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Engagement, edugame and learning: a systematic literature review

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Abstract: Serious games and other edugames have demonstrated significant potential in fostering the teaching-learning process across educational levels, promoting inclusion and enhancing students' motivation and engagement. These interactive environments serve as effective vicarious teaching tools (Sibilio, 2017, 2023), boosting prosocial skills and collaborative problem-solving (Di Tore et al., 2020; Ghanouni et al., 2021). However, as Hookham & Nesbitt (2019) emphasize, understanding the dimensions of engagement—behavioral, affective, and cognitive—is essential to design or select educational video games that ensure active participation. A prior systematic review (1970–2015) identified these engagement dimensions and evaluation methods, including interviews, questionnaires, physiological metrics, and performance data. This study builds on those findings, focusing on contributions published from 2015 to February 2024, considering recent advancements in technology (e.g., virtual, augmented, and mixed reality), methodological developments, new measurement tools, and contextual changes driven by the pandemic. By exploring these updates, the review aims to analyze the evolving interconnections between engagement dimensions (O'Brien & Toms, 2018) and reflect on the implications for integrating these tools into classrooms. The goal is to support teachers in leveraging serious games to enhance learning processes and ensure inclusion for all students.

Keywords: edugame; educational technology; engagement; learning process; inclusion.

1. Introduction

Several studies highlighted the educational-didactic potential of serious games, or other types of edugames (educational videogames, also known as serious games) to promote both the teaching-learning process and to foster school inclusion in any order and grade of school. These interactive and highly engaging learning environments have proved to be *vicarious teaching devices* (Sibilio, 2017, 2023) useful for increasing students' motivation and interest, enhancing numerous skills, sharing ideas, acquiring knowledge and develop problem-solving strategies (Di Tore et al., 2017, 2020; Drummond & Sauer, 2014; Gee, 2002; Ghanouni et al., 2021; Gómez-Fernández & Mediavilla, 2021; Hersh, & Leporini, 2018; Lau,Wang, & Wang, 2020; Rivoltella, 2016; Vallefuoco et al., 2022; Zheng et al., 2021). These potentials are promoted by the digital affordances that these virtual play environments possess,

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among them a variety of mediators and multisensory settings that make the learning experience more enjoyable, engaging and motivating for the learner. Actually, different studies have shown that engagement may be influenced not only by the characteristics of an edugame (e.g. its design), but also by user's peculiarities, among these: the motivation to play; the personality, gender, age of the players; the type of game and its characteristics. As commented by Portnow learning with playful virtual learning environments may be described as what «is not what you learn by being taught but rather what you learn by being exposed to things in a context which you are already highly engaged in».

This consideration is highly shared by multiple researchers who investigated several edugame or serious games potential to develop multiple skills also because they are considered engaging for the students (Abdul, & Felicia, 2015, Hookham & Nesbitt, 2019; Kniestedt, Lefter, Lukosch, Brazier, 2022; Whitton, 2011).

However, despite the extensive research on games, few empirical studies have analyzed how engagement may affect learning in game-based learning environments. Student engagement is a complex, multidimensional concept that requires careful consideration in the context of edugames. While positive engagement can foster motivation and learning, its effectiveness depends on how well it aligns with educational objectives (Abdul, & Felicia, 2015; Beacklund, & Hendrix, 2013). As highlighted by Hookham & Nesbitt (2019), it is necessary to know and understand the different dimensions of "involvement" (engagement) to design or select educational videogames that may ensure active student participation. Usually, engagement refers to the way players experience an educational game, the way they feel emotionally and cognitively connected to its features, and the way they act within the virtual environment to achieve their goals (Csikszentmihalyi, 2020; van Reekum et al., 2004; Ravaja et al., 2005). There is often a tendency to understand the nature of engagement in games designed for entertainment purposes, while neglecting those designed for educational purposes. Furthermore, these studies often fail to assess learning outcomes or focus mainly on psychological factors and related theories that clarify help to better explain the psychological aspects underlying the use of digital media (Boyle, Connolly, Hainey, & Boyle, 2012; Bryant, & Vorderer, 2016; O'Brien & Toms, 2008; Boyle et al., 2012).

