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Enhancing Student Engagement in Learning Management Systems through Exploration of Avatars in Virtual Classrooms: A Systematic Review

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ABSTRACT

The rise of online education has highlighted the crucial need to comprehend student participation in virtual learning environments. With the evolution of online learning platforms, understanding the impact of technological components, especially interactive avatars, on student engagement has become imperative. This study aims to investigate the influence of avatars on student participation in virtual classrooms. Specifically, it seeks to understand the impact of avatars on student interactions, engagement, and involvement within online learning environments. Three primary research questions guide the inquiry: the impact of avatars on student participation, the extent of technology-mediated interaction's effect on engagement, and the nuanced ways in which avatars contribute to or hinder student involvement. The study conducts a comprehensive review of existing literature, delving into the design, integration, and influence of avatars in virtual learning environments. It critically assesses technological advancements, focusing on interactive avatars, and their implications for student engagement. The methodology involves an in-depth analysis of scholarly works, educational platforms, and user experiences to gather valuable insights. The study uncovers the multifaceted impact of avatars in virtual classrooms. Interactive avatars significantly enhance student engagement and participation, fostering interactions between students and teachers as well as among peers. The customization and interactivity of avatars create a more immersive learning experience, positively influencing student involvement. Future research endeavours could explore the integration of avatars with emerging technologies like augmented reality and artificial intelligence, enhancing the depth and scope of virtual classroom interactions. Continued research in this area is essential for refining virtual learning environments and ensuring optimal student participation in the digital educational landscape.

Keywords:

Avatar; Engagement; Virtual classroom; Learning management system

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1. Introduction

In recent times, the field of education has experienced a significant shift due to the emergence of digital learning platforms [1-5]. The incorporation of technology has not only altered the manner in which education is disseminated but has also introduced novel opportunities for investigating the manner in which students interact with educational resources and participate in virtual classroom environments. With the growing prevalence of online education, there has been a significant focus on the concept of student involvement as a critical factor in determining good learning outcomes. This study undertakes a thorough investigation of student participation within online learning settings, specifically examining the impact of avatars on the dynamics of virtual classrooms.

The exponential growth of digital learning platforms has posed several advantages and disadvantages for both educators and students. The conventional confines of the classroom have been substituted by virtual environments wherein learners engage with educational materials, actively contribute to conversations, and cooperate in various academic endeavours [2,3]. In the midst of this transformative period, the notion of student engagement has surfaced as a complex phenomenon that spans various dimensions, including cognitive, emotional, and behavioural components of student participation in the learning process. It is widely considered that effective engagement plays a significant role in promoting a more profound comprehension, fostering critical thinking skills, and facilitating the retention of knowledge. Consequently, this leads to improved educational outcomes.

Online learning environments have grown in popularity as the face of education changes as a result of the integration of technology, offering flexible and open access to educational opportunities [5,6]. It is difficult to guarantee significant student involvement in these virtual environments, though. Although online learning is convenient and flexible, it also adds particular participation challenges, such as feelings of loneliness, less social connection, and a diminished instructor presence [7-9]. Avatars have become a viable method to improve student engagement by fostering more dynamic and immersive virtual classroom environments as a solution to these challenges. Despite the increased interest in avatars, a thorough understanding of how they affect student participation in online learning contexts is still lacking. By enabling students' access to instructional materials from any location and at their own speed, internet-based education has revolutionized the traditional classroom. Although this method of learning has unquestionable benefits, it also has issues with student engagement, which is crucial for producing successful learning results. Online students frequently encounter challenges such as a lack of in-person connection, diminished instructor accessibility, and feelings of isolation, which can have a negative impact on their motivation and overall learning experience.

Digital personas called avatars have drawn interest as potential tools for improving student engagement in online learning settings [10]. By giving learners, a sense of presence, identity, and social interaction that is frequently missing in traditional online environments, avatars can offer a more individualized and dynamic learning experience [11]. A level of anonymity that might encourage involvement is maintained when students negotiate the virtual classroom, interact with peers and teachers, and even participate in simulated scenarios using avatars.

