EMPOWERING EDUCATION IN THE DIGITAL AGE

EXPLORING EMERGING TECHNOLOGIES FOR THE 21ST CENTURY

Honganur Raju Manjunath

EMPOWERING EDUCATION IN THE DIGITAL AGE

EXPLORING EMERGING TECHNOLOGIES FOR THE 21ST CENTURY

EMPOWERING EDUCATION IN THE DIGITAL AGE

EXPLORING EMERGING TECHNOLOGIES FOR THE 21ST CENTURY

Honganur Raju Manjunath

ALEXIS PRESS

ALEXIS PRESS

Published by: Alexis Press, LLC, Jersey City, USA
www.alexispress.us

First Published 2023

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication Data

Includes bibliographical references and index.

Empowering Education in the Digital Age: Exploring Emerging Technologies for the 21st Century
by *Honganur Raju Manjunath*

ISBN 979-8-89161-811-4

CONTENTS

CHAPTER 1

CHANGING LANDSCAPE OF EDUCATION: A REVIEW STUDY

Honganur Raju Manjunath, Associate Professor
Department of Physics, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- hr.manjunath@jainuniversity.ac.in

ABSTRACT:

The landscape of education is continuously evolving, driven by technological advancements, societal shifts, and educational paradigms. This abstract explores the multifaceted dimensions of this transformation. It examines key trends such as digitalization, personalized learning, and global connectivity, which are reshaping traditional educational models. Moreover, it delves into the challenges posed by this dynamic landscape, including concerns about equity, access, and the future of work. Despite these challenges, the evolving educational landscape also presents significant opportunities. Innovations such as online learning platforms, immersive technologies, and interdisciplinary approaches offer avenues for fostering creativity, critical thinking, and lifelong learning. Embracing these opportunities requires proactive measures from policymakers, educators, and stakeholders to ensure inclusivity, adaptability, and relevance in education systems worldwide. This abstract provides insights into navigating the changing terrain of education to cultivate a future-ready workforce and foster societal development in an increasingly interconnected world.

KEYWORDS:

Blended Learning, Digital Literacy, Distance Education, Ed-tech, Equity, Flexible Learning, and Globalization.

INTRODUCTION

The modern age of technology has brought a lot of new and advanced inventions that have really changed the way people live, including how they learn in school. The use of technology in education has changed the way we learn, teach, and use knowledge. This change is happening because new technologies like artificial intelligence, virtual and augmented reality, Gamification, and data analytics are improving quickly. New technologies are coming together with old teaching methods. In the past, education usually had a strict way of teaching with the teacher in charge. The teacher is the main person who knows things, and the students just listen and learn. New technologies are changing the old way of teaching by focusing on students and encouraging them to be active in their learning. The combination of these technologies with teaching methods is changing the way we are educated. Artificial Intelligence is being used in education to help with different tasks. AI helps to customize learning for each student by looking at how they are doing and changing the lesson to fit what the student needs. This way of learning lets students go at their own speed, so they really understand things before moving on. In addition, AI can do office work, so teachers can spend more time with students [1], [2]. Virtual and Augmented Reality in Education helps students learn in a more immersive way. These technologies make abstract ideas easier to understand by bringing them to life. Students can learn about history, travel to other countries, or do science experiments without leaving the classroom. These fun activities help you get more involved and understand things better, so that learning is more enjoyable and has a bigger effect [3], [4].

Using fun elements from games, like points, rewards, and competition, to make learning more interesting is called Gamification. It encourages students to join in and feel good about what they have achieved. Game-based learning makes educational games that are made to teach

specific skills or concepts. Both Gamification and game-based learning help students solve problems, think hard, and work together with others. Data analysis is important for understanding how well students are doing and how they learn. Educators can learn a lot about how students learn by studying big sets of data. These thoughts can help teachers plan lessons, find ways to do better, and make learning better for each student.

Cloud computing has changed the way students can access learning materials. Teachers and students can use learning materials, work together at the same time, and save their work online. This makes learning easier and smoother. Cloud computing helps people to learn from far away and study online. It helps to link students from all over the world. New technologies are helping all students to be included in education. Helpful tools like screen readers, speech-to-text software, and adaptive devices help students with disabilities to learn, giving them the same access to education as everyone else. These technologies help all kinds of students to join in and learn better. Changes in Education New technologies are changing how we learn, making classrooms less traditional and more connected. This change has many big effects. New technology makes learning more fun and exciting for students. It helps them stay interested and want to learn more. Customized learning with AI technology helps each student to learn in a way that works best for them. This makes it easier for students to understand and remember what they learn. Inclusive education uses technology and online tools to make sure everyone, including students with different needs, can access education easily. Technology like Teacher Empowerment Technology can do administrative work for teachers. This means teachers can spend more time helping students and being a mentor [5], [6].

Continuous learning and using online resources and mobile apps help people keep learning and improving their skills to keep up with the changing job market. The change in education, influenced by new technology merging with traditional teaching methods, has the potential to make students and teachers feel more powerful. By using these technologies carefully, education can be more tailored to each person, include everyone, and be more connected to what people need in today's digital world. As we learn more about these new technologies, we will see how they can change education and make the future better for students everywhere.

DISCUSSION

Education is very important for people to grow and change. It has always changed to fit what society needs. From a long time ago when people used to share knowledge by talking, to now where schools teach many different things, education has changed because of changes in culture, money, and technology. However, in the 21st century, there are new challenges and opportunities that have greatly affected education. Globalization has connected the world, allowing information and ideas to spread more easily than ever before. New technology has changed the way businesses work, so now they need workers who are skilled and can adapt easily. The knowledge economy depends on new ideas and skills, so people need to keep learning and improving [7], [8].

Because of these things, people are thinking a lot about changing the old way of teaching and learning. The old way of teaching, where the teacher is in charge and gives out information, is changing to a new way where the focus is on the students and their learning. This change makes learners the main focus of education, and pays attention to what each of them needs and likes. Teachers are realizing that it's important to involve students in activities where they can participate and learn by doing. This is why active learning methods are becoming more popular. Students are told to be active in their learning instead of just listening and reading. Working together on projects and talking in groups helps students learn to work as a team and communicate well with others, so they are ready to work with others in the real world.

Learning by doing and using practical tasks is an important part of education. Students learn concepts better when they have hands-on experiences, like internships, field trips, or simulations. Additionally, technology has made the traditional classroom bigger. Online learning, e-learning and blended learning let students learn from anywhere, anytime. This flexibility helps different types of learners and people with different schedules to keep learning for their whole lives, even if they can't be in a classroom.

The way we teach students is changing. We now know it is important for students to think for themselves, solve problems, and be creative. Remembering facts is becoming less important. Now, it's more about being able to think critically and use what you know in real life situations [9], [10].

Schools and teachers are starting to see the importance of considering students' overall well-being and not just their exam grades. They are focusing on emotional skills, building character, and making sure students are healthy and happy. Programs that teach kids how to understand and manage their emotions and how to get along with others are becoming more popular. They help kids become emotionally strong, caring, and good at getting along with people.

The way we learn is always changing because society and technology are always changing. Educators, policymakers, and people involved in education are working to make sure students have the knowledge, skills, and way of thinking they need to do well in an always changing world. By accepting these changes, education can keep being a strong force for making good things happen and helping people become more powerful.

Technology's Role in Education

Technology is changing education by making it easier to learn, share, and use knowledge. Using technology in education has helped teachers and students in new ways. It has made learning more interesting and changed how we learn. Improving technology makes it easier to get information and learn, no matter where you are or what time it is.

The internet has a lot of information that can help you learn new things. You can find articles, videos, and tutorials to help you study. Students can use the internet to find information from any place, which helps them learn on their own and keep learning throughout their lives. Learning with technology means more than just reading and listening. Using technology like videos, games, and virtual classrooms makes learning more interesting and fun. These experiences help all kinds of students learn in different ways, and make hard ideas easier and more fun for them [11], [12].

Individualized Learning is one of the biggest benefits of technology in education because it can personalize the way you learn. Adaptive learning systems and smart tutoring software look at how each student is doing in their work, and then change the things they're learning and how they're learning to match what the student is good at and what they need help with. This special way helps you learn the most and understand concepts better. Collaboration and Communication Technology helps students and teachers work together. Online platforms, video calls, and teamwork software help people work together and communicate, even if they are far apart. Students can work together on assignments, share thoughts, and talk with each other.

This helps them think critically and communicate effectively. New technology has changed how we assess and give feedback on things, moving away from just using paper tests. Online tests, computerized grading, and data analysis help teachers see how students are doing right away. Getting feedback quickly helps students see what they need to work on and fix it right

away. Technology helps make education available for all different kinds of learners. Assistive technologies help students with disabilities by providing tools like screen readers and speech-to-text software. These tools make sure that all students can participate and learn equally in school.

Continuous learning and professional development for teachers have changed a lot because of technology. Online workshops, webinars, and e-learning courses help teachers learn new things and improve how they teach. They also help them stay current with new ways of teaching and adjust to what their students need. Technology makes it easier for schools to do administrative work like enrolling students, making schedules, grading, and reporting. Administrative software and management systems help schools run better, so teachers can spend more time teaching and working with students. However, using technology in education needs to be carefully planned and done with care. Dealing with worries about keeping personal information safe, understanding how to use digital technology, and making sure everyone has access to it are very important when we are using technology. Making sure everyone can use technology and giving teachers enough training and help is really important to get the most out of it. Technology plays many different roles in education and affects every part of how students learn. As technology in education keeps getting better, it can help make learning more interesting and help students be more creative. It can also help them get ready for the future. By using technology carefully and making the most of its advantages, education can greatly change and help students succeed in the digital age and beyond.

Advantages of using new technologies in education

Using new technology in education has lots of good things, like making learning more fun, helping teachers, and making education more varied and fair. Let's look at the important benefits of using these new ideas in education. New technologies like artificial intelligence and data analytics can create personalized learning for each student based on what they need and like. Adaptive learning systems look at a lot of information to figure out what each student is good at, what they need help with, and how they like to learn. This helps teachers give students the right lessons and tasks for them. This way of teaching helps students get more involved and learn better by focusing on their individual needs.

Exciting new technologies like games and virtual reality make learning more fun and interesting. Using things like points, badges, and leaderboards can make students want to be more involved and work hard to do well in school. Virtual reality and augmented reality help students learn in a more engaging way. They can understand difficult ideas better than with regular methods. These fun activities make students really excited about learning and helps them to get involved in their education. Technology can make education easier for everyone. Helpful tools, like devices and software, help students with disabilities learn and join in class. Online learning websites and digital tools make sure that people in faraway or lacking resources places can get good education. New technologies make it easier for all kinds of students to learn and do well in school.

Real-Time Feedback and Assessment means giving feedback to students right away instead of waiting a long time to grade their work. Traditional assessment takes a long time to grade, so students don't get feedback quickly. New technologies make it easier for teachers to check and grade students' work quickly, and they can see how well students are doing right away. Automated feedback helps students know what they are good at and what they need to work on. This helps them improve quickly in their learning. Working together with people from all over the world is made easy with technology. It helps students, teachers, and experts communicate and work together smoothly. Online websites, video calls, and social media make

it easy for people to connect and work together, no matter where they are. This helps create a global community of learners. This connection allows people to learn from different points of view and experiences, making education better for everyone.

Using data analysis in education helps teachers and school leaders to make smart choices. Educators can look at how well students do in school to see if there are any common trends or patterns. This helps them figure out how to teach and help each student. Using information to make decisions helps teachers find better ways to teach and use resources, making education better and more organized. Teachers learning new things and improving their skills with the help of new technology. Online classes and training sessions on the internet help teachers improve their teaching skills, learn about new trends in education, and connect with other teachers. Continuous growth and improving skills help teachers and students.

Using new technology in education can change the way we teach and learn in a really big way. By using these new ideas, teachers can make a learning environment that fits the different needs of students better and makes learning more interesting for them.