Nevertheless, there are very few studies that analyze and measure engagement but clarifying and refining the concept, alongside developing robust measurement tools, is essential for maximizing the potential of edugames in the teaching-learning process. This is often taken for granted due to the various interpretations and definitions of engagement, driven by the concept's versatility and conflicting definitions, as well as inaccurate generalizations (Doherty & Doherty, 2018). The multidimensional nature of user engagement makes it difficult to measure. For instance, while it is easier to measure concrete events, such as the number of mistakes a user makes when interacting with a system or the time it takes to find a solution, it is more challenging to measure activities without visible or physical outcomes (O'Brien & Toms, 2013).

Currently, only a systematic literature review has examined how engagement has been defined and evaluated in serious games, between 1970 and 2015, identifying three types (behavioral, affective and cognitive) and different modes of evaluation (through interviews, questionnaires, physiological approaches, game metrics, time and task performance). Therefore, considering:

- recent technological developments and advances in the field of virtual, augmented and mixed reality that have improved the quality and accessibility of serious games and all other types of educational video games.
- Methodological developments, of new measurement tools that sometimes also involve the use of machine learning models for data analysis.
- Changes that have affected the different learning contexts, also determined by the pandemic situation.
- Possible interconnections between the different dimensions of engagement (O'Brien, & Toms, 2018),

this paper intends to extend the survey and consider all the contributions published from 2015 to 2024 (February) and then reflect on the implications for teachers' integration of these *vicarious teaching devices* to foster the learning process and inclusion of all learners in the classroom.

2. Why are you engaged? A literature review on student engagement

The concept of student engagement has gained increasing attention in educational literature, particularly with the advent of the digital age and the growing interest in edugames or serious games. Research suggests that game environments are inherently engaging (Admiraal, Huizenga, Akkerman and Ten Dam, 2011; Burgos, Tattersall & Koper, 2007; Ciavarro, Dobson & Goodman, 2008) with the potential to positively impact learning processes (Sugden et al, 2021). However, despite the widespread perception of games as "engaging," there remains little consensus on what engagement actually entails.

In the study of applied games, much of the focus has been on subjective game experiences, including emotional and behavioral constructs like positive or negative emotions, immersion, presence, and flow (Kniestedt, Lefter, Lukosch, & Brazier, 2022). This approach is logical when evaluating entertainment games, where the primary goal is enjoyment and immersion. However, for edugames, engagement must be assessed based on how well it aligns with the game's educational or training objectives, rather than solely on its ability to elicit subjective experiences. This shift requires a deeper understanding of how engagement operates within the context of the game's goals rather than limiting evaluation to its observable effects.

Two comprehensive literature reviews on engagement, the most recent in 2019, emphasize the persistent ambiguity surrounding the concept. They conclude that engagement is a multifaceted construct often conflated with related but distinct terms, highlighting the need for greater clarity and conceptual refinement, particularly in the realm of applied games.

Student engagement is a multifaceted concept with varying definitions that reflect its dual dimensions: one focusing on students' active involvement in their own learning and the other emphasizing institutional efforts to enhance the broader learning experience. Scholars like Kuh et al. (2007). escribe engagement as "participation in educationally effective practices, both inside and outside the classroom, which leads to a range of measurable outcomes." Others, such as Hu and Kuh (2001) emphasize the active role of students, defining engagement as "the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes" (p. 3). In contrast, institutional perspectives, such as those from Little et al. (2009) highlight the deliberate efforts by institutions to empower students in shaping their learning experiences. These definitions reflect a broader

understanding of engagement as a dynamic interplay between individual agency and systemic support.

As an alternative, some scholars advocate for understanding student engagement as a "multidimensional construct" or even a "metaconstruct," encompassing its diverse and interrelated aspects in a holistic framework. In fact, as highlighted by the research group of Mills et al. (2013) and by Hookham and Nesbitt (2019) engagement is often understood as a meta-construct comprising behavioral (Koster, 2005; Bearman et al., 2012), affective (Brom et al., 2014; Gerling et al., 2011), and cognitive (Dezentie et al., 2015; Diehl et al., 2015) dimensions.