The usage of avatars in a variety of settings, including gaming, virtual reality, and social media platforms has been studied in the past [12]. The use of avatars specifically in the context of online learning and its effects on student engagement, however, are largely unexplored. It is essential for educators, instructional designers, and policymakers who want to develop more engaging and successful digital learning experiences to comprehend how avatars affect student engagement dynamics within virtual classrooms.

An extensive study of the available literature is required to close this knowledge gap. This review will look at the various uses of avatars in online learning and analyse how these uses affect interaction styles, learning results, and student engagement. This study intends to give educators and researchers a better understanding of the potential advantages and difficulties of employing avatars as a tool to increase student engagement in online learning environments by synthesizing existing studies.

This examination is guided by three central research questions:

- i. How does the integration of avatars as a technological tool impact student engagement within online learning environments, and what are the specific dynamics and mechanisms by which avatars contribute to enhancing engagement levels?
- ii. To what extent does the presence of avatars in virtual classrooms influence student perceptions of instructor presence, peer interaction, and overall classroom dynamics in online learning environments, and how do these perceptions relate to their engagement levels?
- iii. What role does technology-mediated interaction using avatars play in fostering collaborative learning, active participation, and meaningful social connection among students within virtual classroom settings, and how does this influence the overall dynamics of engagement in online learning environments?

This study aims to investigate the potential of avatars as instruments for boosting student engagement and interaction in the context of online education. By addressing these research issues, significant insights will be provided to educators, instructional designers, and policymakers. The results of this study offer potential insights that can be applied to pedagogical methods and the development of virtual learning platforms, ultimately contributing to the progress of efficient online educational tactics.

In the subsequent sections, we will review pertinent existing research, delving into fundamental notions such as student involvement, virtual learning settings, technology-facilitated interaction, and the significance of avatars. This will be followed by a thorough examination of our findings and its impact on the augmentation of student involvement in online education via interactions facilitated by avatars.

1.1 Literature Review

In the twenty-first century, going without the Internet, a cell phone, an iPhone, or other electronic device for an extended period of time seems unthinkable. Many instructors and educators have been investigating strategies and means to improve the teaching and learning process efficient and enjoyable [13]. Learning using technology continues to offer possibilities for more interventions in educational programming [14]. For programs in teacher preparation, novelty is not as important as giving students meaningful teaching and lasting results. It is important for aspiring educators to understand what teaching is like. As a result, teacher educators must balance the experimenting with various teaching tools with the task of building an authentic classroom. They must employ experimental learning techniques that engage students in meaningful ways and foster intellectual inquiry, moving beyond the conventional teaching strategies used in higher education [15]. In order to prepare students for the reality of the classroom, teacher education programs must work to support their students in learning and experiencing the complexity of being a teacher [16]. Even though it is impossible to imitate all aspects of reality in a classroom setting for

higher education, teacher educators must try by utilizing innovative teaching and learning techniques [17].

Both teachers and students can be transformed via immersive community-based learning [18]. The affordance of embodied gesturing and walking, the design and organization of virtual agents and avatars, and the environmental fidelity in the mixed-reality learning spaces are notable elements that impacted participants' perceptions of presence and their effectiveness as virtual teachers. Many experts contend that for learning to be effective, students need to be actively involved in the learning resources [15,19]. However, present online learners continue to complain about a significant dearth of engaging and interesting learning tools. This pervasive issue is even more obvious in online collaborative learning systems, because the resources lack real user empowerment, social identity, and challenge, negatively affecting learners' engagement and self-motivation [20].

Teachers learn how to give constructive criticism through experience [15]. It is frequently used in effective teaching and serves the objective of assisting students in assessing their present performance level so that necessary adjustments may be made to raise it to the desired level. The process of learning how to provide constructive criticism is a vital aspect of the training undertaken by teachers. This learning is best achieved through hands-on experience, which allows them to understand the nuances and complexities of offering feedback in a helpful and supportive manner [10]. Constructive criticism, often employed as a fundamental tool in effective teaching practices, serves a crucial purpose in the educational context.

Constructive criticism's primary goal is to assist students in assessing their level of performance right now, making it easier to spot areas where they can perform better. Teachers have the knowledge and tools necessary to help students evaluate their own work critically and objectively. Through this evaluation procedure, students can identify both their areas of strength and improvement [21]. Students are able to make targeted efforts to improve their overall performance because they have a better awareness of their accomplishments and areas for improvement. In the environment of online platforms, how does one measure?