The advantages go beyond just school and help teachers and schools prepare students to be good learners forever. They will have the skills and knowledge they need to do well in the constantly changing digital world. Challenges of using new technology in education. Even though it has many benefits, there are also difficulties. Teachers and schools need to be careful and aware of problems that might come up when they use new technology. Let's talk about some of the main difficulties of using these new ideas in education. One of the main problems with using new technology in education is that it needs a strong technical support system. Many schools, especially those in areas with few resources or in countries that are still growing, might not have good internet or new computers. Buying the right equipment, computer programs, and taking care of them can cost a lot of money, making it hard for everyone to use technology for learning.

The digital divide is about some people having less access to technology and the internet than others. Students who are poor or live far away from cities may not have technology, which makes it harder for them to compete with other students. It's really important to close the gap in access to technology so that using technology in education doesn't make inequalities in education even worse. Privacy and keeping student information safe are important when using new technologies that collect and analyze a lot of student data. Using data to make learning better has its benefits, but we need to think about how it might affect students' privacy and keep their information safe. Organizations need to use strong security measures to protect important data and follow the rules.

Teachers need to be good at using technology to make learning better. However, some teachers may have a hard time using new technologies, which creates a gap in their digital skills. It's really important to give teachers good training and help them develop their skills so they can use new technologies in the classroom with confidence and success. The amount of stuff you can learn online is great, but it can also be overwhelming. Not all online stuff is as good as regular school books. Teachers need to find and check online resources to make sure they match the lesson plans and help students learn.

Putting too much focus on technology is not good. Technology is useful, but it should not be more important than good teaching. Technology should help and improve how teachers teach, instead of taking their place. Relying too much on technology without using it in a careful way in the learning plan might make learning experiences not as good. Keeping students interested in learning can be challenging, even with new technology. It's important to plan and think carefully about how to keep students engaged over time. We should use technology in a good

way to help people learn, instead of just using it for fun and getting distracted. Technology is changing quickly, and what is new today may not be new tomorrow. Staying updated with the newest ideas and using eco-friendly technology can be hard for schools.

Using new technologies in education has the power to change the way students learn, include more people, and give students and teachers more power. However, it is important to solve the problems of infrastructure, fairness, privacy, and teacher readiness in order to make sure that everyone can benefit from technology. Educational institutions can use technology in a careful way to help students learn better and prepare for the future.

To deal with these difficulties, the report shows how education is changing. We are changing how we teach to focus more on students and personalize their learning. We are moving away from just listening to the teacher and taking a more personalized approach. Active learning, working together on projects, and gaining hands-on experience are becoming more important in education. The physical classroom is no longer the only place for learning, as online and blended learning are also being used. The article talks about how technology is used in schools and how it helps students to learn better. New technologies are making it easier to get information, and allowing for more interactive and personalized learning experiences. Technology helps people work together, gives immediate feedback and evaluation, and helps teachers make decisions using data.

In addition, the organization stresses that technology makes it possible for all students, no matter where they are or what challenges they have, to be able to learn. This shows how important it is to use technology carefully, and to think about things like keeping our personal information safe, understanding how to use technology, and making sure everyone has the same opportunities to use it. To sum up, 1 gets us ready to learn about new technologies in education. This shows how technology can help people learn better and get ready for success in a changing world. As we keep learning more about each technology, we will find out how they are used, what good things they bring, and what difficulties they can cause in shaping the future of education. By using these new ideas in a careful way, education can keep being a powerful force for good and for helping people become more independent in the digital age and beyond.

CONCLUSION

The way education is changing can be difficult, but it also gives us chances to do new things. We need to think carefully and take action to make the most of these changes. As technology gets better and societies change, schools need to change too to help students learn in a world that is always changing. Many people worry about fairness, being able to learn, and what jobs will be like in the future. But, new ways of learning using technology, individualized teaching, and a mix of different subjects are showing potential for overcoming these challenges. In summary, accepting the changes in education means working together, being creative, and being dedicated to learning for our whole lives. Teachers, people who make rules, and people involved in education need to work together to create schools that include everyone, can change when needed, and teach things that are important in today's world. This will help students do well in the 21st century. By using new ideas, thinking carefully, and connecting with people all over the world, we can understand and navigate the challenges of modern education and help everyone reach their full potential.

REFERENCES:

[1] J. O'Flaherty and M. Liddy, "The impact of development education and education for sustainable development interventions: a synthesis of the research," *Environ. Educ. Res.*, 2018.

[2] W. Leal Filho *et al.*, "The role of transformation in learning and education for sustainability," *J. Clean. Prod.*, 2018.

[3] S. K. Akran and S. Aşiroğlu, "Perceptions of teachers towards the stem education and the constructivist education approach: Is the constructivist education approach preparatory to the STEM education?," *Univers. J. Educ. Res.*, 2018.

[4] S. Palvia *et al.*, "Online Education: Worldwide Status, Challenges, Trends, and Implications," *Journal of Global Information Technology Management*. 2018.

[5] R. G. Klaassen, "Interdisciplinary education: a case study," *Eur. J. Eng. Educ.*, 2018.

[6] I. Deveci and J. Seikkula-Leino, "A review of entrepreneurship education in teacher education," *Malaysian J. Learn. Instr.*, 2018.

[7] N. Türk, N. Kalaycı, and H. Yamak, "New trends in higher education in the globalizing world: STEM in teacher education," *Univers. J. Educ. Res.*, 2018.

[8] I. S. Jenset, K. Klette, and K. Hammerness, "Grounding Teacher Education in Practice Around the World: An Examination of Teacher Education Coursework in Teacher Education Programs in Finland, Norway, and the United States," *J. Teach. Educ.*, 2018.

[9] M. F. Genç, "Values education or religious education? An alternative view of religious education in the secular age, the case of Turkey," *Educ. Sci.*, 2018.

[10] O. Viberg, M. Hatakka, O. Bälter, and A. Mavroudi, "The current landscape of learning analytics in higher education," *Computers in Human Behavior*. 2018.

[11] G. Kiryakova, N. Angelova, and L. Yordanova, "The potential of augmented reality to transform education into Smart education," *TEM J.*, 2018.

[12] C. Da Wan, M. Sirat, and D. Abdul Razak, "Education in Malaysia Towards a Developed Nation," *ISEAS Yu*, 2018.

CHAPTER 2

IMPORTANCE OF VIRTUAL AND AUGMENTED REALITY FOR EDUCATION

Srikantha H, Assistant Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- h.srikantha@jainuniversity.ac.in

ABSTRACT:
Virtual and Augmented Reality (VR/AR) technologies are rapidly transforming the landscape of education by offering immersive and interactive learning experiences. This abstract explores the burgeoning field of VR/AR in education, examining its potential to revolutionize teaching and learning across various disciplines. By creating simulated environments and overlaying digital content onto the physical world, VR/AR technologies enable students to engage with complex concepts in ways previously unimaginable. This abstract highlights key applications of VR/AR in education, including virtual field trips, interactive simulations, and immersive storytelling. It discusses the benefits of these technologies in enhancing student engagement, fostering deeper understanding, and catering to diverse learning styles. Furthermore, it explores the challenges and considerations associated with integrating VR/AR into educational settings, such as cost, accessibility, and ethical concerns. Despite these challenges, the abstract emphasizes the transformative impact of VR/AR on education, particularly in preparing students for the future workforce and equipping them with essential 21st-century skills. By harnessing the power of immersive technologies, educators have the opportunity to create dynamic, experiential learning environments that inspire curiosity, creativity, and critical thinking.

KEYWORDS:

Hybrid Classrooms, Learning, Online Learning, Personalized Learning, Remote Education, Skill Development.

INTRODUCTION

Virtual Reality and Augmented Reality are powerful tools that can change regular learning experiences into fun and interactive ones. In this article, we will look at how virtual reality and augmented reality can be used in education to make teaching and learning better [1], [2].

Learning about VR and AR in Education

Virtual Reality and Augmented Reality are two types of technology that have become very popular in education. Both virtual reality (VR) and augmented reality (AR) give you realistic experiences, but they are different in how they work and how real the experience feels. "Let's learn about what VR and AR are, how they are different, how they are used, and how they are helpful in education. Virtual reality (VR) and augmented reality (AR) are both technologies that change the way we experience the world around us. VR creates a completely digital environment for the user to interact with, while AR adds digital elements to the real world. The key difference between the two is how much of the user's environment is made up of digital elements. In virtual reality, people are completely surrounded by a computer-made world. They can walk around, touch things, and be a part of the world as if they were really there. Virtual reality makes users feel like they are in a computer-generated world and not in the real world. Augmented Reality (AR) adds digital information onto the real world. It makes the user see the real world with computer images, videos, or other digital stuff on it. Unlike virtual reality, augmented reality doesn't make a whole new virtual world. Instead, it makes the real world

better by adding digital stuff to it. Virtual reality and augmented reality are two different technologies that give immersive experiences, but they are very different in how they work and how much they make you feel like you are really there. Let's talk about the main differences between virtual reality and augmented reality [3], [4].

Level of being completely involved in something

Virtual Reality or VR makes a computer-generated world that makes users feel like they are really there and blocks out the real world. When you wear a VR headset, you feel like you are inside a computer-made 3D world. You can touch things and move around as if you were really there. In VR, you can see and feel like you are in a different world, even though you are really just looking at a screen. Augmented Reality (AR) adds digital stuff to what you see in the real world. Instead of changing the real world, AR makes it better by adding digital things like 3D models, text, videos, or animations on top of real things or places. People can look at the real world and use digital stuff at the same time. AR brings together the virtual and real worlds while keeping the user connected to their actual environment. Physical space means the area around us where we can move and place things. Virtual Reality experiences need a specific area for people to move and have fun in the virtual world. Some virtual reality experiences let you move around and do things in a specific area. Other VR experiences might be "sitting" or "standing," so users can play in a virtual world without moving around. Augmented Reality experiences don't need a special place. People can see AR stuff in their current location without needing more room. AR can be used on smartphones or AR glasses, so it's easier for people to use it wherever they are. Conversation or communication between people or things.

Virtual Reality is when you use special controllers or hand-tracking devices to do things in the digital world. People can move and interact with things in a virtual world using special devices. The communication only happens online. Augmented Reality uses your phone to interact. People can play with AR content by touching, moving their finger, or using hand movements on their device's screen. AR also helps you do things without using your hands when using AR glasses or headsets that have sensors built in. Virtual Reality (VR) makes you feel like you are inside a computer world with a full view all around you. The pictures are made by a computer and look very real. They are very clear and make you feel like you are really in the virtual world [5], [6].

Augmented Reality (AR) puts digital stuff into the real world so you can see it in your surroundings. It mixes virtual things with what's really there. "AR lets people see digital information mixed with things in the real world, like putting notes on objects or showing data on physical places. Virtual Reality and Augmented Reality give different experiences with different levels of being deeply involved and interacting. Virtual Reality (VR) makes you feel like you're in a made-up world. Augmented Reality (AR) adds digital things to the real world. Both technologies are useful for education, entertainment, training, and other fields in today's world because they have different uses and benefits. How VR and AR Technologies Work Virtual Reality and Augmented Reality are very advanced technologies that make users feel like they are really in a different world. While they are different, they also have things in common in how they deliver fun and interactive content. Let's explore the technical aspects of how VR and AR technologies operate

DISCUSSION

Making VR stuff involves using special computer programs to make 3D models and images. The people who make them design virtual worlds and things inside them that you can interact with. These 3D objects are then put into a virtual world. Virtual reality (VR) headsets are like special goggles that you wear on your head to watch and play games in a special 3D world.

The main piece of equipment for VR is the VR headset. VR headsets are special goggles that people put on their eyes to see things in a virtual reality world. The headset has special screens for each eye that make things look 3D [7], [8].

Tracking movement

VR headsets have special sensors that track your movements inside the virtual world. These sensors find out how the user moves their head, so they can look around the virtual space right away. As people move their heads, the VR content changes to make sure the view stays the same. Different VR systems have different tools for users to use. They might have handheld controllers or other devices to help them do things in the virtual world. These controllers usually have buttons, triggers, and motion sensors that let people move things and explore the VR world. Virtual reality experiences with immersive audio often use technology that places sounds in a 3D space to make it feel like you are really there. This helps make you feel like you're really in the virtual world. Augmented Reality technology shows digital images or information in the real world.