Behavioral Engagement includes observable actions like task effort, persistence, and participation in learning activities (Koster, 2005; Bearman et al., 2012). While behavioral engagement is often used as a proxy for emotional or cognitive engagement, this assumption is not universally valid. Biologist Robert Leamnson cautions that while "interest in a task is clearly important," it does not guarantee the acquisition of deep, transferable knowledge necessary for future learning. This distinction highlights the importance of differentiating surface-level engagement from the processes that foster meaningful educational outcomes (Axelson & Flick, 2010).

The cognitive dimension involves mental processes crucial for learning, such as sustained attention, focus, and the use of effective learning strategies (Mills et al., 2013). Cognitive engagement represents the depth of students' interaction with learning content, reflecting their ability to connect new knowledge to prior understanding.

Moreover, the concept of engagement in gaming encompasses both an emotional state induced by gameplay and a key motivator for engaging in games. Positive emotional states like enjoyment and flow are critical for fostering motivation and sustained involvement (Boyle et al., 2012). However, excessive engagement driven by escapism or avoidance of negative emotions, such as boredom or depression, can lead to poor self-regulation and unhealthy behaviors (Boyle et al., 2012). In gaming contexts, engagement is both an emotional state induced by gameplay and a motivator for continued play. Enjoyable states like flow and immersion encourage positive attitudes and long-term motivation (Boyle et al., 2012). However, negative emotions such as frustration can arise, often due to excessive engagement or unproductive motivations, such as using games as a form of escapism. The implications of engagement in gaming extend to educational settings, where its role must be carefully aligned with learning objectives (Kniestedt e al., 2022).

Despite its importance, the multidimensional nature of engagement makes it difficult to measure comprehensively (Abbasi, Ting, & Hlavacs, 2017; Hookham, & Nesbitt, 2019; O' Brien & Toms, 2013; Rivera, & Garden, 2021). Various interpretations and definitions have led to the development of multiple measurement systems, each targeting specific dimensions. This fragmentation is driven by the versatility of the concept, conflicting definitions, and overly broad generalizations (Doherty & Doherty, 2018).

To address these challenges, further exploration is needed to identify tools and methods that can effectively measure engagement in edugames. Such efforts should consider the interplay between behavioral, affective, and cognitive dimensions while aligning assessments with the intended educational goals.

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3. Methodology

3.1. Objective

In continuity with the Systematic Review carried out by Hookham and Nesbitt (2019), this paper examines whether the past nine years have introduced significant advancements or shifts in the theoretical interpretation of the construct of "engagement" and its measurement within educational contexts. By deepening our understanding and refining practical applications, educators can more effectively leverage engagement to foster meaningful and transformative learning experiences.

3.2. Research method and selection criteria

The Systematic Review was carried out using databases, search engines and A-level journals recognized by ANVUR, which were most representative for the topic (Appendix 1; Appendix 2; Appendix 3). The identification of the articles was performed through keyword searching and using Boolean operators: Serious Game OR edugame AND measur* OR analy OR evaluat* AND engag* OR presence; Scientific articles, conference proceedings and book chapters were selected, in both national and international Open Access, in Italian and English, published between 2015 and February 2024. The start date for this study was determined based on the most recent systematic review conducted by Hookham and Nesbitt (2019).

Exclusion criteria included research areas outside the educational domain, the absence of references to serious games or engagement measurement, and publications that did not specifically address these topics. Additionally, gray literature, scientifical articles for a fee, and publications in languages other than Italian and English were excluded from the analysis (Tab. 1).

Table 1. Criteria.

CRITERIA 1	Related Serious Games: "serious game", "edugame".
CRITERIA 2	Related to measurements: "measur*", "analy", "evaluat*".
CRITERIA 3	Related to engagement: "engag*", "presence".
EXCLUSION CRITERIA	Non-digital games, non-educational areas, absence of engagement or related concept measurement.