Which brings back to the discussion of what about the use of avatars, nevertheless, that justifies their significance? What role will avatars play in online learning environments? What potentialities make avatars a good fit for addressing the problems with teaching and learning in the twenty-first century?

2. Methodology

2.1 Identification

The method of selecting suitable papers for this study involves three primary phases in the systematic review process. The initial stage involves the identification of keywords and the exploration of associated terms through the utilization of resources such as thesauri, dictionaries, encyclopaedias, and prior research. Subsequently, following the determination of relevant keywords, search strings were generated for the Scopus and ERIC databases, as illustrated in Figure 1.

During the initial stage of the systematic review procedure, a total of 174 papers were successfully retrieved from the databases used in the present research work. The initial stage of the research process entails doing a comprehensive search for scholarly resources that are pertinent to the pre-established research topic. The utilized terms encompass "avatar" and "learning." The initial stage entailed identifying keywords and conducting a search for analogous phrases in prior scholarly investigations. Next, all pertinent terms and search queries for the Scopus and ERIC

databases were formulated (refer to Figure 1). Thus, in the initial phase of the advanced search process, this study successfully acquired a total of 75 publications from the databases.

| | |
|---------------|--|
| Scopus | TITLE-ABS- KEY ("avatar" AND "learning" (engagement)) A ND TO (DOCTYPE , "ar")) AND (LIMIT- TO (LANGUAGE , "english")) AND (LIMIT- TO (SRCTYPE , "j")) |
| ERIC | "Avatar" AND "learning" AND " engagement" |

Fig. 1. Identification of keywords and the exploration of associated terms in Scopus and Eric databases

2.2 Screening

During the initial round of screening, it is imperative to exclude duplicated papers although none were detected. In the initial stage, a total of 174 articles were excluded, followed by the subsequent phase where 75 articles were examined. The selection process for both phases involved the application of specific inclusion and exclusion criteria formulated by the researchers (refer to Figure 2). The initial criterion for selection was literature in the form of research articles, as it serves as the primary source of practical information. Additionally, the present investigation incorporates the omission of publications including systematic reviews, reviews, meta-analyses, meta-syntheses, book series, books, chapters, and conference proceedings. Moreover, the analysis focused solely on scholarly articles authored in the English language. It is imperative to acknowledge that the time frame selected spans a period of five years, specifically from 2013 to 2023. A total of 75 publications made up the final selection.

| Criterion | Inclusion | Exclusion |
|-------------------|-------------------|--------------------------|
| Language | English | Non-English |
| Timeline | 2013 – 2023 | < 2013 |
| Literature type | Journal (Article) | Conference, Book, Review |
| Publication stage | Final | In Press |

Fig. 2. The selection search criteria

2.3 Criteria for Eligibility

In the third stage, referred to as the eligibility phase, a cumulative number of 93 articles was compiled. At this step, a comprehensive evaluation was conducted on the titles and main content of all publications to ascertain their adherence to the inclusion criteria and alignment with the research objectives of the present study. Consequently, a total of 36 reports were excluded from the analysis due to incompatible inclusion criteria. The full text has been removed from this analysis due to the small sample size (n=14). Additionally, the title does not show a significant relationship (n=12) and the research does not align with the stated purpose of the study (n=10), as supported by empirical data. A total of 39 articles are now accessible for examination, as indicated in Figure 3.

2.4 The Concept of Data Abstraction and Analysis

The study utilized the integrative analytic assessment approach to examine and combine several research designs, including quantitative, qualitative, and mixed methods. The objective of the competence research was to identify and analyse noteworthy themes and subtopics. The initial phase in the development of the topic involved the acquisition of data. Figure 2 illustrates the systematic approach employed by the researchers in analysing a corpus of 174 articles to identify claim or content that is pertinent to the present study's research questions. The authors subsequently conducted a comprehensive analysis of the latest influential scholarly articles pertaining to avatar, learning, and technology focusing on engagement. The methodologies utilized in all inquiries, along with the research outcomes, are currently under scrutiny. Subsequently, the author collaborated with other co-authors, namely Mohd Ekram Hashim, an expert in creative technology, Chee Ken Nee, an expert in educational technology, as well as Nor Hazlen Kamaruddin and Muhammad Luqman Hakim Mohd Hanapiah, experts in design technology to establish thematic categories derived from the data in the field of design thinking and creative technology education. The objective of this collaborative effort was to identify and rectify any concerns related to the credibility and accuracy of the research findings. The expert review phase is tasked with evaluating the coherence, importance, and suitability of each subtheme by specifying its scope.