Adding digital things to what you can see in the real world makes AR content. AR content can have 3D objects, videos, words, and things you can interact with. The AR software needs to recognize and know the real world around it to put digital things in the right spot. AR uses the cameras and sensors in your phone or AR glasses. These tools take in information from the world around them and send it to the AR software to be looked at and understood [9], [10].

Marker less and Marker-Based AR can be divided into two types: one does not require markers, while the other uses markers to track and overlay virtual content onto the real world. Marker less AR uses computer technology to find objects and surfaces in the real world. It can put digital things in the right place without needing special markers. Marker-based AR uses special markers, like QR codes or images, to show digital stuff when the camera sees the markers. Object Tracking and Registration the AR software uses advanced math to accurately place digital things into the real world. This process includes matching digital things with real objects and following where they are in real-time as the user moves. Show AR Content the AR content is shown on the user's view of the real world using a device, like a smartphone or AR glasses. The content looks like it's a natural part of the real world, so users can play with things that are real and things that are on a screen at the same time.

People can do things with AR content by using their hands, touching the screen, or talking to their device. AR apps can understand these actions and react to them, making the experience fun and controlled by the user. Virtual Reality and Augmented Reality make 3D content and mix it with the real world. VR uses special headsets and sensors to make users feel like they're in a virtual world. AR uses cameras and sensors to add digital stuff to what the user sees in the real world. Both technologies provide interesting and exciting experiences that could change education, training, entertainment, and other industries.

Advantages of Virtual Reality and Augmented Reality in Education

Virtual Reality and Augmented Reality can help students learn better in school. These new methods of teaching could change the way we learn. They can make learning fun and exciting for students. Let's talk more about how VR and AR can help in education. Improved visualization and understanding VR and AR help students see and understand difficult ideas more easily in a hands-on way. For example, students who are learning about space can use VR to see the solar system, and students studying biology can use AR to see 3D models of cells, which makes learning more fun and easier to understand [11], [12].

Experiential Learning VR and AR help students learn by putting them in realistic and interactive virtual simulations. For instance, history students can use technology to see important events from the past, and medical students can practice surgeries in a computer program to get better at them. This helps them learn and improve their skills. VR and AR experiences grab students' attention and make them want to join in and learn. These technologies are fun to use and help people focus and remember things better. They can also make people more interested in learning new things. Virtual reality can take you to places that are difficult or dangerous to visit in real life. AR can bring old places, old things, or cultural experiences directly into the classroom. This helps connect what students learn with real-life examples. Personalized and Differentiated Learning VR and AR can help people learn in their own way, offering custom learning experiences. Students can learn by themselves and explore what they like at their own speed. This helps them understand subjects better.

VR provides a safe place for students to learn and practice real-life situations in subjects like medicine, engineering, and aviation. Mistakes in virtual reality simulations don't have any bad effects in real life. This means that people can make mistakes and learn from them without any danger. Creating a team effort and talking together VR and AR can help to make learning experiences better by working together. Students in different places can work together at the same time using virtual things, which helps them learn from each other and communicate better.

Virtual Reality (VR) and Augmented Reality (AR) can help all students, including those with disabilities. These technologies can be inclusive and accessible for everyone. These technologies allow different ways to learn and make sure everyone's learning style is included. AR can give students immediate feedback on how they are doing, so they can fix any mistakes right away. This test helps teachers see how students are doing and teach them in a way that helps each student learn best. Connecting Theory and Practice Using VR and AR can connect what we learn in theory to real-life situations. By using these technologies, students can better understand and remember complex ideas by seeing and playing with them in real-life situations.

Combining Virtual Reality and Augmented Reality in education could change how students learn and interact with schoolwork. These technologies help us see things better, learn by experiencing, stay involved, and access experiences we couldn't have otherwise. By using VR and AR in schools, teachers can make more interesting and interactive lessons that help students learn and understand things better. Using virtual reality in education means using computer technology to create a simulated environment. This can help students learn in fun and interactive ways. Virtual Field Trips VR helps students go on virtual visits to important places, like historical sites and natural wonders, without having to actually go there in person. For instance, students studying history can use virtual reality to see old civilizations, geography students can check out important places, and biology students can study underwater life.

Science Simulations VR creates a safe and controlled place to do virtual experiments and learn about complicated scientific ideas. Students can pretend chemical reactions, learn about space stuff, or watch how living things work at the tiny level. Virtual reality helps students change things and see what happens, which helps them understand science better. Using VR for training and skill development is useful in many different job and career training situations. For example, medical students can practice surgery in a lifelike virtual operating room. This helps them get better at it and feel surer of themselves before they actually operate on real patients. In the same way, people who want to be pilots can practice flying in simulations, and engineers can make and try out new designs using computers.

Language Learning VR allows students to learn new languages by practicing conversations in a virtual environment. People learning a language can talk to computer-based native speakers, have real conversations, and practice their language skills in different cultural situations. VR language apps can show you how to do things in daily life, like ordering food in a restaurant in another country or asking for directions in a city where you don't speak the language. Historical and Cultural Reenactments VR uses technology to make events from the past feel real, like you're actually there. Students can see important moments in history, like when the Declaration of Independence was signed or when people first landed on the moon. This can help them understand and care more about what happened in the past. Students can use Art and Design Exploration VR to play around and learn about art and design in virtual studios. They can make 3D art using virtual reality tools. This experience helps students be creative and gives them a way to show their art.

Virtual Reality can help people learn about their feelings and how to get along with others by making different situations that need understanding, finding solutions and solving problems with others. Students can learn how to deal with tough situations like bullying or problems with friends. They can practice handling their emotions and staying calm in a safe place. Students can use Astronomy and Space Exploration VR to go on virtual space missions and explore the universe, visit planets, and see amazing space events. Students can watch space events like eclipses and planetary alignments from different points of view. This helps them learn more about space science.

Virtual reality (VR) can help students experience and explore famous books and stories in an interactive way. They can join the story, talk to the characters, and see what's happening from different angles. This helps them understand and enjoy stories and storytelling even more. Virtual Reality can be used in many different ways in education, covering a wide range of subjects and areas of study. Virtual reality allows students to have amazing chances to explore, interact, and learn in really cool and interesting ways. Virtual reality is changing the way we learn in school. It helps us go on virtual trips and learn new languages and science in a fun way. This makes students excited about learning and helps them take an active role in their education.

Applications of AR in Education

Augmented Texts AR makes regular texts better by adding in fun and engaging learning activities. Students can use their phones to scan pictures or pages in the book. Then, they can see extra things like 3D models, videos, and quizzes. Augmented texts help you learn better by combining pictures and words.

AR in classrooms means using technology to put digital things on real things in the classroom. This can make learning more interesting and fun. Teachers can use AR to show difficult ideas, like the inside of our bodies, how the earth was formed, or old things from history. This helps students understand and be more interested in the lessons. This exciting way of learning helps students to join in and to improve their understanding of the topic. Gamified Learning AR can be added to educational games to make learning fun. Gamification uses game-like things like challenges, rewards, and competition to make students more interested and involved in learning. AR educational games help students to understand and learn new things by exploring, solving problems and doing tasks while also learning important subjects and skills.

Augmented Reality for Professional Training is important for improving specific job skills and helping workers on the job in different industries. For instance, in medical training, AR can help surgeons during surgeries by putting important information and instructions right in front of their eyes. In factories, AR can help workers fix machines by showing them each step and

giving them virtual help. Virtual laboratories and simulations in augmented reality can provide students with the opportunity to do experiments and learn about science using technology. Chemistry students can do experiments on the computer, physics students can learn about how things move, and biology students can look at tiny living things, all without using real lab tools.

Language translation and learning apps help you understand and learn new languages. People can use their devices to translate foreign text in real-time using an AR app. This helps people learning a new language understand and learn new words in their everyday situations. Art and Design Exploration AR helps students see and play with their art and designs in the real world. Art students can use technology to see how their designs look in real spaces. This helps them to be more creative and design better. Augmented Reality (AR) can make history and culture more interesting by adding historical facts and cultural background to real places and objects. Students can visit old places, see drawings of buildings from the past, and talk with people who lived a long time ago. This helps them understand history better and feel more connected to it. Augmented Reality can be used in education for interactive learning, virtual labs, and training support. AR helps connect the digital world and the real world, making learning more fun and giving students cool interactive things to learn from. By using AR technology, teachers can make learning more interesting and help students become more curious, think carefully, and understand subjects and skills better.

Using virtual reality and augmented reality in a classroom. History lessons that are taught online on a computer or mobile device. Using virtual reality to take students to historical events and time periods. Virtual Reality allows students to go back in time and have a realistic and interactive experience of historical events and time periods. Students can use 3D technology to see famous places from the past, watch important events, and interact with historical figures. For instance, they can visit old civilizations, see important moments in history, and watch important events from different viewpoints. Virtual Reality allows students to see old places and buildings from the past, helping them understand the history and importance of these places better. This way of learning history by doing things helps you feel like you're actually there and makes it more real than just reading or listening to someone talk.

The Effect of Immersive Experiences on Understanding History

Virtual reality experiences help students understand history in a deep way. Students don't just read about history, they also get involved and take part in learning about it. They can visit old places, move things around, and tell stories with the help of technology. This helps them understand and remember history better. Virtual reality helps you imagine and feel like you are in historical places and events. This better picture helps you understand and remember what you are learning, making it more interesting and easier to remember.

Encouraging Empathy and Emotional Connection through VR Historical Simulations

Virtual reality historical simulations can help students understand and feel connected to people who lived in the past by letting them experience historical events from their point of view. For example, students can pretend to be Anne Frank hiding, feel what soldiers felt during World War I, or see important events from the civil rights movement. Virtual reality experiences can help students feel and understand history better. It can make them care more about the people in the past and understand how historical events affected them. As students pretend to be people from the past, they learn more about how complex history is and the different experiences of people from diverse backgrounds. VR can help students think about how historical choices affect the world, which can make them better at thinking critically and understanding history more deeply. Using VR technology for history lessons allows students to explore historical events in a fun and interactive way. By using 3D technology, students can experience history

in a more real way which helps them understand and feel connected to the past. These exciting experiences are more than just normal history lessons. They provide a strong and changing way to learn about history that can make you curious and caring, and make you love learning about the past forever.

CONCLUSION

In conclusion, Using VR/AR in education can make learning available to more people, remove barriers to learning, and help students be more creative and innovative. By using these advanced technologies and making the most of what they can do, we can change how we teach and prepare students for the modern world. Virtual and Augmented Reality (VR/AR) technologies have the potential to change education in the digital age. These technologies can make learning more fun and interesting for students, help them understand better, and get them ready for the future. Educators can use virtual trips, simulations, and stories to make learning more fun and interactive. This can help students with different learning styles and teach them important skills for the future. Using VR/AR in schools is not easy because it can be expensive and not everyone can use it. But the good things it can do are much more important than the problems. As technology keeps getting better and easier to use, it's important for teachers, leaders, and others involved to work together and come up with new ideas for how to use it to its fullest.

REFERENCES:

[1] G. L. Lledó and C. S. Galiano, "Bibliometric review of augmented reality in education," *Rev. Gen. Inf. y Doc.*, 2018.

[2] G. Kiryakova, N. Angelova, and L. Yordanova, "The potential of augmented reality to transform education into Smart education," *TEM J.*, 2018.

[3] B. S. Hantono, L. E. Nugroho, and P. I. Santosa, "Meta-review of augmented reality in education," in *Proceedings of 2018 10th International Conference on Information Technology and Electrical Engineering: Smart Technology for Better Society, ICITEE 2018*, 2018.

[4] I. Sural, "Mobile augmented reality applications in education," in *Virtual and Augmented Reality: Concepts, Methodologies, Tools, and Applications*, 2018.

[5] P. P. Nechypurenko, T. V. Starova, T. V. Selivanova, A. O. Tomilina, and A. D. Uchitel, "Use of augmented reality in chemistry education," in *CEUR Workshop Proceedings*, 2018.

