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APLICAÇÃO DA APRENDIZAGEM ENTRE PARES ATRAVÉS DE JOGOS COMO IMPLEMENTAÇÃO DA EDUCAÇÃO DO SÉCULO XXI COM FERRAMENTAS 4IR

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Resumo

Nesta era de gadgets e internet, a educação precisa ser mais lúdica do que sempre rigidamente formal. O ambiente tradicional de sala de aula promove o envolvimento ativo do professor como um líder que impulsiona principalmente o espírito de ensino e aprendizagem, e é por isso que conceitos como aprendizagem alternativa e aprendizagem entre pares parecem não ser bem compreendidos. Devido ao formalismo no formato escolar tradicional, a adesão aos métodos tradicionais de ensino e a não adoção da Quarta Revolução Industrial permanecem aparentes como um obstáculo à transformação educacional. Embora alguns estudiosos tenham escrito sobre robótica, este artigo critica a rigidez e o formalismo na sala de aula a ponto de o argumento aqui apresentado ser a promoção do ensino alternativo, a aprendizagem entre pares com jogos em sala de aula usando gadgets. É nesse contexto que este artigo emprega a teoria da pressão entre pares para argumentar que a aprendizagem entre pares pode ser aprimorada como um aspecto do ensino alternativo por meio de jogos educativos disponíveis na internet. Este estudo qualitativo utiliza análise de documentos e observações de alunos amostrados propositalmente para argumentar que o uso de jogos como ferramentas de aprendizagem faz com que os alunos gostem de aprender. Foram observadas duas salas de aula com 30 alunos cada, sendo que uma delas utilizava o método tradicional, enquanto a segunda utilizava jogos baixados da internet. Este estudo foi realizado na Escola Secundária de Mmanare, pois o ambiente era favorável.

Palavras-chave: 4IR, transformação educacional, aprendizagem por meio de jogos, ensino alternativo, sala de aula tradicional

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ENFORCEMENT OF PEER-LEARNING THROUGH GAMES AS IMPLEMENTATION OF 21ST CENTURY EDUCATION WITH 4IR TOOLS

Abstract

In this age of gadgets and internet, education has to be more playful than being always rigidly formal. Traditional classroom setting promotes that the teacher must be actively involved in the classroom as a leader that mostly drives the spirit of teaching and learning, and that is why concepts like alternative learning and peer-learning seem not well understood. Due to formalism in traditional school format, sticking to traditional methods of teaching and non-embrace of 4th industrial revolution remain apparent as a stumbling block in educational transformation. While some scholars have written about robotics, this paper criticises rigidity and formalism in the classroom to the level that the argument forwarded here is promotion of alternative teaching, peer-learning with games in the classroom using gadgets. It is against that backdrop that this paper employs peer-pressure theory to argue that peer-learning can be enhanced as one aspect of alternative teaching through educational games available on the internet. This qualitative study uses document analysis and observations of purposively sampled learners in order to argue that using games as learning tools makes learners enjoy learning. 2 classrooms of 30 learners each have been observed as 1 classroom was taught in the traditional method while classroom 2 was taught using games that are downloaded from the internet. This study took place at Mmanare High School as that was a favourable environment.

Keywords: 4IR, educational transformation, game learning, alternative teaching, traditional classroom

Introduction

The traditional teaching approaches purport that the teacher be the centre of the classroom in a sense that he / she be the one who drives all learning processes (Raja, 2018). Milenković & Dimitrijević (2019) narrate that in traditional teaching learners are viewed as tabula-rasa and the teacher being the one who knows best in all things. Scholars like Maton & Chen (2019) support this kind of teaching because it is in line with formality of knowledge impartation in schools. School is a formal institution for teaching and learning where all activities cannot happen smoothly without discipline and respect for personal hierarchy (Noble et al, 2021).

This study argues that the problem with the traditional teaching system is that it elevates teachers and their curriculum advisers to a supreme level of power which leaves learners being mere recipients of information with nothing to offer. According to

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Aution (2019) such an educational approach drives an educational system that has extrinsic educational aims which are contrary intrinsic educational goals of those learners. In a traditional teaching approach, the aim is to prepare leaners for life ahead, in which case the learner is presumed to be not knowing anything about life (Bowden, 2020).