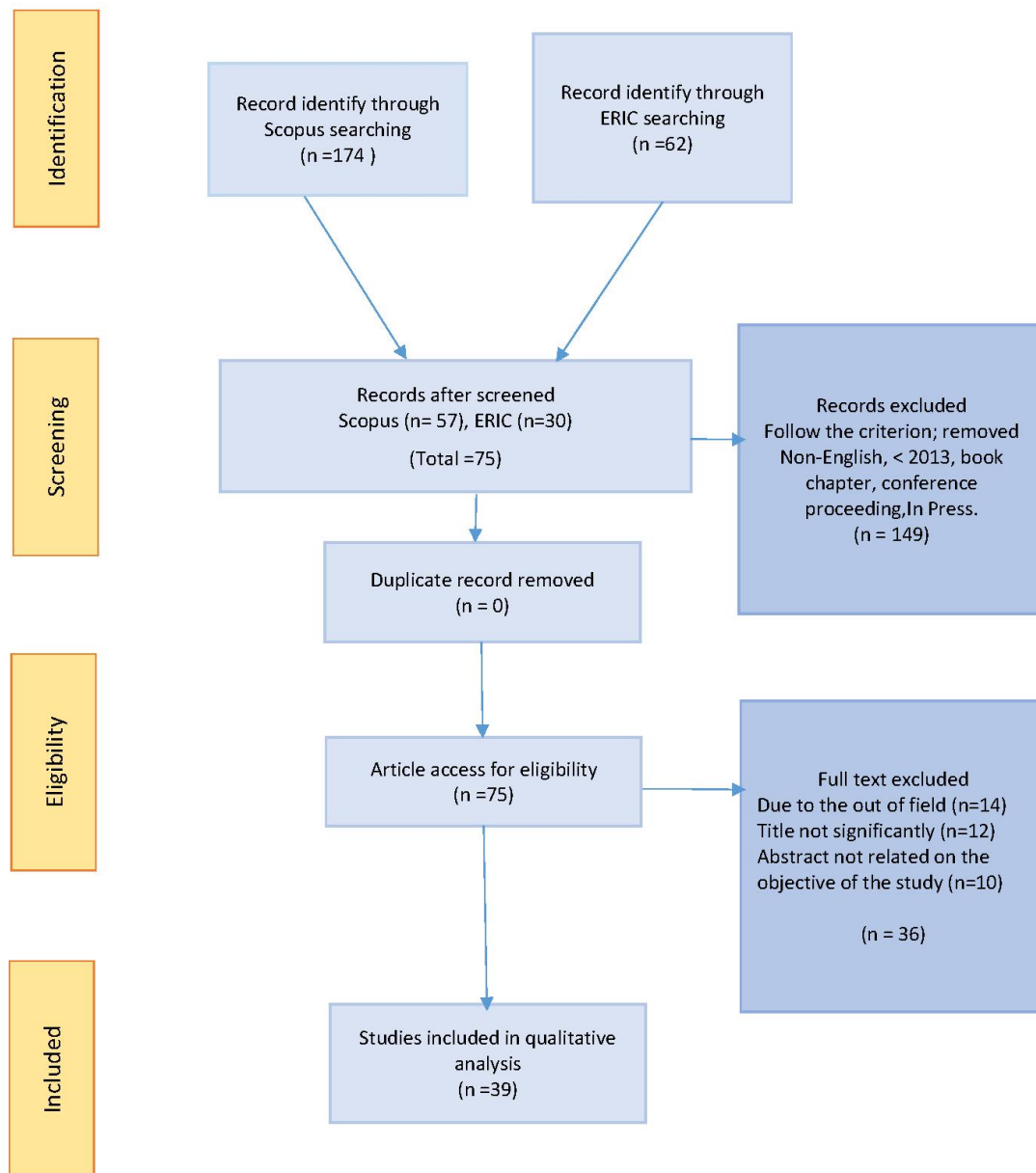


Fig. 3. Flow diagram of the proposed searching study

3. Results

Following a synthesis and analysis of selected research, the potential of avatars to increase student engagement and motivation is a prevalent theme throughout the research. The following three themes come to light:

3.1 Enhancing Engagement and Motivation via Personalization

Using avatars to personalize and customize the learning experience establishes a sense of ownership and connection to the content. Gamification strategies, such as the incorporation of avatars give students a more engaging and participatory learning experience [22,23]. The presence and flow of the learning experience are strengthened by the use of avatars in 3D virtual worlds and game-based environments [1]. Assuring inclusive and engaging educational experiences, the

employment of avatars also caters to a variety of learning requirements and groups, including deaf students and kids with neurodevelopmental difficulties [12].

The realm of online learning has become increasingly relevant in recent times, with researchers focusing on enhancing student engagement within this context. Nevertheless, a recurring issue is the perceived lack of captivating and intellectually stimulating learning materials that can effectively captivate online learners and facilitate effective learning [24]. This issue becomes even more pronounced in collaborative online learning settings where the interactive elements, user empowerment, social identity, and challenges are often lacking, consequently dampening learners' self-motivation and engagement levels [25].

To address these limitations and shortcomings, a novel approach termed Collaborative Complex Learning Resources (CC-LR) has been introduced [26]. This initiative aims to leverage the knowledge extracted during live sessions by virtualizing collaborative learning experiences. As CC-LRs are executed, they animate collaborative sessions, allowing learners to observe the interactions and discussions between avatars, the growth of discussion threads, and the construction, refinement, and consolidation of knowledge. Interestingly, this approach also encompasses intricate facets of the learning process during CC-LR creation, such as incorporating cognitive assessment and emotional awareness. One notable aspect of this research involves the evaluation of CC-LR enriched with complex information and its implications on the discourse process. The study is conducted within the Seventh Framework Programme (FP7) European project known as Adaptive Learning via Intuitive/Interactive, Collaborative and Emotional Systems, underpinning its practical applicability.

In the context of educational game applications, particularly for sexual and reproductive health education among adolescents, the potential of avatars and gamification emerges as a powerful avenue for engaging users and inducing behaviour change [27]. The concept of a mobile game app, propelled by a design-led Theory of Change (ToC) takes centre stage. This approach seeks to immerse users in a virtual experience where their avatars mirror their choices, ultimately fostering informed decision-making. The paper outlines a multi-methodology process involving behavioural frameworks and co-design approaches, which collectively yield a robust framework for impact measurement.

In a similar vein, avatar customization within metaverse environments is explored, particularly in the realm of fashion education [28]. By delving into the effects of different class modes and the mediation of task engagement, this study illuminates how students' creative self-efficacy moderates the relationship between dedication and value in different directions. This nuanced examination of avatar customization underscores the multifaceted interplay between individual characteristics and engagement outcomes.

The inclusion of avatars in educational contexts extends beyond traditional online learning. In the field of healthcare education, the incorporation of virtual simulations and avatars bridges the gap left by pandemic-induced disruptions [29]. These adaptations span telehealth simulations, skill acquisition sessions, and trigger films to foster engagement and practical competence in a rapidly changing educational landscape [30].

A common theme that emerges from these studies is the pivotal role that avatars play in enhancing engagement, fostering emotional connection, and promoting practical skills within educational contexts. Whether utilized for complex learning resources, gamified sexual health education, or innovative simulation methods, avatars act as conduits for experiential learning, holding the potential to revolutionize the way learners interact with digital environments.

In the pursuit of enhancing engagement and improving learning outcomes, the utilization of avatars appears to be a recurring and promising strategy. As these studies illustrate, avatars not

only serve as visual representations but also play a crucial role in catalysing interaction, personalized experiences, and behavioural change in various educational domains. By delving into the dynamics of avatar-student attachment, customization, and interactive storytelling, researchers are gradually unravelling the profound impact avatars can have on education, virtual environments, and user engagement.