[6] D. N. L. Nasser, "Augmented reality in education learning and training," in *Proceedings of 2018 JCCO Joint International Conference on ICT in Education and Training, International Conference on Computing in Arabic, and International Conference on Geocomputing, JCCO: TICET-ICCA-GECO 2018*, 2018.

[7] W. Gavilanes, M. J. Abásolo, and B. Cuji, "Summary of reviews on Augmented Reality in education," *Espacios*, 2018.

[8] Z. Turan, E. Meral, and I. F. Sahin, "The impact of mobile augmented reality in geography education: achievements, cognitive loads and views of university students," *J. Geogr. High. Educ.*, 2018.

[9] F. Ozdamli and D. Karagozlu, "Preschool teachers' opinions on the use of augmented reality application in preschool science education," *Croat. J. Educ.*, 2018.

[10] D. Gudonienė and T. Blažauskas, "The Ways of Using Augmented Reality in Education," in *Communications in Computer and Information Science*, 2018.

[11] M. Fidan and T. Meric, "Cypriot Journal of Educational Augmented reality in education researches (2012 – 2017):," *Cypriot J. Educ. Sci.*, 2018.

[12] F. del C. Velázquez and G. M. Méndez, "Augmented reality and mobile devices: A binominal methodological resource for inclusive education (SDG 4). an example in secondary education," *Sustain.*, 2018.

CHAPTER 3

LANGUAGE LEARNING THROUGH AUGMENTED REALITY: A COMPREHENSIVE REVIEW

Dushyanth V Babu R, Associate Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- vb.dushyanth@jainuniversity.ac.in

ABSTRACT:
Language learning is a dynamic process that is increasingly being augmented by innovative technologies, notably Augmented Reality (AR). This abstract delves into the burgeoning field of language learning through AR, examining its potential to transform traditional language education paradigms. By overlaying digital content onto real-world environments, AR offers immersive and interactive language learning experiences that engage learners in meaningful ways. This abstract explores the diverse applications of AR in language learning, including vocabulary acquisition, pronunciation practice, cultural immersion, and real-life situational simulations. It highlights the benefits of AR in enhancing language acquisition by providing contextualized learning experiences, promoting active engagement, and catering to individual learning styles. Additionally, it discusses the challenges and considerations associated with integrating AR into language education, such as technological barriers, content development, and pedagogical alignment. Despite these challenges, the abstract underscores the transformative potential of AR in language learning, particularly in fostering language proficiency, cultural understanding, and communication skills. By leveraging the affordances of AR technology, educators can create dynamic and personalized learning environments that empower learners to explore, practice, and interact with language in authentic contexts.

KEYWORDS:

Personalized Learning, Remote Education, Skill Development, Technology Integration, Virtual Classrooms, Workforce Readiness.

INTRODUCTION

Virtual Reality allows scientists to do dangerous experiments in a safe way inside a virtual lab. This helps to save money and reduce risk. Students can use computer programs to do science experiments without worrying about accidents happening. They can do things like mix chemicals or learn about complicated scientific things without any problems. Virtual reality allows students to do the same experiments many times, trying different things and seeing what happens. This helps them understand the science better. This way of doing experiments over and over helps students understand and get good at scientific ideas and methods. Using virtual reality simulations to make scientific thinking and critical reasoning better. Virtual reality simulations in science labs make students think hard and use science to solve problems. Students have to look at information, understand what it means, and make decisions based on their online experiments, which are like real scientific research. VR simulations can show students situations where they have to create and do experiments on their own. This helps them learn to work by themselves and take control of their own learning [1], [2].

Creating opportunities for students to work together and learn from each other, even if they are in different places. VR helps students learn together by letting them join a virtual science lab from anywhere at the same time. Students can use virtual reality to work together and do experiments at the same time, even if they are not in the same place. Working together in virtual reality labs helps students work as a team and learn from each other. They can share ideas, talk

about what they've found, and work on science projects together. This way of working together across different fields is like how scientists often work together to solve problems. Virtual collaboration helps students learn about different views and ways of doing science. This helps them understand science better [3], [4].

Access to very good and special tools and machines

Virtual reality science labs can give you the chance to use special and high-tech lab tools that you may not have in regular classrooms. Students can use fancy science tools like electron microscopes and particle accelerators to learn more about science. Virtual Reality can also create situations where equipment breaks and other difficult problems happen. This helps students to learn how to fix things and solve problems without any real danger. Making something fit your needs and being able to change it to fit new situations.

Virtual reality science labs can be changed to fit different school levels. This lets teachers make special experiences for students at different levels. This flexibility makes sure that each student's learning experience is interesting and tough. Using virtual reality in science labs has many benefits. It makes experiments safer, helps improve skills like thinking scientifically and critically, and allows for collaborative learning. "Virtual Reality (VR) helps students learn by letting them try out experiments in a safe way. This allows them to understand difficult scientific ideas and improve their scientific skills. VR simulations make learning fun and hands-on for students. They help students understand science better and get them interested in learning more about science for their whole life. Also, working with classmates from different places helps students learn new things and prepares them to work with others in the future to solve problems and do scientific research [5], [6].

DISCUSSION

Augmented Reality language learning apps help you learn new words and understand languages better through fun and interactive activities. These apps can show labels, pictures, or moving pictures on real things like things in your house or signs outside. When students use their AR devices to look at these objects, they get quick translations, audio pronunciations, and extra information that helps them learn language in real life. AR apps can include language activities and tests in the real world, making it fun for people to use their language skills in everyday situations. This active participation helps people learn and remember language more quickly. Developing understanding and appreciation for different cultures using augmented reality cultural activities.

AR can help people learning a new language by showing them cultural things on top of real places like landmarks, art, or historical places. Students can use AR to discover the importance of these places, learn about local traditions, and hear stories from native speakers. This helps them understand the cultural background of the language they are learning. Augmented Reality-based cultural experiences help students learn more than just language skills. They also help them understand and respect other cultures, so they can communicate better with native speakers and feel more comfortable in different social settings [7], [8].

Dealing with different languages in diverse classrooms

Augmented reality can help people learning a new language in classrooms where there are different languages spoken. Translation apps using AR can help people talk to each other even if they speak different languages. This can make it easier for students with different language backgrounds to communicate. AR can also help students practice speaking another language

with native speakers. For instance, students who are learning Spanish can talk with native Spanish speakers using AR language exchange apps to practice speaking Spanish.

Language learning apps make learning a new language fun by turning it into a game, which makes practicing the language more enjoyable and interactive. Using rewards, challenges, and tracking progress helps students stay interested and keep trying to learn a new language. Using AR, people can learn languages by playing games, acting out scenarios, and taking virtual tours of different places. This helps them practice speaking the language in real-life situations and learn about different cultures. AR language learning apps can give you advice on how to say words properly and improve your speaking. Students can improve how they speak by using their AR devices to practice and get feedback from the app on how to make their pronunciation better.

Augmented Reality helps people learn languages better by giving them interactive and rich experiences. AR language apps help people learn and understand new words and language by using real-life situations. They also help people learn about different cultures which can make them more aware and understanding of the world around them. In classrooms with students from different cultures, AR helps people who speak different languages to understand each other better and talk to each other [9], [10].

Also, using game elements and getting immediate feedback on how to pronounce words in augmented reality apps makes learning a language more interesting, encouraging, and successful. By using AR's interactive features, people can improve their language skills and learn about other cultures. This makes learning a language more fun and interesting. Thinking carefully about what is right and wrong, and being careful about possible problems. Thinking about what is right and wrong when using VR and AR in education, and being aware of possible problems. Protecting student information and privacy in VR/AR platforms.

Virtual reality and augmented reality platforms gather a lot of information about how people use them, what they do, and what they like. In school, it's very important to keep students' information private and safe. Teachers and school leaders need to make sure that the VR/AR apps used in class follow privacy rules and have strong security to protect student information. Clear permission systems should be set up to explain to students and their parents about the information being collected and how it will be used. Schools need to work with VR/AR companies that are reliable and safe with student data.

Ensuring Age-Appropriate Content and Experiences for Students

VR and AR experiences can be very different in what they show and how complicated they are. It is important to choose content that is right for the age and maturity of the students. Some VR/AR experiences can have scary or violent content that may not be suitable for younger kids. Teachers need to choose VR/AR content that matches their teaching goals and helps students learn in a good way. Using content filters and parental controls can help make sure that students only see things that are right for their age. Dealing with how immersive technologies can affect people's feelings and mental health [11], [12].

Virtual reality experiences can make students feel very strong emotions and reactions. Sometimes, students might see things that are unsettling or disturbing when they do projects about history or culture. Teachers need to think about how school can affect students' feelings and help them in the right way. Having conversations after intense VR experiences can help students understand and deal with their feelings and thoughts. Encouraging students to talk openly and providing ways to deal with their emotions can help them handle the psychological effects of immersive technologies. Using VR and AR devices for a long time can make people

rely too much on technology and spend too much time looking at screens. This can be bad for students' health and how they feel. Teachers should make rules for when and how to use VR/AR, and remind students to take breaks to rest their eyes and have good habits with screens.

It's important to mix VR and AR with other teaching methods so we don't rely on them too much. Old-fashioned teaching ways and activities where you use your hands are still important in education. Making sure everyone feels included and that everyone can access things easily. Some students with certain disabilities may find it hard to use VR and AR. We need to make sure that everyone can use these new technologies in schools. Making sure that VR/AR apps work with tools that help people with disabilities and giving students with disabilities different ways to learn can make learning inclusive for everyone.

Virtual Reality and Augmented Reality have a lot of good things for education. But we also need to think about the ethical issues and problems that might come up. We need to be really careful about them. Teachers and school leaders must think about how VR and AR will affect students' privacy, what type of content is suitable, how it will affect students mentally, how much we rely on technology, and including everyone when using these new tools in the classroom. By dealing with these ethical issues right away, teachers can make sure that all students feel safe and included while using advanced technology for learning. This will make the technology have a better effect on how students learn. The difference in access to technology and the internet, and how easily people can use it. Making sure that every student has the same opportunity to use VR/AR technologies.

A big problem with using VR and AR in education is that some students might have these technologies while others don't. Schools and policymakers need to work together to make sure all students have the same chances to do well. Schools can think about using VR/AR technology that all students can use, even if they don't have it at home.

his can include having special places at school with VR/AR equipment or using carts that can be wheeled to different classrooms. Decision-makers can give money and help to schools so they can get VR/AR technologies. They also need to make sure that schools in areas with not enough resources get good support to give all students a chance to use these tools. Helping students with disabilities take part in virtual reality and augmented reality activities.

Accessibility is really important when using VR/AR in school, especially for students who have disabilities. Schools and teachers need to make sure that VR/AR activities can be used by all students, no matter their abilities. Virtual and augmented reality apps need to work with tools that help people with disabilities, like screen readers or voice commands, so they can be used by students who have trouble seeing or moving. Teachers need to learn how to use VR/AR in a way that helps each student, so that everyone can benefit from these cool technologies. Working with experts and disability support services can help us figure out the best ways to make sure that all students can take part in VR/AR experiences.

Role of Schools and Policymakers in Bridging the Digital Divide

Schools are very important in helping everyone to have the same access to virtual reality and augmented reality technology. This means giving students access to VR/AR technology at school and making VR/AR activities part of their lessons. Schools can work with nearby businesses, groups, and leaders in the community to get more money or supplies for using VR/AR in schools that need it. Decision makers should create plans to help make sure everyone has equal access to technology, including virtual and augmented reality, in schools. They should also provide money to help schools get the technology they need. Decision makers can also argue for laws that help schools use technology, making sure they have what they need to

invest in VR/AR technology. When schools, government leaders, and tech companies work together, they can make it easier for students to use VR/AR technology in school. This will help more students to have access to this technology.

It's really important to make sure that all students have access to VR/AR technology in education so that everyone has a fair chance to learn. Schools and people who make decisions have an important job to make sure everyone can use VR/AR technology, help students with disabilities, and make sure technology is used by everyone. By working together and using smart rules, teachers can use VR and AR to make learning more exciting and effective for all students, no matter where they come from or what they can do.

