Research Article

Virtual Reality (VR) as a Learning Tool in The Classroom

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ARTICLE INFO	ABSTRACT
	Use Virtual Reality (VR) technology as tool classroom learning has interesting significant attention in a number of year final . Study This aim For serve review comprehensive literature about use of VR in context education , especially in the classroom . Method research used is library research, with collect and analyze literature related from various source like article journal scientific , books , and reports research . Overview literature covers draft VR basics , deep VR applications classroom learning , advantages and disadvantages use of VR, as well challenges and opportunities For future development . Research result show that the use of VR can increase involvement students , provide experience engaging learning , and expanding accessibility to experience realistic learning . However , there are also challenges like cost implementation and lack thereof content quality learning . Implications findings This For practice future learning and development deep VR technology education discussed in a way detailed . With consider findings This is expected educators , researchers , and makers policy can Work The same For develop and implement effective and sustainable use of VR in education.
	Keywords: Virtual Reality (VR), Learning tools, Education , Engagement student.

Introduction

In the era of continuous technology develop fast , education face challenge For Keep going innovate and exploit development technology the in the learning process . One of increasingly technology popular and promising is Virtual Reality (VR). VR doesn't Again only become entertainment only , but also has enter realm education with potency big For increase experience learning in class (Merchant et al., 2014). Virtual Reality (VR) is technology possible revolutionaries user For interact with environment simulation created digitally (Burdea & Coiffet , 2003). With using a special headset or device other , users can feel sensation of " presence " within environment that , as it were they truly are in place That . Experience This often difficult or even No Possible For accessed in life real , so give dimensions new for experience man .

VR offers various benefit in education , like increase experience Study with possible student For experience situation or difficult environment reachable , for example exploration room space or journey to an enriching past learning and improving involvement students (Merchant et al., 2014). Besides that , VR technology makes it possible more learning interactive and practical , like student medicine can train procedure surgery in safe and controlled VR environment (Weiss et al., 2014). VR can too customized For fulfil various style learn , give chance for visual, auditory , and kinesthetic learners For understand material with more good (Johnson-Glenberg , 2018). Studies show that use of VR in education can increase comprehension and retention information Because its immersive and interesting nature (Radianti et al., 2020).

However , there is a number of a must challenge overcome For maximizing benefits of VR in education . One of constraint main is cost VR devices are still relatively high , make it difficult accessible to all institution education (Wang et al., 2018). Excessive use of VR can also be cause problem health such as cybersickness, which is marked with nausea and dizziness consequence prolonged use of VR (LaViola , 2000). Besides that , VR implementation requires infrastructure adequate technology , incl device strong hardware and stable

internet connection (Dunleavy et al., 2009) . Moment this , still limited content educative quality available for VR to be constraint for adoption technology This in education (Tudor et all., 2018).

In context education , VR opens up door For create experience immersive and deep learning (Schott & Marshall, 2018) . Student can explore various environment , start from exploration lower sea until exploration outside space , without must leave class them (Freina & Ott, 2015). They can observe and interact with object , situation , or difficult concept understood in learning conventional (Radu, 2014). For example , in lesson history , students can " visit " events historic in a way direct ; or in science lessons , them can witness a natural process in a way direct in safe and controlled virtual environment .

Use of VR in education is also possible increase motivation and interest Study students (Lindgren & Johnson-Glenberg , 2013). Sensation presence in virtual environment creates learning become more interesting and fun (Huang, 2016) . This matter help increase involvement students and makes it possible they For more active in the learning process . Besides that , VR makes it possible experience adaptive and individual learning . Student can Study with appropriate way with style Study they yourself , you can increase effectiveness learning and deepening understanding they about material lessons (Dalgarno & Lee, 2010) . VR doesn't only offer experience innovative learning , but also enriching classroom learning with give access to previous experience No Possible or difficult accessed (Bailenson , 2018) . With development VR technology continues continues and improves its accessibility , potential For increase quality education and experience Study students in the future become the more promising .

Utilization of Virtual Reality (VR) as tool classroom learning promising Lots possible potential increase experience Study students (Makransky et all., 2019) . Firstly , VR makes it possible concepts abstract become more concrete and easy understood through visual and interactive simulation . For example , in lesson geography or history , students can experience historical sites or phenomenon geographical in a way direct through VR experience , which makes concepts the more easy understood than only through picture or text (Jensen, 2018) . With put student in environment realistic simulation , VR makes it possible they For feel and see in a way direct context from concepts that , so deepen understanding they .