According to Hastings (2021) traditional pedagogies are founded on Idealism and Realism theoretical frameworks from Plato and Aristotle who were ancient Greek philosophers. The commonalities or similarities between those schools of thought ignore the intrinsic aims of a learner who seeks to acquire knowledge is useful in his/ her already happening life (Canillo & Bendanillo, 2023). This study considers Idealist and Realist pedagogical perspectives problematic because they consider education as static than dynamic.

The main research question of this study is, why teachers and learners stick to the traditional teaching and learning methods while 4IR technology provides a better alternative suitable for this 21st century era? The sub-questions that follow are, (i) does traditional teaching still serve the purpose of education in this contemporary generation? (ii) are Idealist and Realist theoretical pedagogical approaches still relevant in the 21st century? (iii) what delays teachers in rural schools from embracing games as 4IR tools for teaching and learning in the 21st century? (iv) What benefits does the transition from traditional teaching methods to 4IR tools like games offer in the 21st century education? And (v) does learning through games in the 21st century really enforce peer-learning? These are the questions that guide this study as findings and themes will be directly linked to them throughout the discussion.

The main aim of this study is to defend the enforcement of peer-learning through the games as the practical implementation of 4IR tools in the 21st century education. This defence of teaching with games in schools purposively argues that traditional teaching methods are outdated, and using 4IR tools like games improves peer-education in the 21st century. The objectives of this study are, (a) to find out whether or not traditional teaching methods still serve the purpose of education in the 21st century era, (b) to find out if Idealist and Realist theoretical perspectives are still

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relevant in the 21st century, (c) to explore factors that delay the embrace of games as 4IR tools of teaching and learning in the 21st century, (d) to explore possible benefits of transitioning from traditional teaching methods to 4IR tools like games offer in the 21st century education, and (e) to find out if teaching and learning through games in the 21st century truly enforce peer-learning.

This study brings forth some arguments that mark its significance and contribution to literature. The key presuppositions or argumentative standpoints that this study puts forth are, (1) teachers are not gods of knowledge and they do not know all that can be known, and learners do have knowledge in which their teachers can learn as well, (2) learners have life that is already happening, therefore it is erroneous to believe that education should prepare them for the life to come, (3) since knowledge changes over time and so does its impartation, education is more dynamic than static, and (4) educational transformation in South Africa like anywhere else, will remain dragging if teachers stick to ancient theoretical perspectives that are blind to the nature of knowledge which is dynamic. In carrying out this exploration in this study, the discussion is divided in sections or parts as follows; (i) methodology which explains methods, (ii) literature review which gives vies and arguments from existing literature, (iii) theoretical framework which gives guidance to the lens at which this study can be read, (iv) findings from observations, (v) analysis which is made of themes from the findings, (vi) recommendations as suggestive points emanating from this study, (vii) conclusion which summaries this study with some advice for further studies, and then (viii) references which will be listed at the end.

Literature review

Games have always been part of learning the world in children (Campbell et al, 2021). Learners do not learn well in a tense environment because they get passive and sleep instead of actively participating (Klopfer et al, 2018:45). That corroborates Dishon and Kafai (2022:1000) when they say,

> “Participation in a lesson makes learners remember during their spare time. With games they even remind one another and keep playing. That is one of the reasons some scholars would argue that playing must be part of learning. As teachers teach, there must be a time to reflect on why do learners sometime cram and cheat in

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> examinations. The answer there would be simple, learners did not understand anything out of what the teacher told them."