Finding a mix between online activities and in-person learning

Virtual Reality and Augmented Reality can make learning more interesting, but it's important to also use regular ways of learning, like books and hands-on activities. Teachers should use VR/AR in the classroom in a way that helps students learn better, without taking the place of regular teaching methods. Using virtual experiences can help to make hard concepts easier, create difficult situations to practice, or show places far away. Physical learning lets students use real objects, be in their environment, and work together with other students in person. It's important to learn by doing because it helps you develop real-life skills, think carefully and solve problems. Using VR/AR too much could reduce chances for trying things out and figuring things out yourself. Teachers should find when it's better to use real-life experiences instead of virtual ones. For instance, doing science experiments, making art, and playing outside are good for learning by using your body and senses. A good education means having a mix of online and in-person learning. This helps students learn a variety of skills and have different experiences.

Motivating students to discover the real world as well as virtual experiences

VR and AR can help students to explore and learn about the real world. After trying virtual trips or simulations, teachers can plan actual trips to the same places. This helps students remember what they learned online and gives them a chance to do things in real life. Virtual experiences can make kids interested in certain topics and make them want to learn more about them by visiting places or doing activities in their own neighborhoods. Encouraging students to use both online experiences and in-person activities helps them understand the topic better and feel a connection between what they learn online and in real life.

Tailoring educational experiences to fit the goals of learning

Teachers should think about what their students need to learn and what will help them the most when they choose between using VR/AR and hands-on learning. VR/AR can help explain difficult concepts and simulations. It's also helpful for exploring history and different cultures. Learning by doing with your hands is good for getting better at using your fingers, being creative, and making friends. These things are important for a complete education. It's important for students to have a mix of using screens and doing things in real life for a well-rounded education. Virtual Reality (VR) and Augmented Reality (AR) can make learning more interesting and real, but they should only be used to add to traditional ways of learning, not to replace them. Encouraging students to learn about the real world and also use virtual experiences helps them become curious, think carefully, and really understand the subjects they are learning about. Educators can mix virtual and in-person learning to help students learn better. They can adjust the activities to match what students need to learn, so they get a good education.

The advantages of virtual reality (VR) and augmented reality (AR) in education are carefully studied. "Enhanced Visualization and Understanding" explains how technology helps students understand difficult ideas by using interactive and hands-on experiences. "Experiential Learning" is about learning by doing things. Students practice and use what they know in real-life situations. "The use of VR and AR in education captures students' attention, helping them to stay focused and remember information better. The article talks about how VR can help students see faraway or risky places in the classroom, and how AR can show cultural experiences right in front of them.

In addition, "Personalized and Differentiated Learning" uses VR and AR to help people learn in their own way, encouraging them to learn on their own and understand things better. "Safe and Controlled Learning Environment" talks about how VR lets students practice real-life situations without any danger, especially in areas like medicine and engineering. "Working together and talking to each other" shows how VR and AR can help students in different places learn and work together.

The importance of making sure that VR and AR technologies are accessible to all kinds of learners, including those with disabilities, is highlighted in "Inclusivity and Accessibility. Finally, "Real-Time Feedback and Assessment" shows how AR can give quick feedback to teachers, so they can see how students are doing and teach them better. Overall, 2 shows how Virtual and Augmented Reality can be used in education. This shows how new technology can make learning more interesting, help students think and question and understand their school work better. By using VR and AR in schools, teachers can make fun and interesting learning spaces that motivate students to be involved in their learning. Artificial intelligence is being used to help teachers and students learn better. Artificial Intelligence is changing education by providing new ways for students to learn and get better grades. This talks about how AI can help people learn better and how AI tutors and learning assistants can help. It also talks about the importance of keeping people's data private and making sure AI doesn't show favoritism.

AI-Powered Tailored Learning

In regular schools, teachers usually teach the same lessons to all students, even though they have different abilities, interests, and ways of learning. However, each student is different, and we should consider their own needs and likes to help them learn better. Personalized learning understands that every student is different and tries to customize the way they learn to suit their individual needs. Personalized learning is about making sure each student can learn in the way that works best for them. This means considering things like how they learn and what helps them understand new ideas. For example, some students might learn better when they see pictures, while others learn better when they can do things themselves. Personalized learning uses different teaching methods to help students with different ways of learning.

Students are more interested and excited when they can study things they like. Personalized learning makes people excited and helps them learn better by focusing on the things they are interested in. Recognizing what a student is good at and where they need help helps teachers focus on making their strong skills even better and giving them help in the areas they find difficult. Personalized learning lets students go through the school work at their own speed. They can take their time with difficult things and go faster with things they are good at. Using AI to personalize learning for each student in a classroom or school is hard to do without technology. This is when AI starts to be involved. AI technologies like machine learning and data analytics can handle large amounts of data from students using educational content and platforms. The information has test scores, what people look at online, and how they do on quizzes or activities. By looking at this information, AI programs can make personalized

learning plans for each student. The process includes AI gathers and studies information from different places like websites, education apps, and tests. This information shows how the student is doing in school and what they like to learn.

Analyzing and organizing data, the AI system uses computer programs to find patterns and trends. It makes detailed reports about how each student learns, what they are good at, what they need help with, and how they like to learn. The AI system suggests learning materials like videos, articles, and quizzes that match what the student needs and likes, based on analyzing data. Adaptive Assessment AI can give tests that change to match how well a student is doing. The questions get harder or easier based on how the student is doing, so the tests always match what the students can handle. Advantages of AI-Powered Personalized Learning AI in personalized learning helps students and teachers have a better learning experience. When students get learning materials that match their interests and how they learn, they get more interested and motivated to learn. This helps them remember what they learn better.

Better Understanding of Subjects Through personalized learning with AI, students can focus on their own learning needs and improve their understanding of subjects. This helps them to grasp concepts thoroughly and have a deeper understanding of their studies. Students are given more control over their learning. They can learn about things they like and become more involved in their education. Improvement in School Grades When students get the help and resources they need, their grades and self-confidence get better, leading to higher success in school. Using AI to personalize learning makes education better by making it more tailored to each student, instead of the same for everyone. It helps students learn better and keeps them interested. By using smart computer programs to look at information and give personalized learning plans, teachers can make better and fairer learning spaces. This means every student can do their best. As technology gets better, using AI in education could make learning more personalized and improve education in a good way.

CONCLUSION

Learning a language using Augmented Reality (AR) could be a great way to make it more fun and interesting. It can give you a more realistic and interactive experience, which can help you learn better. This summary showed how Augmented Reality can be used to help people learn languages. It can give personalized practice and help people understand different cultures. Even though there are difficulties like technology problems and creating content, it's clear that AR can really help people learn new languages. In summary, using AR in language education has a lot of potential to help students learn the language and understand different cultures in our connected world. By using AR technology, teachers can make fun and real language learning places that make students curious, help them communicate better, and understand different cultures. In the future, we need to keep searching, working together, and coming up with new ideas to make the most of AR in language learning and help students succeed in different languages.

REFERENCES:

[1] Y. Zhou and M. Wei, “Strategies in technology-enhanced language learning,” *Stud. Second Lang. Learn. Teach.*, 2018.

[2] N. Mohamad Nor and R. A. Rashid, “A review of theoretical perspectives on language learning and acquisition,” *Kasetsart Journal of Social Sciences*. 2018.

[3] J. Kannan and P. Munday, “New trends in second language learning and teaching through the lens of ICT, networked learning, and artificial intelligence,” *Circ. Linguist. Apl. a la Comun.*, 2018.

[4] V. Persson and J. Nouri, "A systematic review of second language learning with mobile technologies," *Int. J. Emerg. Technol. Learn.*, 2018.

[5] F. Rosell-Aguilar, "Autonomous language learning through a mobile application: a user evaluation of the busuu app," *Comput. Assist. Lang. Learn.*, 2018.

[6] A. Habók and A. Magyar, "Validation of a Self-Regulated Foreign Language Learning Strategy Questionnaire through multidimensional modelling," *Front. Psychol.*, 2018.

[7] T. Grigoryan, "Investigating digital native female learners' attitudes towards paperless language learning," *Res. Learn. Technol.*, 2018.

[8] N. McLelland, "The history of language learning and teaching in Britain," *Lang. Learn. J.*, 2018.

[9] N. Purba, "The Role of Psycholinguistics in Language Learning and Teaching," *Tell Teach. English Lang. Lit. J.*, 2018.

[10] M. Pawlak and Z. Kiermasz, "The use of language learning strategies in a second and third language: The case of foreign language majors," *Stud. Second Lang. Learn. Teach.*, 2018.

[11] M. Hedayati, B. Reynolds, and A. Bown, "The impact of computer-assisted language learning training on teachers' practices," *J. Lang. Teach. Res.*, 2018.

[12] R. Yetkin and S. Ekin, "Motivational orientations of secondary school EFL learners toward language learning," *Eurasian J. Appl. Linguist.*, 2018.

CHAPTER 4

AI TUTORS AND LEARNING ASSISTANTS: AN ANALYTICAL REVIEW

Raghavendraprasad H D, Assistant Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- p.raghavendra@jainuniversity.ac.in

ABSTRACT:
Artificial Intelligence (AI) has emerged as a transformative force in education, particularly through the development of AI tutors and learning assistants. This abstract explores the evolving role of AI in education, focusing on its potential to revolutionize traditional teaching and learning paradigms. AI tutors and learning assistants leverage machine learning algorithms and natural language processing to provide personalized, adaptive, and scalable support to learners across various domains. This abstract delves into the diverse applications of AI tutors and learning assistants, including personalized tutoring, content recommendation, feedback provision, and progress tracking. It highlights the benefits of AI in enhancing learning outcomes by catering to individual learning styles, addressing misconceptions, and promoting self-directed learning. Additionally, it discusses the challenges and considerations associated with the adoption of AI in education, such as privacy concerns, ethical considerations, and the need for teacher training and support. Despite these challenges, the abstract underscores the transformative potential of AI tutors and learning assistants in democratizing access to quality education, fostering inclusivity, and optimizing learning experiences. By harnessing the capabilities of AI, educators can augment their teaching practices, empower learners, and unlock new opportunities for personalized and adaptive learning.

KEYWORDS:

Adaptive Learning, Artificial Intelligence, Chatbots, Data-Driven, Intelligent Tutoring Systems, Machine Learning.

INTRODUCTION

In the last few years, smart computer programs and virtual helpers have become really important in education. These smart AI robots help students learn better and make it easier for teachers to organize their work. Let's look closer at each part. Intelligent Tutoring Systems are smart computer systems that act like human tutors to help with learning. These systems use computer programs to study student information, understand how they learn, and provide personalized teaching and advice. Important parts of IT'S include. Customized teaching ITS changes the way it teaches and what it teaches based on how each student learns, how fast they learn, and how well they are doing. This personal approach makes sure that each student gets the right help and things to do that match their skills. Instant Feedback Just like a teacher, ITS gives quick feedback on student answers to tests and exercises. This quick feedback helps students fix their mistakes and makes them understand the lessons better. Adaptive Learning ITS changes the difficulty of learning materials as the student learns. It brings new challenges as students learn new things, helping them improve and grow. Virtual teaching assistants are like robots that help teachers with their paperwork and organization. These helpers can take care of everyday tasks, so that teachers can spend more time on important teaching activities. The main jobs of virtual teaching assistants are: Virtual teaching assistants can help with administrative tasks such as keeping track of attendance, scheduling, and organizing course materials. This automation makes tasks easier for teachers and gives them more time to teach [1], [2].

AI-based assistants can check and grade assignments, quizzes, and tests very accurately and quickly. This automation saves time and makes sure that evaluations are always the same. Virtual teaching assistants can help students with questions about their class like the material they are learning, when assignments are due, and other important information. Students can get information quickly and this helps them learn better and stay interested [3], [4].

Virtual assistants in Learning Analytics can look at information about how students are doing in their studies and how much they are taking part in class. This can help teachers understand how students are doing and how they behave. This information helps teachers change their teaching methods and help students better improve how students learn. AI tutors and helpers make learning better for students because they can help in a very good way. Find out what students don't know by watching how they're doing their work. AI tutors can quickly understand where students are struggling or have misunderstandings. This helps teachers to quickly fill in the gaps in learning and avoid children from falling behind. AI tutors can suggest extra materials like articles, videos, or practice exercises to help you learn better and explore more. Create a helpful learning environment by giving students personalized feedback and support from AI tutors. This help makes them feel more confident and motivated to do well in school.