The use of VR makes it possible student For Study in a way active and exploratory (Luo et all., 2020) . They No Again limited to studying from book or presentation two dimensions , but rather can " visit " faraway places or even No There is in the real world . For example , in lesson biology , students can watched structure cell in a way directly and see complex biological processes in controlled VR environment (Chow et all., 2017) . Ability For interact with virtual objects and environments provide experience unique and in -depth learning , where students can try experiment , create decisions , and observing impact in a way direct .

Utilization of VR in classroom learning No only simply enrich material learning , but also change method student learn and understand the world around you them (Hew et all., 2016) . With give access to previous experience No Possible or difficult accessed in life real , VR opens up door For more learning dynamic , interactive , and immersive (Parong & Mayer, 2018) . As results , potential use of VR in education become the more promising , with opportunity For increase quality learning and preparing student For face ongoing world challenges develop . Although the potential of Virtual Reality (VR) in education is very promising , still There is Lots necessary questions answered and necessary challenges overcome (Huang et all., 2019) . First of all , how method integrate VR technology to in existing curriculum There is is one of question necessary key answered . This integration need mature thinking about how VR can used in a way effective For support objective existing learning set in existing curriculum (Makransky & Lilleholt , 2018) . This matter involve election appropriate VR content with material lessons taught and development of suitable learning strategies with technology This .

How to measure effectiveness of VR in increase understanding and skills student become attention main . Evaluation This must covers aspect Qualitative and quantitative For understand impact use of VR against results learning student . With Thus , it is necessary development method appropriate and valid evaluation for measure achievement learning student in context use of VR(Adnan , 2020) . No lost importance is How We ensure that all student own access and opportunity For use VR technology . Inequality in access to technology can produce gap more learning in between students (Slater & Sanchez, 2016) . Therefore that 's necessary There is effort For provide equitable access to VR devices and content relevant education for all students , regardless from background behind social , economic , or geographical they .

With answer questions it and overcome it associated challenges , the potential of VR in education can realized in a way more effective . With Thus , the use of VR can become tool more learning inclusive , innovative and effective in help student obtain more understanding depth and relevant skills For facing an increasing future complex . In context this , research about use of VR as tool classroom learning become the more important . Through systematic and holistic approach to research This can investigate potential , obstacles , and implications use of VR in increase quality education . Therefore that , research This aim For serve review comprehensive literature about use of VR in the classroom , analyze advantages and disadvantages , as well identify direction future development in integrate technology This to in practice sustainable and inclusive learning . With more understanding in about potential and challenges use of VR in context education , hopefully study This can give valuable insight for educators , researchers , and makers policy in effort they For increase effectiveness classroom learning .

Method Study

Studies This use purposeful library research approach For investigate and analyze relevant literature about use of Virtual Reality (VR) as tool classroom learning . Approach This chosen Because possible researcher For gather broad and in - depth information from various sources that have been exists (Papaioannou et all., 2016; Garrard , 2017). Search literature will done through various academic databases and sources information others , incl However No limited to Google Scholar, PubMed, IEEE Xplore, ProQuest, and trusted online sources other . Relevant keywords such as "Virtual Reality", " Classroom Learning " , "Education", " Effectiveness ", and " Utilization technology " will used For identify appropriate literature (Webster & Watson, 2002). After search beginning carried out , literature will filtered based on criteria inclusion and exclusion that have been set previously . Criteria inclusion covers relevance with topic research , quality methodology research , and novelty information . Selected literature will including article journal scientific , book , report research , and other sources considered relevant and quality (Tranfield et al., 2003). Literature that has selected will analyzed in a way systematic For extract relevant information with topic study . Analysis will covers understanding draft basic Virtual Reality, deep VR applications classroom learning , advantages and disadvantages use of VR, as well trends and developments latest in its use .

Results and Discussion

Results
Overview Basic Concepts of Virtual Reality (VR)

VR is environment simulation created digitally possible user For interact with environment the . Analysis literature show that draft VR basics include making virtual environment , use of a headset or device other For experience environment these , and interactions active user with object in virtual environment .