According to Osakwe et al (2022) traditional teaching approach that considers a teacher to be the god of knowledge is outdated in this 4IR age. Perhaps learners in 1400's were tabula-rasa due to waiting for the teacher to feed them with knowledge, but nowadays learners require vibrant ways of facilitating their learning (Mustafa et al, 2022). A study by Ndlovu and Mhlongo (2020) shows that South Africa is one of those countries that lack behind in gamification of learning in schools. South African schools still lack resources that can support the 21st century 4IR education (Ndlovu and Mhlongo, 2020). Although in some developed countries teachers have embraced modern ways of teaching, South Africa still suffers from the resilient mentality of old teachers who are stuck in ancient didactics (Botha-Ravyse et al, 2018). According to scholars like Mutekwe (2022) curriculum must transform and accommodate the modern pedagogical needs of learners. In his words Mutekwe (2022:130) argues,

> "a curriculum that does not change with times is not worth acceptance and application. Learners of 1900's are different from these of 2000's and that should be understood by all stakeholders. Teachers as people who are at the forefront of serving the communities should be progressive in the struggle for change. The change that puts the learners first and cater for their needs. This is regardless of whether the school is in the rural area or urban area".

Mutekwe (2022) corroborates Ndlovu and Mhlongo's (2020) views as he argues that some of the educational system leaders in South Africa are afraid of transformation. Therefore, rural schools like Mmanare high school remain victims of poorly resourced for embracing the 21st century tools which will facilitate more peer-learning than traditional learning from teachers. It is for that reason that a study like this one becomes a voice for the voiceless. Peer-learning is explained by Marcus et al (2020) as a practice whereby learners learn by themselves and share their knowledge. Coutts and Barber (2023) also explain peer-learning as a practice whereby learn from one another and find ways to better themselves in academic activities. According to Awan (2021) this is one practice that can be well motivated by the use of games in teaching and learning for better results. Learners get bored if they cannot relate to the lesson, and that is what traditional teaching philosophies perpetrate (Awan, 2021; Mutekwe, 2022). This study finds that, literature itself is full of game-learning activities

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and techniques from other countries than South Africa, and that emphasises the need for more research in this subject.

Methodology

This is a qualitative study that seeks to be innovative in terms of how teachers can catch up with the 21st century digital technology and use it for the development of quality in teaching and learning. Documents that explain teaching and learning like relevant policies are hereby used for reference while sources like books, academic articles, newspapers, magazines, and Youtube videos will be used. At the same time, it is the commitment of this study that in line with Ethics of scientific research will be properly acknowledged both in-text and in the bibliography which is the last section of this paper.

Ethical clearance with the reference number TREC/226/2024:PG was acquired from the research ethics board of the University of Limpopo, and the permission letter to collect data at Mmanare high school was obtained from the school management team (SMT) of the same school. Data was collected through observations in which 2 grade 11 classes of 30 learners each were separated and exposed to two teaching methods ie traditional teaching method and modern game teaching method. Similar to teaching practice evaluations, researchers had to form part of the class with the aim to have a close observation of teaching and learning while a particular method of teaching is implemented.

Consent forms were circulated as researchers were being introduced before the beginning of sessions with a clear instruction to all learners that it is voluntary to participate in those lessons. During the implementation of game method of teaching a projector was connected to the laptop where games were downloaded for visibility to all, and different game lessons were displayed. During the lesson researchers were carefully recording their findings which would then be thematically analysed in order to formulate a constructive discussion within this study. During the discursive analysis of this study, findings are interpreted using a triple interpretation approach.

According to Ntshangase (2024) triple interpretation approach encompasses (a) textual interpretation which focusses on the phenomenon of teaching as a written work eg a lesson plan, (b) contextual interpretation which focusses on the context where the lesson takes place, and (c) substantive interpretation approach which focusses on how relevant, necessary, or effective is the teaching method in relation to the 21st century digital technology era. Limitations to this study include (a) time which was not allowing researchers to travel to many schools for observations as other schools would complain that research observations will disturb their school calendar/ timetable, (b) the qualitative nature of this study makes this study be only subject to qualitative findings, and (c) having this study being conducted in South Africa might be a limitation if there is a sense in which results might have been different elsewhere. The literature review which will be discussed in the next section below sets out what has been done in South African education system, how teaching has been understood, and the gap that this study seeks to fill while at the same time stating the arguments in defence of educational transformation towards embracing the 4IR digital technology in schools.