AI tutors and virtual teaching assistants are very important in changing the way we learn in school. By copying how human teachers work and taking care of paperwork, they make learning easier, so teachers can spend more time helping students. Furthermore, these AI programs help create customized and helpful learning experiences that make it easier for students to do well in school. As AI technology gets better, AI tutors and learning helpers will probably have a bigger effect on education. This will make learning better for students and teachers. As AI becomes more important in schools, we need to make sure we protect students' information and don't treat people unfairly. Protecting students' information and making sure it's used in the right way is very important for keeping trust in schools and AI technologies. Furthermore, it is important to reduce bias in AI programs to prevent making social inequalities worse [5], [6].

DISCUSSION

In education, using AI means collecting and studying a lot of student information like grades, likes, behavior, and sometimes private details. To keep this data safe from unauthorized use, schools need to focus on keeping it private and secure by doing the following things. Data Encryption Data should be coded when it is being kept and sent to stop people from looking at it without permission. Access controls help to keep student data safe by only allowing certain people to see it. This lowers the chance of data breaches. Hiding people's personal details in the data keeps their identities safe. Regular checks of how data is handled and security measures help find and fix any possible weaknesses. Educational institutions need to follow data protection laws to make sure that they protect people's information [7], [8].

The school and AI companies must follow strict rules when using student information. It is very important to make sure that data is only used for school work and not used for making money or causing harm. Basic rules for using student data ethically are. Schools should ask students and their parents' permission before they collect and use their information. We should only use the data we collect for educational reasons and not use it for other purposes without the right permission. Data Minimization means only gathering the smallest amount of data needed for education to lower risks. Data Retention Policies make rules for how long data should be kept. They make sure that data is not kept longer than it needs to be. Clear rules about how data is used should be communicated to students, parents, and staff. Reducing Bias AI

algorithms learn from old information, which might have unfair ideas from society. These prejudices can continue and get stronger because of the computer programs, causing unfair and unfair results. To make AI systems used in education fair, we can take these steps to reduce bias.

Using a wide variety of data to make sure that everyone is represented fairly and equally in computer programs helps to reduce unfairness and make sure all students are treated fairly. Regular checks on AI programs can help find and fix any unfairness that might have happened during their training. Using tools to find bias can help us see if AI models are biased. Using human oversight and intervention in decision-making can stop biased outcomes from happening without anyone checking. Continuously checking how well AI systems are working helps find and fix any unfairness that might come up. Creating diverse teams in the development and design of AI systems can help find and address any potential biases early on [9], [10].

By using strong privacy and security measures and following ethical rules, schools can make sure that AI in education is used fairly and responsibly. This method keeps students safe and helps them trust AI educational tools. It also helps everyone feel included and treated equally in the learning environment. AI technology is used to make learning more personal and specific to each person instead of using the same lessons for everyone. Using AI programs, we look at a lot of information about students to make personalized learning plans. We change the content, speed, and help for each student based on what they need, like, and how they learn. AI personalized learning helps students learn better by keeping them interested, helping them understand subjects well, encouraging independent learning, and improving their academic performance.

AI tutors and learning assistants are really important in making education better. Intelligent Tutoring Systems are like human tutors and give interactive and changing learning experiences. They give feedback right away, teach each student in a way that works for them, and use information to help each student get better. Online teaching helpers do things like grading tests and answering student questions. This helps teachers have more time to work one-on-one with students. Ensuring that people's information is kept private and that there is fairness in using AI in education is very important. Schools and colleges need to make sure they keep student information safe by using strong security measures to prevent it from being seen or stolen by people who shouldn't have it. Ethical rules make sure that student information is only used for school work and not used for making money or causing harm. In addition, it's important to reduce prejudice to stop AI programs from continuing unfair beliefs in society. Teachers and AI creators need to work hard to make sure that their programs and systems are fair for everyone. They should use different kinds of information to lessen unfairness in the computer programs. By using AI in education carefully and making sure to protect data and use it ethically, educators can use AI to make learning better for students. This can create a better future for education.

Using games and fun to help with learning is called gamification. It uses people's natural love of playing and competing to make learning more enjoyable and effective. In this article, we explore how gamification principles can be used in education. Educators can make learning more fun and motivating by understanding what makes people want to play games. This can help students enjoy learning more and develop a passion for it [11], [12].

The Psychology of Gamification

Gamification is using game elements like points and rewards in non-game situations to keep people motivated and interested. It's important for teachers to understand how gamification

affects people's thoughts and feelings if they want to use it to motivate students in a good way in school. Many ideas from psychology help make gamification successful. Studying how games can motivate people to keep playing for a long time. Players find games interesting and stay involved for a long time. This motivation comes from many different things. Games give players clear things to work towards and accomplish, which helps them know where they're going and why they're playing. In school, when teachers tell students exactly what they are supposed to learn, it can help them work harder and be more interested in learning.

Immediate Feedback Games give you feedback right away. This helps you see how you're doing and make changes if needed. In school, getting feedback on time can help students know what they're good at and what they need to work on. This helps them get better and feel good about learning. Video games often celebrate small victories and successes, making players feel proud of what they have done. In the same way, when we notice and celebrate the things students do well, it can make them feel good about themselves and want to keep learning. Understanding what motivates people, from within themselves and from outside factors, is important. Gamification can tap into both of these kinds of motivation and affect how people act. Intrinsic motivation means being motivated from inside yourself and enjoying doing something just because it feels good. In gamification, you can make people more motivated by making learning fun and satisfying. When students have fun and feel satisfied while learning, they are more likely to work hard and be interested in their studies. Extrinsic motivation is when you do something because you will get something in return, like a reward or prize. Gamification uses rewards like points, badges, or rankings to motivate people to learn. Using outside rewards to motivate people can work for a little while, but teachers should be careful not to depend only on these rewards. It might make people less motivated from within in the long run.

Gamification is using game elements to make learning more fun. Flow is when people are really focused on something and lose track of time. It feels like they are completely involved in the activity. In a state of flow, people feel really focused and engaged. They are not bored or anxious. In video games for learning, it's important to pick challenges that are just right for the students' abilities. If the tasks are too simple, students might get bored and lose interest. However, if the problems are too hard, students might get upset and lose their motivation. Gamification can change the difficulty of learning based on how well students are doing, so it keeps them engaged and focused. Getting rid of things that can take your attention away can help you stay focused. Distractions can interrupt your concentration. In schools that use games for learning, teachers should make sure the activities keep students interested and focused. They should avoid anything that might distract students and keep them on task. Teachers need to understand how gamification works in order to make learning fun and interesting for students. Educators can use games to motivate students and help them learn better. They need to understand what motivates students and make learning enjoyable to help students stay interested and learn more. It's important to carefully plan and create gamified activities in a way that helps students learn over a long time.

Using games as a way to teach in school

Teachers can use things like points, badges, and rewards to make learning fun and motivate students. This can help students stay interested and do well in school. Let's learn more about these ways to make games more engaging. Points, badges, and leaderboards are the basic parts of gamification. Points are an important part of gamification that show how well someone is doing in a game or task. Students get points for doing things like homework, tests, projects, or joining in class activities. Points are a way to show how well you are doing and to encourage you to keep learning more. In simple words: Badges are signs or symbols that show someone

has achieved something or has a particular role or authority. Badges are special pictures given to students when they do something really well, like learning new things or doing very good work. Badges are like awards that show when someone has done a good job. They can make students want to do better and try harder in their school work.

Leaderboards

Leaderboards show how students rank based on their points, badges, and other accomplishments. Public leaderboards can make students compete and strive to do better and move up in the rankings. However, teachers need to be careful about making the classroom too competitive because it might make some students feel less motivated. Keeping track of the things you are working on and setting goals for what you want to achieve.

Gamified learning platforms show students how they are doing and what they are learning in a fun way. By checking how they are doing, students can see that they are getting better over time. This makes them feel good about themselves and helps them stay motivated to keep learning. Creating specific and attainable targets is very important when using games for learning.

By asking students to set goals, teachers can help them take charge of their own learning. When students set clear and doable goals, they are more likely to stay focused and motivated to achieve them. Reward systems are ways that companies or organizations give out rewards or bonuses to employees for meeting certain goals or performing well at their job. Incentives are also rewards given to encourage people to work harder or do better. In fun learning games, students can earn both inside and outside rewards. However, teachers need to be careful not to rely too much on material rewards, as it could make students lose interest in learning in the future.

Incentives are rewards to encourage students to get involved and join in. One way teachers can motivate students is by giving them extra points for doing extra work, letting them access study materials early if they participate a lot, or hosting a fun learning event as a reward for reaching certain goals. Rewards make learning fun and help students want to learn on their own. In general, using games in education can help students stay interested and motivated. By using things like points, badges, leaderboards, tracking progress, setting goals, rewarding students, and giving incentives, teachers can make learning more fun and motivating for students. This can help students become more involved in learning and enjoy it. Like any teaching method, it's important to find the right balance and adjust gamification to fit the specific needs and interests of each student.

Making classroom activities into a game

Gamification can make regular classroom activities more fun and interesting for students. It grabs their attention and helps them learn in a more meaningful way. By adding fun game parts to different school activities, teachers can make learning more exciting and interesting. Let's see how we can use gamification in three different class activities.

Fun quizzes and tests that feel like games

In a fun quiz game, teachers can make questions that are easy or hard. As students take the quiz, they get harder questions and earn more points for answering them correctly. This plan motivates students to push themselves and rewards their progress in learning and abilities. Adding time limits to quizzes makes students feel like they have to think fast and make choices quickly. This can make them feel a sense of urgency. Timed quizzes can be like real-life situations and can help students think and solve problems better. Students get feedback right

away after each quiz question, which helps them understand how well they know the subject. Encouraging students with points or badges when they give right answers makes they want to work hard and do their best. Choose-your-own-adventure stories let students make choices that change the story. Students are learning by making choices and seeing how they affect the story. Role-playing activities help students learn by pretending to be in real-life situations. This helps them use what they know to solve problems and make decisions. Playing make believe can help students understand others and learn about difficult things while working together and talking with each other. Character development and progression means that students can create characters that change and grow as the story or game goes on. Students care more about their characters doing well, which makes them feel like they own and are committed to the learning experience.

Virtual Expeditions and Simulations

Virtual field trips and simulations let students explore new places and learn about history or science in a safe and realistic way. By taking students to different places, teachers can make learning more memorable and hands-on. In virtual lessons, teachers can create fun games and tasks that make students use what they've learned to solve problems and reach certain goals. Successfully finishing these challenges helps you learn better and makes you feel proud of yourself. Working together with classmates and using computer programs to explore and learn things together. When students work together to solve problems, they learn to communicate and work as a team. This helps create a friendly and welcoming learning environment. Teachers can make learning more fun by turning quizzes and assignments into games, telling interactive stories and acting out scenes, and taking students on virtual trips and simulations. This makes students more interested and excited about learning. Gamification uses games and competition to make learning more fun and motivating for students. When used carefully, games can help students learn better, get more interested in school, and make the class better.

CONCLUSION

AI tutors and learning assistants are changing how we learn. They give personalized help to students in many subjects and can change to fit each student's needs. This summary has explained how AI can change education for the better.

It can help students learn more, meet their specific needs, and make teaching better. Even though there are some problems like privacy and training for teachers, AI can really help in education. Overall, using AI tutors and learning assistants can help more people access good education, include everyone, and improve how people learn. By using AI technology in a responsible and ethical way, teachers can improve their teaching, help students learn better, and create new ways for customized and flexible learning. In the future, it's important to keep learning, working together, and coming up with new ideas to make AI a big help in changing how we learn in the digital age.

REFERENCES:

[1] J. L. Alzen, L. S. Langdon, and V. K. Otero, “A logistic regression investigation of the relationship between the Learning Assistant model and failure rates in introductory STEM courses,” *Int. J. STEM Educ.*, 2018.