- Environment Digital Simulation : Virtual Reality (VR) is A enabling technology making environment simulation created digitally . This means that the virtual environment No There is in the real world , but created digitally with use device soft special . Environment This Can in the form of a fantasy world , a replica from environment real , or even an environment that doesn't Possible There is in the real world (Škola , 2020; Slater & Wilbur, 1997).
- Interaction User with Environment : VR users can interact with the virtual environment . This means user can do various action like walking , running , talking , moving object , and so on in environment the . Interaction This give more experience immersive to user , so they feel as if are inside the virtual environment (Steuer et all, 1995).
- Use of Headset or Device Others : One method For experience virtual environment is with using a VR headset or device other . VR headsets are device hard that is worn on the head and covers eye user with display screen picture from virtual environment . Some headsets are also equipped with possible motion sensors user For move body they in virtual environment . Apart from headsets, there are also other devices such as sarong hand or controller used For interaction with virtual environments (Bowman & McMahan, 2007; Barfield & Hendrix, 1995).
- Interaction Active with Object in Virtual Environment : VR users do not only interact with environment in a way general , but also with the objects contained in it . This means user can touch , move , manipulate , or interact with objects the in accordance with need or objective in virtual environment . Interaction active This possible user For feel sensation real from are inside virtual environment (Bailenson & Yee, 2005; Riva, 2009).

With thus , concept the basis of Virtual Reality (VR) from facet literature give deep understanding about technology this , covers making virtual environment , use of a headset or device other For experience environment these , and interactions active user with object in virtual environment .

Virtual Reality Applications in Classroom Learning

Use of VR as tool classroom learning own various promising application . Research result show that VR can used For increase understanding student to concepts abstract , facilitate learning explorative and based experience , as well enrich experience Study with provide access to environments and experiences that are not Possible or difficult accessed in life real .

- Using VR as a Learning Tool in the Classroom : This refers to implementation Virtual Reality (VR) technology in context room class or environment formal learning . With use VR devices , such as headsets and devices soft related , teachers can create experience learn more interactive and immersive for students (Piovesan et al., 2012).
- Various Promising Application : Show that VR has broad potential in various aspect learning . This including its use in various eye subjects , such as science, mathematics , history , art , and others. VR apps can too customized with various level education , start from school base until college high (Akçayır & Akçayır , 2017; Rojas et al., 2023).
- Increase Understanding Student to Concepts Abstract : One benefit main from the use of VR is his abilities For describe difficult concepts understandable , especially those of a nature abstract . With visualize

concepts This in virtual environment , students can more easy understand and internalize material lessons (Cheng et al., 2013).

- Facilitate Learning Exploratory and Based Experience : VR makes it possible student For explore concepts lesson in a way direct through experience based experience . They can do virtual experiments , exploring difficult places accessed , or even participate in simulation realistic situation . This help facilitate more learning active and involved (Jin et al., 2018).
- Enrich Experience Study with Access to Difficult Environment and Experiences Accessible : VR delivers access to student For explore environments and experiences that are not Possible or difficult accessed in life real . For example , students can do virtual trip to in cell body human , visiting places distant historic , or even explore the planets beyond space . This enrich experience Study them and open outlook new . (Ke & Im , 2013)

Application of V R in learning give Lots benefits , incl increase understanding student to concepts abstract , facilitate learning explorative and based experience , as well enrich experience Study with provide access to difficult environment and experience accessed in life real . With Thus , the use of VR as tool classroom learning own potency big For increase quality education .

Advantages and disadvantages Use of VR in Learning
Although own potency large , use of VR in learning also has a number of necessary advantages and disadvantages considered (Zulherman et al., 2021). The advantages covers increase involvement students , provide experience fun and engaging learning , as well expand accessibility to experience realistic learning (Cavanaugh et al., 2009) . Experience Fun and Engaging Learning motivating student For Study more further and more serious (Sobel, 2019). Realistic and attractive virtual environment can create experience fun learning for students (Lee & Hammer, 2011). Expand Accessibility to Experience Realistic Learning possible access to experience difficult study or even No Possible accessed in life real . VR makes it possible student For do virtual visit to places historic or exploration of a complex scientific world (Bailenson , 2018).

However , there are also drawbacks like cost high implementation , lack of content quality learning , and potential effect side like drunk motion (motion sickness) for a number of individual (Helsel , 1992) . Cost High Implementation is possible become obstacle for institution education with budget limited (Cavanaugh et al., 2009) Devices hardware and devices necessary software For implementing deep VR learning can become expensive. Lack of Content Quality Learning Still become challenge in use of VR in learning (Zulherman et al., 2021). Although VR technology continues growing , still There is limitations in quality and quantity content available learning .