3.2 Developing Immersive and Interactive Learning Environments

The development of immersive and interactive learning environments is greatly aided using avatars. Students can explore, communicate with others, and conduct experiments in virtual environments thanks to avatars, whether through 3D virtual worlds or simulated experiences [31]. Positive learning outcomes, such as skill improvement, positive learning experiences, and enhanced self-efficacy result from this immersion. With avatars, students may move around and interact with virtual items, promoting experiential learning. Avatars' interaction and dynamic features aid in the better comprehension of challenging ideas and practical applications [32].

The given research includes a wide range of studies with an emphasis on many facets of educational technology, particularly the use of avatars and virtual worlds to improve student engagement, interaction, and learning outcomes [20,33]. In addition to addressing specific issues in online education and gender-segregated cultures, these studies examine the potential of avatars to create immersive and participatory learning environments. Here, we offer a summary analysis of the major ideas and conclusions from these articles.

Avatars are used in the first series of research to increase student engagement in online learning environments. In the studies, the advantages of digital media and Web 2.0 technologies for fostering social presence in asynchronous online learning environments are highlighted. In contrast to face-to-face training, the research highlights the value of social presence and the possible advantages of avatars in encouraging participation [22]. Nevertheless, other research indicates that the efficacy of technologies, such as Voki avatars may vary and that pedagogical approaches continue to be extremely important in determining engagement [34].

Another group of studies focuses on the use of avatars to address certain issues in education like gender segregation in Saudi Arabia's higher education system [3]. According to these studies, a solution to the problem of gender segregation and a way to encourage inclusivity in Massive Open Online Courses (MOOCs) is to use avatar representations of female instructors. The study examines whether avatars can enhance the experiences of both instructors and students in gender-segregated societies and acknowledges the potential of avatar technology to develop social interaction environments.

The synthesis also includes research that emphasize how avatars help students gain abilities and capabilities. For instance, one study investigates how pre-service teachers might interact with avatars to build effective feedback abilities [2]. Teacher candidates gain experience through giving feedback and commenting on their experiences by taking part in virtual sessions and interacting with avatars, which improves their readiness for future teaching positions.

Additionally, studies that look at how avatars affect creativity, engagement, and learning outcomes are included in the study [33,35]. These studies look at the potential of three-dimensional virtual environments to promote engagement, creativity, and authentic cross-cultural communication. They contend that using avatars in virtual settings can provide a fun and engaging learning environment that will motivate students to learn.

These studies show the potential advantages of avatar-based learning environments. It is investigated whether avatars can be used to develop immersive, interactive, and interesting

educational experiences. They address issues related to social presence, gender segregation, the ability to give constructive criticism, and creativity. Although the results are usually encouraging, some studies note that careful planning and pedagogical alignment are necessary to fully realize the potential of avatar-based learning. Avatars have potential as a tool for improving several educational features, and that future research might examine the effectiveness of avatars in various settings and with varied learner demographics.

3.3 Structuring Learning Processes and Skill Development

Avatars are a useful tool for structuring learning procedures and skill development. Avatars offer a secure and controlled environment for students to practice and apply recently learned skills in contexts like qualitative research and therapeutic treatments. Before participating in real-world events, students can get practical experience through simulated learning encounters with avatars. With the use of avatars, students can experiment, make mistakes, and improve their methods. This skill-development scaffolding strategy promotes confidence, competence, and autonomy.

Numerous studies stress the significance of striking a balance between face-to-face instruction and technology-mediated learning, particularly in language education [20]. These studies express concerns about an over reliance on technology devices and tools, arguing that these developments have not necessarily resulted in major breakthroughs in linguistic and communicative abilities. The abstractions demand creative approaches to student engagement that employ a moderate bit of technology [36]. To encourage educators to think about a more comprehensive approach to language acquisition, the idea of an "avatar teacher" is presented as an alternative to solely online resources and robot teachers.

Studies examining the effects of Second Life (SL) apps on creativity bring art and design education into focus [37]. To encourage students' imagination and creativity, the use of avatars in the design process is currently being investigated [38]. The study emphasizes how using avatars in virtual settings can help students build 21st-century skills and stimulate their creative thinking.