3.3. Data selection and extraction process

The systematic review followed the PRISMA method (Liberati et al., 2009), with a flow diagram created to outline its four distinct phases (Fig. 6). The search was conducted across academic databases, search engines, and A-level journals recognized by ANVUR, yielding a substantial initial result of 772,230 published works. After removing 16 duplicates, the identification and selection phase began, during which

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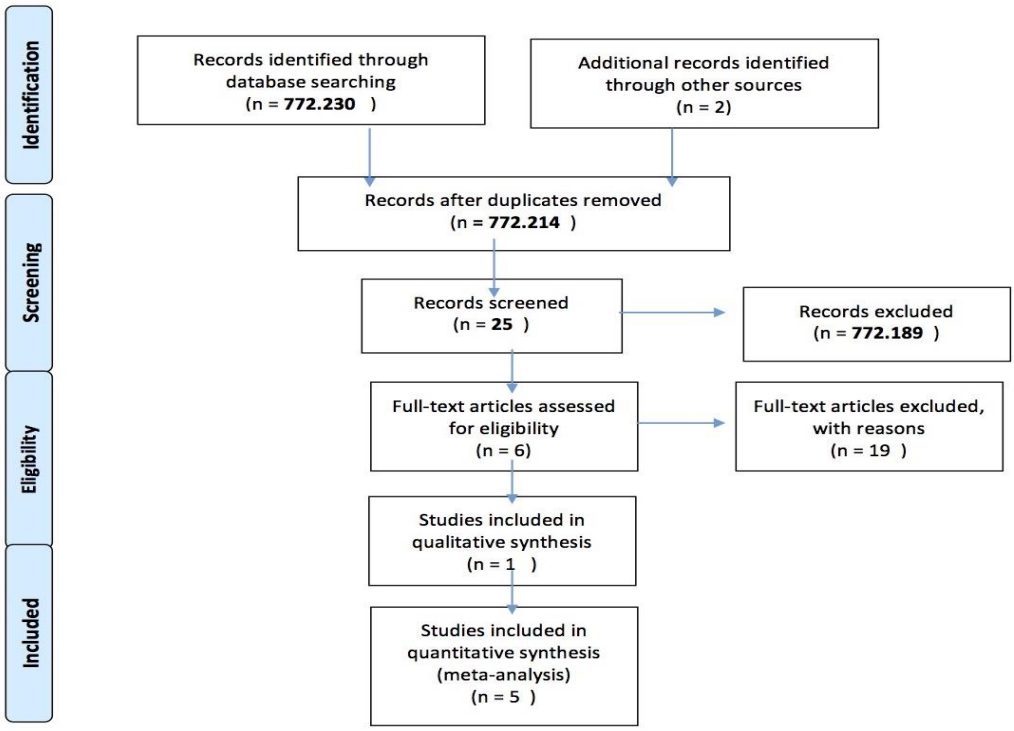
titles and abstracts were evaluated (Prahladh & van Wyk, 2020). This process excluded 772,189 publications due to their focus on non-educational research areas, lack of reference to Serious Games or engagement measurement, inclusion as gray literature, paywalled content, or languages other than Italian and English.

In the subsequent screening phase, full-text evaluations (Badger et al., 2000) were conducted on 25 works, of which only six directly addressed the measurement of engagement in the context of Edugames within education. These six studies were included in the final analysis. Additionally, the bibliographic references of these studies were examined (Hopewell et al., 2007), leading to the identification of two further articles that were reviewed for supplementary insights but deemed unsuitable for inclusion in the systematic review.

For each relevant study, researchers compiled a detailed table (Fig. 1) documenting bibliographic information (author(s), year of publication), objectives, study population and sample size (if applicable), methodology, methods and tools used (if applicable), and key findings related to the research question. This tabulation process proved invaluable for synthesizing and interpreting qualitative data, allowing researchers to organize information analytically around key themes (Arksey & O'Malley, 2005).

Figure 1. Prisma Flow.



4. Results and discussion

The systematic search yielded a substantial number of results across academic databases, search engines, and A-level journals recognized by ANVUR. During the initial screening phase, 25 studies were shortlisted based on an evaluation of their titles

and abstracts, ensuring that terms related to serious games, engagement, and measurement were explicitly present. In the subsequent suitability phase, a comprehensive review of the full texts was conducted, applying the previously established inclusion and exclusion criteria. This phase revealed that 19 studies did not meet the criteria, primarily due to their focus on unrelated research areas or the absence of studies addressing the measurement of engagement.