Theoretical framework

The integration of game-based learning into educational practices is underpinned by several key theoretical perspectives that highlight its effectiveness in enhancing student engagement and motivation. Games facilitate simultaneous learning on multiple levels, allowing learners to absorb contextual information, engage in decision-making, and experience the real-time consequences of their actions. This dynamic form of learning promotes critical thinking and problem-solving skills, mirroring the complexities of real-world situations and making it a valuable pedagogical tool in the context of the Fourth Industrial Revolution (4IR).

In the book The ecology of games: Connecting youth, games, and learning, Watkins et al (2007:4) say that,

> "The link between games and learning is not a contemporary phenomenon, nor a digital one. Long before Math Blaster or Oregon Trail hit the market, games have been used as learning tools. Members of the volunteer Militia of Rhode Island played American Kriegsspiel in the years following the Civil War, theater games like Sibling Rivalry were

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> used in contexts rang ing from activism to acting, and Froebel's invention of kindergarten in 1840 was premised in large part on the integration of learning through games and play".

Watkins et al (2007) suggest that historically learning through games is not jus a new It's not just another "pedagogical trend." or something. Historically, the use of games as educational tools is not merely a response to modern digital advancements but rather a well-established tradition in education. Over time, different cultures and educational theorists have recognized the value of games for fostering critical thinking, strategy, collaboration, and creativity. From military strategy games used for training soldiers in the 19th century to theater exercises for skill-building and Fröbel's structured play in early childhood education, games have historically served as powerful tools for experiential learning.

This perspective demonstrates that the educational potential of games was acknowledged long before video games emerged, reflecting a consistent understanding across eras and disciplines: that learning through play is engaging and effective. Historically, then, game-based learning is deeply embedded in pedagogical practices and has evolved alongside cultural and technological shifts, adapting to meet the needs of learners across various contexts. The enduring relevance of games in education highlights that while the tools and technologies may change, the underlying principles of engagement, challenge, and active learning remain valuable across generations.

Watkins et al (2007) emphasize the connection between games and learning has deep historical roots, predating the digital age. It suggests that while digital educational games like Math Blaster and Oregon Trail may have popularized game-based learning in the modern era, the concept itself has been embedded in educational practices for centuries. The reference to historical examples, such as the use of strategy games by the Rhode Island militia and theater games for activism and acting, illustrates the versatility of games in facilitating learning across diverse fields and contexts.

For instance, the mention of Friedrich Fröbel's kindergarten model in 1840 highlights how foundational play and games have been in early childhood education.

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Fröbel's vision established play as central to the learning experience, recognizing that children absorb knowledge through interactive and enjoyable activities (Belmonte et al, 2019). This historical perspective reinforces the idea that games are an effective pedagogical tool, capable of engaging learners in active and experiential learning long before the digital era. Thus, game-based learning is not simply a modern trend but a long-standing educational approach rooted in the understanding that interactive play stimulates cognitive and social development.

Moreover, games have been shown to significantly increase student motivation and enjoyment in learning. The incorporation of games into the curriculum can lead to noticeable changes in student attitudes, demonstrating clear differences in outcomes when compared to traditional teaching methods. This shift towards a more interactive and student-centered approach aligns with constructivist theories, which advocate for active engagement and collaborative learning as essential components of effective education. Raybourn (2014:472) says**,**

> "Games open up possibilities for simultaneous learning on multiple levels; players may learn from contextual information embedded in the dynamics of the game, the organic process generated by the game play, and through the risks, benefits, costs, outcomes, and rewards of alternative strategies that result from decision making".

Raubourn's quote highlights the multifaceted learning potential that games offer, particularly in educational contexts. By interacting with the game's mechanics, players can absorb contextual information embedded within the gameplay, which enriches their understanding of the subject. In this way, games create an immersive environment where players engage with content on multiple levels, allowing them to learn in ways that traditional methods often cannot provide.

Moreover, the organic nature of gameplay, where players must adapt to evolving situations, may teach them to think critically and flexibly. Decision-making becomes a central part of the learning process, as players experience the consequences of their choices in real-time. This fosters skills like strategic thinking, problem-solving, and risk management, as players evaluate the risks, benefits, and outcomes of different approaches. In educational contexts, this type of learning can be particularly powerful because it mirrors real-world complexity. Students are not just passive recipients of information but active participants who must navigate challenges,

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adapt their strategies, and learn from the results, making game-based learning a dynamic and effective tool for 21st-century education.