[2] L. M. Top, S. A. Schoonraad, and V. K. Otero, “Development of pedagogical knowledge among learning assistants,” *Int. J. STEM Educ.*, 2018.

[3] J. L. Alzen, L. Langdon, and V. K. Otero, “The Learning Assistant model and DFW rates in introductory physics courses,” 2018.

[4] A. J. Maher and P. Vickerman, "Ideology influencing action: special educational needs co-ordinator and learning support assistant role conceptualisations and experiences of special needs education in England," *J. Res. Spec. Educ. Needs*, 2018.

[5] F. Davenport, F. Amezcua, M. S. Sabella, and A. G. Van Duzor, "Exploring the Underlying Factors in Learning Assistant - Faculty Partnerships," 2018.

[6] B. Arend, "Investigating Siri as a virtual assistant in a learning context," *Proc. 12th Annu. Int. Technol. Educ. Dev. Conf.*, 2018.

[7] D. E. Akcora *et al.*, "Conversational support for education," in *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 2018.

[8] B. Silva, M. A. S. Netto, and R. L. F. Cunha, "JobPruner: A machine learning assistant for exploring parameter spaces in HPC applications," *Futur. Gener. Comput. Syst.*, 2018.

[9] E. E. Mon, N. Funabiki, R. Kusaka, K. K. Zaw, and W. C. Kao, "A test code generation method for coding standard input/output with exception handling in Java programming learning assistant system," *Adv. Sci. Technol. Eng. Syst.*, 2018.

[10] A. J. Maher, "'Disable them all': SENCO and LSA conceptualisations of inclusion in physical education," *Sport. Educ. Soc.*, 2018.

[11] C. Thurgate, "Supporting those who work and learn: A phenomenological research study," *Nurse Educ. Today*, 2018.

[12] R. E. Scherr and R. M. Goertzen, " Periscope□: Looking into Learning in Best-Practices Physics Classrooms ," *Phys. Teach.*, 2018.

CHAPTER 5

EXPLORING THE INTERSECTION OF LEARNING AND ENTERTAINMENT

Dimple Bahri, Assistant Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- dimple.bahri@jainuniversity.ac.in

ABSTRACT:
The intersection of learning and entertainment, commonly known as edutainment, represents a dynamic and evolving approach to education that leverages engaging and interactive content to facilitate learning experiences. This abstract investigates the multifaceted realm of edutainment, examining its potential to redefine traditional educational paradigms and engage learners across diverse demographics. Edutainment encompasses a wide range of media formats, including educational games, interactive simulations, virtual reality experiences, and multimedia storytelling. These immersive and interactive platforms offer learners the opportunity to acquire knowledge and skills in a fun and engaging manner, blurring the lines between education and entertainment. This abstract highlights the benefits of edutainment in promoting active learning, fostering curiosity, and enhancing retention. By integrating elements of storytelling, Gamification, and interactivity, edutainment captivates learners' attention and motivates them to explore complex concepts and topics.

KEYWORDS:

Edutainment, Gamification, Interactive Learning, Learning Games, Serious Games, Simulation.

INTRODUCTION

Designing the curriculum is really important for how students learn. In this, we look at how we can use game principles in lesson planning to encourage students to take part and really understand the topics. In order for using games in education to work well, it's important to make sure the goals of the game align with the bigger goals of the school's curriculum. In this way, teachers make sure that the game-like parts help students understand important ideas and make their learning better. Here's how to make sure everything lines up correctly [1], [2].

Finding the main ideas and what you should learn from them

Teachers should begin by creating a detailed map of what they want to teach. This means finding the important ideas, abilities, and information that students need to learn in a certain subject or topic. Learning goals after figuring out the main ideas, clear and specific learning goals should be created. Learning objectives tell you what you should be able to do at the end of a class, lesson, or course. Consider using a competency-based approach that focuses on how well students can use what they've learned in real life. Gamified learning goals should match these skills and focus on real-life use.

Adapting Game Parts Different topics and different ages might need different game parts to work well. For instance, math can use points and quizzes, and history can use stories and acting. Challenges in games should be the right level for the player's age so they stay interested and can learn at their own pace. Younger students might need easier games, while older students might like harder challenges. Using games to learn different subjects together can help students learn in a more holistic way. Combining games with school subjects helps students understand how things are related and gain a better overall understanding of the world. Inclusive design

makes sure that gamification works for all students, no matter how they learn or what abilities they have. When making fun learning activities, think about how different people like to learn and what they need. Find the right mix of traditional teaching and gamification. Gamification should work together with traditional teaching, not take its place. The fun parts of the game should help people learn better, but they shouldn't be more important than what they need to learn [3], [4].

In the end, the key to gamified learning working well is making sure it fits with the overall educational goals and can be changed to fit different subjects and ages. By using games in lessons in the right way, teachers can make learning more interesting and help students understand the main ideas better. This can also make students more interested in taking part and working hard to reach their goals in school. Gamification can change how tests are done in school. Teachers can make tests more fun for students by adding game-like features. This will make students more interested and motivated to do well. We can make tests more like a game. This can be used for both practice tests and big tests. It makes the usual way of testing into a fun and interactive way to learn. Gamification means using game-like elements to make something more engaging or motivating. In Formative and Summative Assessment, gamification can be used to make the process of learning and testing more fun and interactive.

Formative assessments are tests or checks that happen while you are learning to tell you how you are doing and help you learn better. In formative assessments, gamification can be done by using fun quizzes, educational games, and getting feedback right away. Gamified quizzes help teachers see what students are good at and what they need help with. This makes it easier for teachers to give students the right kind of help at the right time. Testing at the end of learning to see what students know and can do. Summative tests can be made into fun games with stories, puzzles, and prizes. "Games in tests keep students interested and excited. This helps them feel less worried and have a good experience during the test [5], [6].

Gamified Rubrics and Feedback Mechanisms

Traditional rubrics can be changed to be more like games. Students can move through different levels or stages based on how well they do. For example, students can begin with little experience and improve to become really good at a certain skill or subject. This way shows progress in a clear way and encourages students to work harder to do better. Immediate Feedback Gamification means getting feedback right away after finishing a task or test. Students get instant feedback on their work, showing them which answers they got right and explaining the ones they got wrong. It also gives them helpful advice on how to improve. The quick feedback helps students learn from their mistakes and improve their learning quickly. Reward systems in feedback are like getting points or badges when you reach certain goals. They can be used in giving feedback. Praising and giving rewards to students when they do well helps to make them want to keep trying their best. Keeping track of your progress can be fun with feedback tools that are like games. These tools help students see how they are doing as they work on their assessments. Tracking progress helps students know how they are doing and gives them the power to take control of their learning. By using games to test and grade students, teachers make learning fun and help students do well. Playing games during tests can make students want to do better, feel less stressed, and have a positive attitude towards learning and improving. Plus, they give important information about how students are learning and performing, helping teachers make better choices to improve learning. It's important to find a balance between using games and making sure assessments are still challenging. This way, we can focus on doing well in school while also using fun game elements to make assessments better.

Strategies for keeping people interested for a long time

Using fun games to help students learn for a long time, like a whole semester or year, by keeping them interested and motivated. It's important to keep students interested so they keep learning and feel like they are in charge of their own education. This helps them make steady progress towards their academic goals. Here are some good ways to keep people interested for a long time [7], [8].

Storytelling and how the story develops over time

Creating an interesting story that keeps students interested throughout their learning can capture their imagination. The story should be about the things students need to learn and should include characters, problems, and adventures that students face as they learn. Thematic progression is when students explore different parts of a topic in a lot of detail. Each new part of the theme should be harder than the last and give you chances to learn and improve.

Advancing based on what you have accomplished

Advancing to higher levels when completing challenges and mastering skills can help students stay engaged for a long time. More advanced levels should show more difficult or deeper knowledge, making you feel like you've accomplished something and moved forward. Unlockable content is like extra stuff that students can get when they do well in the game. It can be things like bonus things, secret tasks, or more resources. It helps students stay interested and work harder to do better.

Collaborative projects and contests

Working together on projects and doing activities in groups helps people work as a team and interact with each other. Students can help each other to reach the same goals and create a feeling of belonging. Arranging fun competitions between classes or schools promotes friendly competition and teamwork. Top teams can win prizes and be recognized as the best. This can make students work harder and feel proud of what they accomplish. Personalization means making something unique to a particular individual, and choice means being able to pick what you want. Personal Learning Paths give students the freedom to choose what they want to learn and focus on what they're good at.

This helps them feel in control of their education. Giving students options in their assignments or projects helps them to pick topics that they find interesting and makes them want to work harder. Creating challenges or projects that have many different ways to solve them helps people think creatively and critically. Students stay interested when they can explore and share their ideas freely. Giving student’s feedback on time, and telling them how to improve, is really important for getting better. Getting feedback regularly helps students know how they're doing and what they're good at, as well as where they can improve. Recognizing and celebrating students' successes, no matter how small, helps them feel good and want to keep doing well in the future. Giving students badges, certificates, or praise in front of everyone can make them feel even better about their achievements [9], [10].

Creating plans for keeping students interested in gamified education for a long time requires thinking carefully and checking on the students' needs and progress often. Teachers can make learning more interesting and long-lasting by telling stories, having a theme that progresses, working together on projects, making things personal, and giving feedback at the right time. Also, creating projects and units about gas that students find interesting and related to their educational goals makes sure they stay interested in learning. This leads to a more enjoyable and life-changing learning experience.

DISCUSSION

Games are usually fun, but they can also help us learn. We want to see how learning and fun can work together, and how teachers can use this to help students learn better.

Encouraging kids to enjoy learning by playing games

Games can grab people's attention and encourage them to learn, which makes them really good for helping people enjoy learning. By adding games to learning, teachers can get students more interested and make learning more fun. This can help students use skills they learn in games in their everyday life. This is how playing games can encourage you to enjoy learning.

The Importance of Being Involved to Remember Information

Active Participation Games need players to actively take part, which helps them think more deeply and remember things better. When students are interested and involved, they are more likely to remember and use what they learn for a long time. Games usually tell you how well you're doing right away so you can fix any mistakes and do better next time. This feedback loop helps people learn better.

Creating good connections with learning

Games are really fun and enjoyable. They make learning feel good because they create happy emotions. When students think learning is fun, they will be more excited to try new things and learn new stuff. Intrinsic motivation games give you motivation from inside yourself by giving you challenges, letting you explore, and making you feel satisfied when you achieve something. When students want to learn because it makes them happy, they are more likely to learn on their own [11], [12].

Using games to learn and apply knowledge in the real world

Games can make learning feel real by simulating things in the real world. This helps students understand how knowledge is useful in real life situations by connecting what they learn to how it is used. Solving problems and making decisions are important in many games. These skills can be used in real life when you need to think carefully and make important decisions.

Using skills learned in games in real-life situations

Games teach you skills that you can use in many parts of your life, like school, personal stuff, and work. These skills include thinking, working with others, and talking to people. When people do well in games, it can make them feel more confident and believe in their ability to take on challenges in other areas of their lives. Exploration Games that are risk-free give learners a safe place to try new things and take chances without worrying about making mistakes or being punished. This helps students try out different ways to solve problems without any limits. Many games let you be creative by designing and solving problems. Encouraging creativity in video games can make people more creative in other parts of their lives.

Finding the right balance between fun and serious learning

Playing fun games can make learning more interesting and fun. However, teachers need to find a good mix between fun and challenging work to make sure students stay focused on learning. Meaningful Integration Gamification needs to do more than just adding basic game features to learning. Making sure that the games we use fit with what we're trying to teach and what we want students to learn. Games should be difficult and make you think hard to solve problems. The right mix of things that are hard and help makes learning the best it can be. Thinking about

what happened when you played games and using strategies to understand and improve how you learn. Games can help people enjoy learning, create positive feelings about learning, use their skills in real life, and think creatively and critically. When games are used in education, they can make learning more fun and exciting, and help make students interested in learning for their whole lives.