The findings of this review highlight a significant gap in the current research landscape regarding the measurement of engagement during the use of edugames in educational contexts. Over the past decade, only six studies have explored this topic in depth. The primary objective of this review was to analyze the theoretical evolution of the concept of engagement, as well as to examine the methods and tools used to measure engagement in the context of serious games in education. This analysis aims to provide insights into how the interpretation and assessment of engagement have changed over time and how these developments inform the effective use of edugames in learning environments.

4.1. Definition of Engagement

This study highlights that while researchers' interest in evaluating the outcomes of learning processes through edugames has grown significantly over the last decade, few studies have focused specifically on measuring engagement. This gap is primarily attributed to the challenges of theoretically defining the concept of engagement and developing consistent measurement tools.

From the systematic review, six scientific articles were selected for analysis to assess changes in the theoretical interpretation of engagement and the methodologies used for data collection. The findings revealed an increased adoption of the three-dimensional framework of engagement, with four out of the six studies utilizing tools to measure behavioral, affective, and cognitive dimensions (Hookham et al., 2016; Henry et al., 2017; Sugden et al., 2021; Kim et al., 2024). These studies support the view that engagement is a multidimensional construct comprising three interrelated components (Sugden et al., 2021). Specifically:

- affective engagement involves emotional investment in a task, reflected in enjoyment, interest, or a sense of belonging to a learning community.
- Cognitive engagement refers to the attentional resources and mental effort directed toward understanding and mastering a task.
- Behavioral engagement, which is closely linked to the cognitive dimension, encompasses active participation or involvement in a task.

Two other studies focused on narrower aspects of engagement. Sanchez (2022) examined only the affective dimension, defining it as the sense of satisfaction derived from meeting personal expectations within a training program. Meanwhile, the systematic review by Gris and Bengtson (2021) emphasized the lack of specified and explicit theoretical foundations in the studies they reviewed. They defined engagement primarily as the likelihood of continuing to play and the subjective experiences and perceptions associated with gameplay, which were explained through various psychological theories. The findings from this review suggest a growing tendency to consider engagement as a multidimensional construct rather than isolating it to single components such as behavior, cognition, or emotion, as was more common in earlier literature (e.g., Hookham & Nesbitt, 2019). This shift toward a holistic understanding

of engagement provides a promising foundation for future research. It suggests the potential for a more unified interpretation of the concept, facilitating a functional and comprehensive approach to studying engagement in educational contexts.

4.2. Measurement of Engagement

The lack of a unified theoretical definition of engagement and its inherently multidimensional nature (Ben-Eliyahu et al., 2018; Kahu, 2013), combined with its focus on aspects of the mind that are not directly observable, significantly impacts both the methods used to measure it and the type of tools employed. Much of the research on engagement has relied on qualitative methods, including indirect measures such as questionnaires, observations, and interviews (Hookham & Nesbitt, 2019). Hookham and Nesbitt (2019) found that qualitative approaches were most used to gather data on engagement. Among these, questionnaires and indirect observations were preferred, while focus groups were less frequently utilized and often combined with other methods, such as interviews (Koster, 2005), direct field observation (Koster, 2005), or indirect observation (Bearman et al., 2012). The review revealed that data collection is often aligned with specific engagement dimensions. For instance:

- studies exploring the affective dimension used tools such as the *Competitive State Anxiety Index* (CSAI-2; Hong et al., 2015), the *Positive Affect Negative Affect Scale* (PANAS; Brom et al., 2014; Watson et al., 2013), and the *Game Experience Questionnaire* (GEQ; Gerling et al., 2011; Cargnin et al., 2015; IJsselsteijn et al., 2007).
- Research focused on the behavioral dimension relied on direct and indirect observation as well as focus groups (Koster et al., 2005; Bearman et al., 2012).
- Studies examining the cognitive dimension predominantly used tools like the *System Usability Scale* (SUS; Dezentie et al., 2015; Diehl et al., 2015).
- A smaller subset of studies (Schuurink et al., 2008; Gowases et al., 2008; Andre et al., 2011; Ghergulescu et al., 2011) incorporated physiological measures such as electromyography (EMG), electroencephalography (EEG), heart rate (ECG), and tracking of physical movements (e.g., gaze, posture, and limb activity).