This dynamic nature of game-based learning makes it particularly valuable in fostering critical 21st-century skills, such as collaboration, creativity, and digital literacy. In contrast to traditional, linear teaching methods, games engage learners in a more holistic and interactive way, where learning is not confined to the content but extends to the skills required to navigate the game's ecosystem. The process of making decisions, evaluating strategies, and reflecting on outcomes simulates real-life scenarios, helping learners to transfer these experiences to other contexts beyond the classroom.

Furthermore, Raubourn's perspective aligns with theories of experiential learning, where students learn best by doing. In a game, players experience the consequences of their actions directly, allowing for immediate feedback. This accelerates the learning process as players are constantly evaluating and refining their approach, leading to deeper understanding and retention of knowledge. In this sense, games foster an active learning environment that encourages experimentation and iteration, which are essential for cultivating resilience and adaptability—traits that are increasingly important in a rapidly changing world shaped by the Fourth Industrial Revolution (4IR).

By integrating game-based activities and assessments, into educational settings, teachers can create more engaging, motivating, and effective learning experiences. Games not only make learning enjoyable but also encourage learners to take ownership of their educational journey, promoting self-regulation and intrinsic motivation.

Also, this researcher show us that, "[...] games provide an environment for active, critical learning. Through games one learns to appreciate the inter-relationship of complex behaviors, sign (images, words, actions, symbols, etc.) systems, and the formation of social groups (idem)" this could mean that games create a unique environment where active and critical learning can flourish. Unlike traditional learning environments, games encourage players to engage deeply with complex systems, connecting behaviors, symbols, and language in a way that mimics real-world

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dynamics. The inter-relationship between these elements in games allows players to explore how different actions and symbols interact, fostering an appreciation of the interconnectedness of knowledge and skills. Corroborating this understanding, Sánchez (2023:13) suggests that

> "Games are one of the best tasks to increase motivation and make students learn while they are enjoying the language. Moreover, I introduced a game in my teaching unit while I was carrying out my teaching practices. Consequently, I could observe how students' attitudes changed as well as the differences in the results comparing a traditional methodology with a task-based methodology"

Sánchez's (2023) reinforces the idea that games serve as powerful tools for boosting student motivation and engagement in the learning process. The assertion that games make students learn while enjoying the material highlights the dual benefit of game-based learning: it not only makes the educational experience more enjoyable, but also increases the effectiveness of learning. Within fun and interaction, games, and consequently game-based activities and methodologies, shift the focus from passive reception of information to active involvement, making the learning process more dynamic and meaningful.

Sánchez's personal experience using games in teaching underscores the transformative impact that this methodology can have on both student attitudes and academic outcomes. The noticeable change in students' attitudes suggests that games can alleviate the monotony often associated with traditional methods, making learning feel less like a chore and more like an exciting challenge. When students are more engaged and motivated, they are more likely to absorb and retain the material, which can lead to improved academic performance.

The comparison between traditional and task-based methodologies further emphasizes the limitations of conventional teaching approaches, which often fail to engage students at the same level. The observed differences in results between these two methods serve as evidence that games not only increase motivation but also lead to better learning outcomes. This suggests that integrating task-based and game-based learning strategies can bridge the gap between merely transmitting knowledge and fostering deeper, more meaningful learning experiences. Sánchez's observation also highlights a crucial pedagogical shift—moving from teacher-centered to learner-

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centered approaches. Traditional methodologies often rely on direct instruction, where the teacher controls the flow of information, and students passively receive it. This can result in disengagement, especially when learners feel disconnected from the material. However, by adopting task-based methodologies, especially those that incorporate games, the learning process becomes more participatory and student-driven. Games encourage students to become active problem solvers and critical thinkers, allowing them to apply their knowledge in practical, interactive contexts.