Potency Effect Side like Drunk Motion (Motion Sickness) can bother experience learn and cause discomfort (Cavanaugh et al., 2009). A number of individual prone to to drunk motion moment use VR technology , especially If There is incompatibility between visual and sensory movements . Although own shortcomings , many from problems the can overcome with development more technology further and improvement content quality learning . With Thus , the use of VR in learning Still is a promising area with potency big For increase effectiveness and experience learning student .

Discussion

Implications Findings For Practice Learning
Research result This own implications important For practice classroom learning , where educator need consider VR integration to in curriculum they with choose appropriate content and develop effective learning strategies with use technology this (Johnson et al., 2015). VR can be used increase involvement students and enrich experience Study them (Yıldırım et al., 2020). Use of VR in learning has proven effective in increase involvement students (Akçayır & Akçayır , 2017). With give experience interactive , immersive , and engaging learning , VR encourages student For more involved in the learning process (Zulherman et al., 2021). Besides increase engagement , the use of VR is also enriching experience Study students (Dalgarno & Lee, 2010). With possible access to difficult environment and experience or even No Possible accessed in life real , VR opens up door For more learning deep , varied , and memorable for students (Mulders, 2020).

Implications practical from study This is necessity VR integration to in curriculum education (Wu et al., 2013). This covers election appropriate content with material lessons taught and development of effective learning strategies with utilise VR technology (Kerawala et al., 2006). Educator need consider election appropriate VR content with objective learning and needs student . Besides That , they also need develop effective learning strategies that utilize VR technology optimally (Moher et al., 2009). This strategy must designed For maximizing potency VR learning and ensuring that student can experience the benefits in a way maximum . With So , results study This show that VR uses have implications important For practice classroom learning , where educator need consider VR integration to in curriculum they with choose appropriate content and develop effective learning strategies with use technology This . This is step important in increase effectiveness learning and enriching experience Study student .

Challenges and Opportunities For Future Development

Although Virtual Reality (VR) technology offers interesting opportunity in context classroom learning , however No can denied that There is a number necessary challenge faced For maximizing potential (Billinghurst et al., 2015). One of challenge main is cost implementation VR technology often Enough high (Billinghurst et al., 2015). Device hardware and devices necessary software For provide quality VR experience can become big investment for institution education . Besides that's a challenge other is development quality content (Hu-Au & Lee, 2017) . Although VR technology continues developing , development content appropriate learning with curriculum and capabilities fulfil standard high quality Still become A challenge . This matter need time , source power , and expertise special in development effective and engaging VR content for student

Educators are also faced with challenges in matter training and development Skills related with use VR technology (Ravichandran & Mahapatra, 2023). Use of VR in learning need knowledge adequate technical and pedagogical high so you can take advantage of it in a way effective in the learning process (Dede, 2009). Lastly , aspects safety and health users also become consideration important (Dunleavy et al., 2009). Effect side like drunk motion or inconvenience physique other can arise from use VR technology , so required effort For ensure safe and comfortable use of VR for students and educators .

Although thus , with Keep going development technology and research in the field of VR, opportunities are also open big For overcome challenges (Milgram & Kishino , 1994). Progress technology can help reduce cost implementation and improvement quality content learning (Yuen et al., 2011). Besides that , research continues develop will bring more understanding Good about optimal way of integrating deep VR technology learning (Chen & Tsai, 2012). With focus on innovation , collaboration , and development skills , open opportunities For develop more VR applications effective , inclusive and useful for classroom learning (Ravichandran & Mahapatra, 2023). With so , though There is necessary challenge overcome , opportunities also open up big For optimizing use of VR in education and creating experience more learning interesting , interactive , and effective for student

Conclusion

Research result This prove that use of Virtual Reality (VR) as tool classroom learning own potency big For increase experience Study student . Although there is necessary challenge overcome , like cost implementation , development content , and training educators , VR integration into in practice learning can open opportunity promising new . With take into account implications findings this , educators and researchers expected can Work The same For develop and implement practical use of VR effective and sustainable in context education . Collaboration between second party will help identify solution For existing challenges , as well produce innovative and relevant learning strategies . With Thus , the environment more learning dynamic , interactive , and fun can created , makes it possible student For obtain more understanding deep and varied about material lesson . Besides Therefore , effective implementation of VR can also be done open door for inclusivity in learning , ensuring that all student own the same opportunity For get experience meaningful and relevant learning . With awareness will the potential and challenges involved , as well Work just as sturdy between educators and researchers , the use of VR in education can become A significant breakthrough in increase quality classroom learning and preparation student For face the world's constant demands develop .

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