The current review highlighted that among the studies employing the three-dimensional engagement model, two out of four integrated qualitative and quantitative approaches to saturate all three engagement dimensions. These included tools like *Smart Serious Game* (Henry et al., 2017) and *Engagnition* (Kim et al., 2024). Conversely, two other studies (Hookham et al., 2016; Sugden et al., 2021) continued to use the tools identified in Hookham and Nesbitt's (2019) review, such as the SUS, "Perceived Usefulness", and "Ease of Use" questionnaires, as well as the GEQ. One study (Sanchez, 2022) focused exclusively on the affective dimension, employing the Job Engagement Test (Rich et al., 2010), originally designed for workplace settings. Lastly, a systematic review by Gris and Bengtson (2021) reinforced the absence of a unified theoretical framework for engagement and highlighted the continued reliance on indirect and qualitative measurement techniques.

In detail, we will delve into the two tools cited in the studies included in the review: Smart Serious game (Henry et al., 2017) and Engagnition (Kim et al., 2024).

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The Smart Serious Game tool is the result of the work carried out by scholars Henry, Tang, Hanneghan and Carter in 2017, which measures student engagement based on class attendance and punctuality as well as self-perception (Henry et al., 2017). Moreover, it was developed to measure student engagement across emotional, cognitive, and behavioral dimensions. It incorporates the Internet of Things (IoT) to collect data through wireless sensor networks and in-game questionnaires. In particular, to quantify the behavioral dimension, they established a system of wireless sensor networks that monitor the frequency and punctuality of lessons, while through a questionnaire incorporated into the serious game, they obtain scores relating to the emotional and cognitive dimensions (Henry et al., 2017). Obtaining data through a wireless sensor network generates accurate data that has been captured less invasively than traditional systems, so game points are awarded for attendance and punctuality (Henry et al., 2017). The scoring system of the questionnaire follows, however, established principles whereby a score from 1 to 4 is assigned to questions that monitor distribution, commitment, contribution, concentration, interest, boredom, anxiety, happiness, desire and strategy (Henry et al., 2017). The scores accumulated from sensor networks and questionnaires will allow us to produce an aggregate score capable of indicating a student's level of engagement (Henry et al., 2017). The total engagement score is obtained through an algorithmic equation that adds the weekly total of game points equal to attendance and punctuality (Ca and Cp) and the weekly questionnaire scores (Wt). The measure of student engagement will be displayed in the game as a score, where a high value equates to high levels of engagement (Henry et al., 2017).

$$En = [1\backslash 2\ (Ca+Cp+Wt\backslash d)] \quad \text{(Henry et al., 2017)}$$

Engagnition (Kim et al., 2024), on the other hand, is a dataset designed to measure engagement in children with Autism Spectrum Disorder (ASD) through a Serious Game called "Defeat the Monster", which aims to improve recognition and classification skills (Kim et al., 2024). The authors, also in this case, started from an interpretation of engagement as a multidimensional construction that includes cognition, emotion and behavior. Kim and colleagues (2024) established a data set in four categories:

- expert notes on participant involvement, gaze fixation and intervention. Involvement was noted with three scores 0-not involved 1-moderately involved 2-very involved (Kim et al., 2024). Gaze fixation was annotated with two scores 0-look at areas not related to the Serious Game 1-look at areas related to the Serious Game (Kim et al., 2024). The intervention was noted distinguishing 3 types, discrete intervention, continuous intervention all the time, without the need for intervention (Kim et al., 2024). The experts used a touch slide to accurately and quickly note down the scores (Kim et al., 2024).
- Physiological responses were collected, however, through tools such as GSR for galvanic skin response and ST to detect skin temperature (Kim et al., 2024).
- Behavioral responses include performance scores (whether the participant successfully completed the task), and recordings of the time taken (for each session). Finally, to quantify active movement during gaming activities, the ACC (accelerometer) (Kim et al., 2024).

The subjective questionnaires, System Usability Scale (SUS) and Task Load Index (NASA-TLX) were used to evaluate game usability and cognitive load (Kim et al., 2024). This data set was used on a sample of N=57 children with autism spectrum disorders, to measure their involvement during the activities carried out with a specially designed serious game "Defeat the Monster", based on the improvement of recognition and classification (Kim et al., 2024).