Moreover, Sánchez's experience aligns with constructivist theories of learning, which emphasize that knowledge is best constructed through active engagement and social interaction. Games naturally foster collaboration, communication, and competition among students, creating opportunities for peer learning and collective problem-solving. These elements not only enhance students' academic abilities but also help develop essential life skills such as teamwork, decision-making, and adaptability. In this sense, cherington (2023: 289) say that,

> "Communities can provide a context of shared meanings and enable organisational learning through inter- and intra-firm knowledge exchanges (Hernes and Irgens, 2013). However, learning communities have changed with the rise of hybrid working (Alexander et al., 2021; Gressgård, 2011). Reflecting on this change, importance must now be given to evaluating remote interactions and online communication and how this impacts knowledge sharing (Ketonen-Oksi and Valkokari, 2019) and thus organisational learning across spaces (online-only or hybrid) and places (co-located or remote)"

It is to say that are an evolving role of communities in organizational learning, particularly in the context of hybrid and remote work environments. Historically, communities have been essential for creating shared meanings and facilitating knowledge exchange, both within and between organizations. However, with the shift towards hybrid and online work models, the traditional structure and function of these learning communities have transformed.

As Cherrington et al (2023) and other researchers suggest, the emphasis has now shifted to understanding how remote and online interactions affect knowledge sharing and organizational learning. This change introduces new challenges, such as evaluating the effectiveness of virtual communication and understanding how knowledge flows across different types of workspaces. In a hybrid work setting, where

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some interactions occur face-to-face and others online, it becomes essential to address how these varied forms of communication impact collective learning and knowledge retention. Building on these insights, the theoretical framework underscores the importance of game-based learning in developing critical 21st-century skills that go beyond academic knowledge, such as collaboration, creativity, adaptability, and digital literacy. By simulating complex real-world dynamics, games provide a practical approach to problem-solving that prepares students for the demands of an increasingly digital and interconnected world shaped by the Fourth Industrial Revolution (4IR). This approach aligns with constructivist theories, which emphasize learning through active, hands-on experiences that encourage students to apply knowledge within engaging and interactive contexts.

We could sa that the integration of games in educational practices offers more than just an engaging learning experience; it builds a framework for holistic, adaptable, and meaningful learning that resonates with students. As we adapt to new models of education and work in the digital age, the role of games as learning tools will likely continue to expand, creating opportunities for innovative, community-centered learning environments that promote lifelong skills. The theoretical foundation laid in this section highlights the significance of game-based learning as an essential component of modern education, offering educators a powerful method for preparing students for the complex challenges of today's world.

Findings

(a) Traditional teaching methods (teacher-centered) are no longer relevant in 21st century education
(b) Idealist and Realist educational philosophies are outdated in this contemporary era
(c) Lack of support and resources in South Africa delays the embrace of games as 4IR tools for teaching and learning
(d) Traditional teaching methods offer no benefits to 4IR tools of 21st century education
(e) Teaching and learning through games in the 21st century really enforce peer-learning in the school environment

Analysis/ Discussion

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Theme 1: *teacher-centred philosophies with their methods have nothing to offer in the 21st century.* Teacher-centred methods in education risk making the whole education system stagnant while it should keep changing with time (Hastings, 2021). Learners nowadays have to use digital technology and Apps, so education should find them there within those digital spaces/ platforms which attract their interest as Awan (2021) narrates. According to Hastings (2021) and Awan (2021) teachers get to be boring as they stick to those teaching philosophies that suffocate the 21st century learners. In the past centuries, lecture method of teaching was effective for the learners of that time because back then technology was not as advance as in the contemporary age of 4IR (Ndlovu and Mhlongo, 2020). Nowadays learners can get information in their fingertips, therefore no teacher must think he/she knows best. The only thing a teacher must do is to guide learners on how to use their gadgets for learning, hence this study talks about peer-learning. Another aspect is that teachers should also be teachable and not think that their learners cannot know more than them through what they find on internet.