A study that highlights an inventive initiative in which students develop avatars to address educational difficulties from many angles also focuses on teacher education programs [26]. By encouraging them to think and behave as their avatars when confronted with teaching obstacles, this strategy seeks to train aspiring teachers. The project shows how using avatars can help students learn by doing and reflecting, which improves their comprehension of instructional strategies.

The usage of avatars is also examined in relation to the improvement of learning experiences, engagement, and student self-efficacy. Studies in this field show how avatars can be used to design immersive and interesting learning settings, especially in three-dimensional multi-user virtual environments (MUVES) [39]. It is recommended that the use of avatars in virtual learning environments fosters interactivity, engagement, and better learning results. Additionally, the connection between avatar interventions and modifications in teachers' self-efficacy is investigated with early results pointing to a favourable relationship.

The creation of efficient 3D interfaces for online learning systems is an important additional theme [40]. According to these studies, immersive environments and avatars are important elements that can improve student interaction and engagement. For the creation of intuitive and interesting online learning experiences, the integration of avatars and environments is seen to be crucial.

The studies also cover child-computer interaction and its possible effects on engagement and learning [41]. Avatars as touchless gestural interfaces are investigated, with a focus on how they

can help young learners engage in meaningful interactions by overcoming affordance blindness [42]. These studies demonstrate how avatars have the potential to aid in the creation of kid-friendly instructional tools.

Overall, the synthesis analysis shows how adaptable avatars are at arranging learning activities and skill growth in a range of educational environments. Avatars are investigated as a tool that can improve engagement, interaction, creativity, and reflective learning experiences in a variety of learning contexts, including language education, art and design, teacher training, and online learning systems. The results highlight the necessity of a well-balanced and careful integration of avatar-based learning approaches to maximize their advantages for students and teachers.

4. Conclusions

This systematic review investigates the topic of "Exploring Student Engagement in Online Learning Environments: A Comprehensive Review of Virtual Classroom Dynamics". In summary, the combination of these several studies provides strong evidence for the significant role that virtual environments are playing in the field of education. These studies provide valuable insights into the need of employing creative teaching approaches to foster engagement, which is a fundamental aspect of effective learning and teaching attempts.

Within the extensive body of research, a discernible pattern emerges, highlighting the significant capacity of inventive pedagogical approaches to stimulate student involvement and cultivate an interactive educational environment. As education expands beyond conventional limits and incorporates the opportunities presented by virtual worlds, it becomes evident that active involvement is not an incidental result but rather a purposeful achievement attained through intentional educational strategies. The aforementioned research collectively emphasizes the significance of strategically using virtual platforms, dynamic avatars, and interactive technologies in order to enhance the learning process.

In this context, the function of avatars is revealed as a tool that brings about transformation in terms of involvement, specifically inside virtual educational environments. Avatars possess the ability to surpass their digital manifestation, assuming the role of intermediaries for interactions that effectively bridge the physical divide between learners and the educational material. By utilizing avatars, learners are transformed from passive observers to engaged participants who actively contribute to and shape their educational experience. The capacity to customize avatars and negotiate virtual settings confers agency upon learners, fostering a perception of ownership and control over their educational journey. As a result, learners are inclined to engage in a more comprehensive manner, hence cultivating an educational experience that is more enriched and engaging.

Moreover, avatars play a vital role in facilitating the collaborative dimension of education, which is essential for fostering a supportive and participatory learning community. They play a crucial role in helping learners to develop a visible presence, and therefore, facilitating the formation of relationships and fostering meaningful interactions, regardless of geographical distances. Asynchronous learning settings is transformed, becoming dynamic arenas wherein students engage in active idea-sharing, exchange of perspectives, and collaborative knowledge construction. Avatars serve to bridge the divide between individual seclusion and collective cooperation, thereby fostering a unified virtual educational environment.

Finally, the combination of these research highlights the adaptable and transformational potential of avatars in education. They act as stimuli for imaginative expression, participatory learning, and introspection. Avatars serve as dynamic agents in influencing current educational

paradigms in a variety of fields, including language instruction, art and design, teacher preparation, online learning systems, and child-computer interaction. The overarching storyline demonstrates how the thoughtful incorporation of avatars has the potential to expand teaching methods, empower students, and create a generation ready to succeed in the ever-changing educational environment.

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