These tools underscore two significant advancements in engagement research within serious games for education. First, they enable the collection of integrated qualitative-quantitative data, capturing all three engagement dimensions. Second, compared to traditional data collection methods (e.g., pen-and-paper surveys), they provide less invasive, more accurate, and less falsifiable means of capturing engagement metrics. For instance, the use of IoT-based sensors and physiological measures reduces interference with participants' activities, ensuring higher data reliability (Henry et al., 2017).

The findings illustrate that as engagement is increasingly viewed as a multidimensional construct, researchers are moving toward more comprehensive measurement approaches. This shift holds promise for future studies, offering a more nuanced understanding of engagement and its role in learning processes.

5. Conclusions

This systematic review provides valuable insights into the evolving understanding of engagement within the realm of educational games, highlighting both progress and persistent challenges in the field. Over the past decade, there has been a growing recognition of the multidimensional nature of engagement, which encompasses behavioral, cognitive, and affective components. These dimensions are essential for understanding how edugames can be effectively designed and integrated into educational practices to foster learning and inclusion.

First, the absence of a unified theoretical framework for engagement has hindered the development of standardized measurement tools. Many studies rely on qualitative methods, such as questionnaires, interviews, and observations, which provide valuable insights but often lack the precision required for a comprehensive understanding of engagement. This limitation has been partially addressed by emerging tools like *Smart Serious Game* (Henry et al., 2017) and *Engagnition* (Kim et al., 2024), which integrate qualitative and quantitative data to capture the full scope of engagement. These tools not only measure all three dimensions of engagement but also utilize less invasive and more reliable methods, such as IoT systems and physiological tracking, offering a promising direction for future research.

Second, the findings emphasize the critical role of engagement in enhancing deep learning. Highly engaged students are more likely to adopt cognitive strategies that promote meaningful learning, leading to stronger memory retention and a greater ability to apply knowledge. As the literature suggests, designing edugames that foster all dimensions of engagement can enhance students' active participation and motivation, thereby improving learning outcomes (Sugden et al., 2021; Bevan et al., 2014).

Lastly, this review identifies an urgent need for further empirical research on engagement in educational contexts. Only a small number of studies in the past decade have explored this topic in depth, and most fail to address the multidimensional nature of engagement comprehensively. Moving forward, researchers should focus on refining theoretical models, developing robust and multidimensional

measurement tools, and examining the interplay between engagement and learning outcomes across diverse educational settings.

The insights gained from this review provide a foundation for further investigations that should focus on refining engagement measurement methods, expanding the design of inclusive edugames, and providing educators with the training and resources needed to effectively implement these tools. Through such initiatives, by leveraging tools and methods that accurately assess engagement, educators can tailor their teaching strategies to meet students' needs, fostering more inclusive and effective learning environments. This integration of engagement-focused edugames has the potential to transform educational practices, making learning more accessible, interactive, and impactful.

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Appendix 1. Academic databases

ACCADEMIC DATABASES	IDENTIFIED	SELECTED
AIDA Online – Articoli Italiani di periodici accademici (De Gruyter)	0	0
Annual Reviews – Sciences Collection	0	0
ArchivioPRO del Corriere della sera	0	0
Brill's Classical Studies I-II-III e-Book collections	0	0
Brill's Philosophia Antiqua Online	0	0
Conference Proceedings Citation Index (Web of Sciences)	0	0
De Gruyter Complete Journal Package HSS	0	0
De Gruyter/ eBook Phylosophy	0	0
Dictionnaire des Philosophes antiques (DPhA)	0	0
EIO\Casalini – Editoria Italiana Online - Torrosa	0	0
JCR – Journal Citation Reports	0	0
JSTOR- Journal Storage Project	0	0
Mirabile on line	0	0
Oxford Journals Collection	0	0
Oxford Scholarship Online\ e-books Classical Studies	302	0
Periodicals Archive Online (PAO)	0	0
Periodicals Index Online (PIO)	0	0
Philosopher's Index Online	0	0

Philosophia Antiqua Online, Supplement 2018	0	0
Rivisteweb Il Mulino	0	0
Sage Journals	0	0
Scopus – Research Data	69	1
Springer Link	7	0
Taylor & Francis Journal Collections (SSH e S&T)	0	0
The Oxford Classical Dictionary (4 ed.)	0	0
Web of Science (WOS)	3	2
Wiley – Online Reference Works Collection	0	0
Wiley Journals	0	0
Wiley online books	0	0
TOTAL	**381**	**3**