Theme 2: *lack of support and resources in South African rural schools delays the embrace of 4IR tools for learning in the 21st century.* Although South Africa may be counted among developing countries in Africa according to Ndlovu and Mhlongo (2020) but the educational budget still lacks strength to finance the buying of conducive infrastructure for game learning. Rural schools like Mmanare high schools still lack behind in terms of using game learning, and learners suffer being technologically left behind. Teachers from rural areas also lack skills of using 4IR technology, hence they do not fight for gadgets that can facilitate game learning (Dishon and Kafai, 2022). The issue gets more problematic as those very teachers are expected to produce good results as those urban schools that are well funded and well resourced. Canillo and Bendanillo (2023) report that there is a big difference when one compares the performance results from a digitally facilitated, well resourced school and a poor school from the rural village. That means there are more benefits in embracing the 4IR tools and incorporate them in teaching and learning than not doing so.

Theme 3: *teaching and learning through games in the 21st century does enforce peer-learning in a school environment*. Peer-learning according to Marcus et al (2020) requires that learners must have interesting lessons with which they can relate. Learners learn well on their own when there is something equally interesting in all of them (Coutts and Barber, 2023). Since technology has become the main thing everywhere, South Africa is not an exception, and it should be educated with that thought in mind. Curriculum advisors need to advise well with the advice that includes the incorporation of 4IR tools in teaching and learning, thus argue Botha-Ravyse et al (2018). It is an abnormal thing that learners are chastised when found with cellular phones in schools, because those are gadgets that can be used in learning (Mutekwe, 2022). It makes sense to say that the use of gadgets needs to be regulated but banning them completely makes the school be as if it is situated in dark ages (Osakwe et al,

2022). Peer-learning is one of the good practices that happens well in the school environment because it inculcates teamwork skills on learners right at their tender age (Awan, 2021). According to Coutts and Barber (2023) learning is a long-time journey that needs no learner to travel alone, but as groups it becomes fun. It is from that perspective that this study argues that 4IR tools/ gadgets must be used to enforce peer-learning and make education interesting to learners in all South African schools.

Recommendations

After a careful consideration of the findings in this study with their relative themes, this study deems it fit to level the following recommendations for enforcing peer-learning through 4IR tools for the 21st century education. The following recommendations are suggestions that may be considered for the embrace of the use of 4IR tools demanded by the 21st century epoch. Therefore, this study recommends the following; (a) rural schools in South Africa must seek funding to furnish their classrooms with computers, laptops, and projectors for the facilitation of 4IR teaching and learning, (b) DBE must find ways to fund the security of rural school environments where the teaching and learning equipment will be stored, (c) DBE must organise workshops and organise time for all rural school teachers to be inducted/ conscientized about game teaching, (d) new regulations must be drafted by DBE to regulate the use of gadgets in schools than purely putting a ban on cellular phones in all South African schools (e) there must be a recognition by the teachers that teachers can also learn new things from their learners, and this requires change of mentality, then (f) DBE must realise that a learner-centred education creates a good space for peer-learning which can improve the pass-rate in rural schools around South Africa. With these few recommendations, this study submits that DBE in South Africa needs to undergo a serious transformation, especially in rural schools where there is a real struggle to embrace 4IR tools for teaching and learning.

Conclusion

This study has explored the concepts like peer-learning, game teaching, game learning, and 4IR tools of the 21st century which literature does not show any evidence of them being explored in one source. Thoroughly explaining the contestations and purpose of this study makes all discussions logically flow from one stage to the next, thus simplifying the argumentative that this study provides. Although some may view this study as a theoretical battle to defend the shift from traditional teaching methods to the modern 21st methods, the core argument hereby unveils the dynamicity of knowledge itself, before teaching happens. Majorly, this study links theoretical perspectives with the stagnation of teachers in traditional teaching methods in defence of educational transformation that is needed in South African schools. Thematically analysed findings of this study give insight to the fact that educational transformation of any form does not make sense if it does not relate to the contemporary era as well

as its generation. Issues like the availability of funds to furnish rural schools with 4IR technology, gadgets, and internet data are still matters for further research. Similarly, the seeming fear or dislike of using 4IR technology in elderly teachers is also a subject for further research or other studies. However, one of the most important things about this study is that it has outlined some recommendations for consideration in the South African education system and they can be operationalised for education to resonate with the 21st century.

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