlanemily, 2022; Zhang et al., 2020).

Table 7 Collaboration Support Level based on Eigenvalues

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	2.149	71.624	71.624
2	.605	20.157	91.780
3	.247	8.220	100.000

Table 8 Collaboration Support Factor Analysis

	Factor
	1
Team Collaboration	0.742
Community Collaboration	0.893
Network Collaboration	0.895

In relation to teacher collaboration support as perceived by educators through factor analysis, it has been established that a single group of factors is generated. These factors encompass various variables, specifically (1) team collaboration, (2) community collaboration, and (3) network collaboration. This suggests that teachers recognize the significance of engaging in team-based work, collaborating with the educational community, and establishing professional networks with colleagues to enhance the quality of teaching and foster their own professional development. By comprehending these factors, teachers can effectively cultivate collaborations that facilitate growth and development in the realm of education.

CONCLUSION

In the contemporary education landscape, the outcomes of this study hold significant relevance. The research highlights the crucial role of video and audio in enhancing interaction

during the learning process, which aligns with the advancements in digital technology and the growing trend of utilizing audiovisual media in modern teaching practices. Furthermore, the study's emphasis on planning, teaching strategies, teaching methods, instructional media, and learning resources in subject delivery is in line with the current educational demands that prioritize the use of diverse approaches and resources to cater to the needs of a diverse student population. The findings also support the active, student-centered learning approaches that are characteristic of contemporary education, as they underscore the importance of student-based content and student-centered teaching approaches. Lastly, the study's recognition of the significance of team collaboration, community engagement, and professional networks in teacher education aligns with the contemporary educational developments that prioritize cross-disciplinary collaboration and community integration in a results-oriented educational context, emphasizing continuous learning and teacher professional advancement.

SUGGESTIONS

The present study exhibits several limitations, such as a potential lack of contextualization, a narrow focus on specific variables, restricted data availability, absence of causal analysis, and an inability to track the dynamics of change in modern education. Educational practitioners can derive valuable insights from the study's limitations and recommendations to inform contemporary education practices. First, recognizing the importance of contextual understanding in educational research prompts practitioners to prioritize contextual analysis, tailoring interventions to specific settings. Second, adopting a holistic approach to data collection, including mixed methods research, enables practitioners to overcome limitations related to narrow focus and restricted data availability, ensuring a comprehensive understanding of the educational landscape. Lastly, emphasizing continuous monitoring and adaptation addresses the study's limitations in causal analysis and tracking dynamic changes, fostering a culture of ongoing assessment and adjustment to meet evolving educational needs. Implementing these insights can contribute to a more responsive and adaptable educational system in the face of a constantly evolving landscape. Consequently, it is advisable to supplement this research by gathering data from diverse educational settings, engaging additional stakeholders, and conducting more extensive analyses to comprehend the underlying causes and effects. Furthermore, periodic data updates and the utilization of mixed methods research could enhance the significance and comprehensiveness of this study, thereby furnishing more valuable insights to educational practitioners operating in a constantly evolving educational landscape.

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