Appendix 2. National A-level journal recognized by

JOURNALS	**IDENTIFIED**	**SELECTED**
Academy of Management Learning & Education	0	0
Active Learning in Higher Education	0	0
Adult Education Quarterly	0	0
Area Open	0	0
Ajidd American Journal on Intellectual and Developmental Disabilities	0	0
American Educational Research Journal	0	0
American Journal of Education	0	0
Annali Online della Didattica e della Formazione docente	0	0
Assessment & Evaluation in Higher Education	0	0
Assessment in Education	0	0
Assessment in Education: Principles, Policy and Practice	0	0
Australasian Journal of Educational Technology	9	1
Australasian Journal of Special and Indusive Education	0	0
Australian Journal of Special Education	0	0
British Educational Research Journal	0	0

British Journal of Educational Technology	0	0
British Journal of Special Education	0	0
Cambridge Journal of Education	0	0
Cognition and Instruction	0	0
Computers & Education	0	0
Digital Studies	0	0
Disability & Society	0	0
Distance Education	0	0
Education Research International	0	0
Education Sciences & Society	0	0
Educational Assessment	0	0
Educational Measurement, Issues and Practice	0	0
Educational Reflective Practices	0	0
Educational Research and Evaluation	0	0
Educational Technology & Society	0	0
Educational Technology Research and Development	0	0
Educational Research for Policy and Practice	0	0
Educazione	0	0
Environmental Education Research	0	0
European Journal of Psychology of Education	0	0
European Journal of Special Needs Education	0	0
Form@are	0	0
Formazione & Insegnamento	0	0
Frontiers in Education	0	0
Giornale Italiano della Ricerca Educativa	9	3
Giornale Italiano di Educazione alla Salute, Sport e Didattica Inclusiva	7	1
I Problemi della Pedagogia	1	0
Innovations in Education and Teaching International	0	0
International Journal of Computer-Supported Collaborative Learning	37	0
International Journal of Development Education and Global Learning	8	0
International Journal of Digital Literacy and Digital Competence	321	0
International Journal of Disability, Development, and Education	0	0
International Journal of Indusive Education	0	0
International Journal of Science Education	2	0
Italian Journal of Educational Technology	8	0
Italian Journal of Special Education for Indusion	0	0
Journal of Computer assisted Learning	1	0

Journal of Deaf Studies and Deaf Education	2	0
Journal of Education for Teaching	1	0
Journal of Educational Research	4	0
Journal of Experimental Education	1	0
Journal of Indusive Methodology and Technology in Learning and Teaching	6.560	0
Journal of Information Technology Education: Research	0	0
Journal of Intellectual Disability Research	0	0
Journal of Research on Technology in Education	2	0
Journal of Science Education and Technology	1430	0
Journal of Youth and Adolescence	447	0
Learning, Media and Technology	2	0
L'integrazione Scolastica e Sociale	0	0
LLL	3	0
Media Education	5	0
Metis	2	0
Mind, Brain, and Education	3	0
Nature	749.000	6
Orientamenti Pedagogici	129	0
Pedagogia e Vita	9	0
Pedagogia Oggi	3	0
Pedagogia più Didattica	11.400	0
Q-Times Webmagazine	23	0
Review of Educational Research	4.340	1
Ricerche di Pedagogia e Didattica	125	0
Ricerche e Pedagogiche	10	0
Science	750.000	0
Social Psychology of Education	169	0
Studi sulla Formazione	2	0
Studies in Science Education	4	0
TD Tecnologie Didattiche	68	1
Teachers and Teaching	0	0
Teachers and Teaching: Theory and Practice	1	0
Technology, Pedagogy and Education	3	0
The Journal of Special Education	3.320	0
TOTAL	**771.646,56**	**13**

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Appendix 3. Search engines

SEARCH ENGINE	IDENTIFIED	SELECTED
ERIC – Institute of Education Sciences	0	0
Google Scholar	87	9
TOTAL	**87**	**9**