Learning through games and using the skills in the real world

Game-based learning means using games to help people learn and get better at things. Game-based learning helps people learn real-life skills that they can use outside of the game. This is how playing games can help you use your skills in real life. Some games are made to copy real situations, so you can use what you've learned in a real way. For instance, games that mimic real life in areas such as medicine, engineering, and business help people learn by giving them hands-on experience.

This improves their skills in solving problems. Games that involve decision-making and problem-solving often need players to make smart choices and solve difficult problems. These skills can also be used in real life when you need to think carefully, like solving everyday problems or making decisions at work.

Playing games with others helps people work together and talk to each other. These teamwork skills can be used for group projects, at work, and in other real-life situations where working well with others is important. Games often have surprises and difficulties that players need to deal with. As students deal with changes and keep trying even when they fail, they become stronger and better at dealing with unpredictable events in real life. In many games, players have to complete tasks and reach goals within a certain amount of time. These experiences can help students get better at managing their time and setting goals, which are important in school, personal life, and work.

When you learn things from games and use them in real life, it's called transfer of learning. It happens when you can use what you've learned in one place in a different situation. Helping people learn new skills involves thinking about a few things. We need to make sure that the skills people learn in games can be used in real life. Teachers should talk about how the skills from games can be helpful in real life. Talking about how skills used in games can be useful in everyday life helps people understand better and makes them want to use those skills outside of the game.

Thinking about your gaming experiences and figuring out how you can use those skills in real life helps you understand and improve your thinking and learning process. Teaching step by step helps learners practice using their game skills in a controlled way before using them in real life. This can make it easier for them to use their skills in different situations. Connecting real-life problems and situations into learning games can help students connect what they learn in the game to real life and apply those skills in real-world situations.

Games let people try new things and be imaginative in a safe and controlled way. They can do this without worrying about making mistakes or facing bad results. This safe place helps students to take chances, think creatively, and come up with new ideas. Games help people try new things and be creative. You can test out different ideas and see what works without any negative consequences. By trying different ways and making mistakes, people can improve and learn from them. Exploration games let you play and have fun while you learn. You can solve different challenges and be creative. This fun activity helps students be creative and think of new ways to solve problems. Customization in games lets players show their creativity by designing characters, building worlds, and making artistic things. This freedom lets students

use their creativity to think of new ideas. Games are lots of fun and make people feel happy and relaxed. This helps people be more creative. When students feel comfortable and interested, they are more likely to try out new ideas and methods. Playing games that encourage different ways of thinking can help people be more creative by helping them come up with many possible solutions to problems. By using games to learn and letting students be creative, teachers can help students learn skills that they can use in real life. Game-based learning is a great way to help people learn practical skills and enjoy learning. It uses real-life examples and lets people be creative in a safe environment. This helps them learn and develop a love for learning that goes beyond just playing games.

One of the main challenges in using games for learning is finding the right mix of fun and serious learning. Although games can make learning fun and interesting, it's important to remember that the main goal is still to learn and achieve educational goals. Here are plans for finding the right balance. Start by making clear goals for what you want to learn, and make sure the game rules match these goals.

The game parts should make the main lessons and skills stronger. Meaningful gamification means using game elements in a way that adds value and makes sense, instead of just adding them for no real reason. Every game-like part should have a reason and help with learning. For instance, the points you earn should show how well you've learned the important ideas.

Create games that get harder as students get better. This makes sure that students move from simple ideas to harder ones smoothly, while keeping them interested and motivated. Create a game that changes the difficulty as you play better or worse. This way makes sure that every student gets the right level of challenge and doesn't get bored or frustrated. Regularly check how well students are doing in the games to see if they understand and are making progress. These tests can help make plans for how to make games better and make changes in teaching. Preventing shallow gamification. Superficial gamification happens when game parts are added without any real connection to what you're supposed to learn, which makes the experience feel empty or not very important. To prevent making games seem more important than they really are.

Concentrate on what you need to learn first, instead of playing games. Begin with the things students need to learn, and make fun games that help them understand and use the lessons. Make sure that the game parts are related to the topic and have a clear reason for being used in learning. Students need to understand why playing games is useful and how it can be applied to their learning. Don't focus too much on rewards. Rewards can motivate students, but if you focus too much on giving prizes, they might not pay attention to the learning. Find a good mix of outside rewards and the fun of learning to stay motivated. Teaching kids to think carefully and solve problems in learning games. Playing games can help you become better at thinking critically and solving problems. Here is how to blend these thinking skills into learning through games. Create games that give students difficult problems to solve that require them to think critically and find solutions. Students need to use advanced thinking skills to solve problems. Create situations in games where students have to make decisions and think about the different choices and what could happen as a result.

Encouraging creative thinking by making games that have many different ways to solve problems. Encourage students to try out different ways of solving problems and understand that there may not always be just one right answer. Encourage students to think about their gaming experiences and why they make certain decisions. Support students in thinking about how they solve problems to help them better understand their strategies. Connect video game challenges to real-world situations or relevant case studies. This link helps students understand

how their problem-solving skills can be useful in real life. By carefully mixing fun and serious learning, without making it too simplified or trivial, and adding thinking and problem-solving skills to games, teachers can use games as great tools for learning. Games that are well-designed for learning can make students interested, help them understand subjects better, and teach them important thinking skills that can be used outside of the game.

CONCLUSION

Edutainment is when learning and fun come together. It has the potential to change education in the digital age. Edutainment uses fun and engaging activities to get students interested and help them remember what they learn. This summary talks about different ways and good things about edutainment.

It shows how it can change traditional education and interest learners from different groups. Using edutainment in education has the potential to make big changes, but it also comes with challenges like making the content, testing it, and thinking about what's right and wrong. But, by facing these problems and using the good parts of edutainment, teachers can make fun and welcoming learning spaces that encourage learning for life. In conclusion, it's important to keep using edutainment in education to help kids enjoy learning, stay interested, and get ready for the digital future. By using entertainment to teach, we can create new learning experiences that help students succeed in a changing world.

REFERENCES:

[1] S. Li, S. Yamaguchi, and J. I. Takada, “The influence of interactive learning materials on self-regulated learning and learning satisfaction of primary school teachers in Mongolia,” *Sustain.*, 2018.

[2] L. Villardón-Gallego, R. García-Carrión, L. Yáñez-Marquina, and A. Estévez, “Impact of the interactive learning environments in children’s prosocial behavior,” *Sustain.*, 2018.

[3] J. J. Dudley and P. O. Kristensson, “A review of user interface design for interactive machine learning,” *ACM Transactions on Interactive Intelligent Systems*. 2018.

[4] Y. Pan, G. Novembre, B. Song, X. Li, and Y. Hu, “Interpersonal synchronization of inferior frontal cortices tracks social interactive learning of a song,” *Neuroimage*, 2018.

[5] N. Parsazadeh, R. Ali, and M. Rezaei, “A framework for cooperative and interactive mobile learning to improve online information evaluation skills,” *Comput. Educ.*, 2018.

[6] H. Ghaem Sigarchian *et al.*, “Hybrid e-TextBooks as comprehensive interactive learning environments,” *Interact. Learn. Environ.*, 2018.

[7] D. Leszczyńska and N. Khachlouf, “How proximity matters in interactive learning and innovation: A study of the venetian glass industry,” *Ind. Innov.*, 2018.

[8] N. R. Akbarini, W. Murtini, and A. N. Rahmanto, “The effect of Lectora inspire-based interactive learning media in vocational high school,” *J. Pendidik. Vokasi*, 2018.

[9] R. Rajeshkannan and V. Ambedkar, “Interactive learning in the classroom – not a competitor but a partner for e-learning,” *J. Appl. Adv. Res.*, 2018.

[10] C. Pietrobelli and C. Staritz, “Upgrading, interactive learning, and innovation systems in value chain interventions,” *Eur. J. Dev. Res.*, 2018.

[11] N. R. Akbarini, W. Murtini, and A. N. Rahmanto, "Design of Interactive Learning Multimedia Development in General Administration Subject," *Int. J. Multicult. Multireligious Underst.*, 2018.

[12] F. Cruz, S. Magg, Y. Nagai, and S. Wermter, "Improving interactive reinforcement learning: What makes a good teacher?," *Conn. Sci.*, 2018.

CHAPTER 6

ANALYZING ROLE OF BLOCKCHAIN AND DIGITAL CREDENTIALS

Gautham Krishna, Assistant Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- k.gautham@jainuniversity.ac.in

ABSTRACT:

Blockchain technology has emerged as a disruptive force with transformative potential across various industries, including education. This abstract explores the intersection of blockchain and digital credentials, highlighting the innovative ways in which blockchain is revolutionizing the verification and authentication of educational achievements and credentials. Blockchain offers a decentralized and tamper-proof ledger system that ensures transparency, security, and immutability of data. In the realm of education, blockchain-based digital credentials enable learners to securely store and share their academic achievements, certifications, and qualifications in a verifiable and portable format. This abstract delves into the benefits of blockchain-based digital credentials, including enhanced trust, reduced fraud, and streamlined verification processes. Moreover, this abstract discusses the potential applications of blockchain in education beyond credentialing, such as transparent academic records, secure student data management, and innovative funding models. While blockchain holds immense promise for transforming the education landscape, it also presents challenges related to scalability, interoperability, and regulatory compliance.

KEYWORDS:

Cryptography, Decentralization, Digital Certificates, Distributed Ledger Technology (DLT), Interoperability, Smart Contracts.

INTRODUCTION

In today's world of technology, old-fashioned paper certificates and credentials are not very useful anymore. Employers and schools want better ways to check people's qualifications. Blockchain technology looks like a good option for this. Blockchain is a type of record-keeping system that is spread out and can't be changed, where transactions are recorded in a clear and secure way. This explores how blockchain is changing the way credentials and certifications are used. Understanding how Blockchain Technology works. Blockchain Technology is a way of storing and recording information securely on a digital ledger. A Decentralized Ledger Blockchain is a type of technology that keeps track of information in a way that doesn't rely on one central person or group. It is a series of blocks, each with a list of transactions, connected using special codes. Blockchain is set up so that no one person or group has full control over it. This makes it more secure and transparent [1], [2].

Important things about blockchain are that data cannot be changed once it's recorded and that it's always transparent and secure. This means that once information is stored in a block, it can't be changed without changing the other blocks. This feature makes sure that the data is secure and cannot be changed or misused. Furthermore, blockchain's transparency lets anyone see all the transactions that have ever been made, which helps to build trust between the people involved. Blockchain security is kept safe by using codes and systems that make sure no one can hack in or change the information.

How Blockchain Works Blocks, Nodes, and Consensus Mechanisms Blockchain works using a group of nodes, each having a copy of the whole blockchain. Transactions are put together into blocks and then added to the blockchain by agreement. Consensus mechanisms make sure that all nodes are in agreement about whether transactions are correct before they are put on the chain. Popular ways to reach an agreement include Proof of Work, Proof of Stake, and Delegated Proof of Stake. Each has good and bad points. Traditional credentialing systems have problems like document fraud, long verification times, and not being able to keep up with new skills and small certifications. These problems make it hard for the system to work well. Certificates and transcripts made of paper can easily be faked or changed, which makes people question if they are real or not. Furthermore, checking qualifications can take a long time and cost a lot of money, especially for big companies or schools [3], [4].

Decentralized learning records on the blockchain are a new way to keep track of your education and skills. They fix the problems with old-school credentialing systems. By putting your school grades, awards, and abilities on the blockchain, people can make a clear and secure record of what they have learned. Decentralized learning records show all the skills a person has learned, and they are confirmed as true. This makes it easier for employers and schools to understand what a person can do. Giving learners the power to own and control their credentials helps them feel confident and in charge of their achievements. Students can decide to securely share their qualifications with potential employers or schools, without needing anyone else to help and making it easier to verify. This ownership helps people trust you and keeps them learning new things all the time. You can keep adding new things you learn to your digital records. Self-sovereign identities change how we think about identity online. In old systems, people's private information is kept in one place, which makes it easy for others to steal it and invade their privacy. SSI lets people control who can see their personal information on the internet and only share it with those they choose. This keeps their data safe and private.

Decentralized identity helps create self-owned and verifiable identities using blockchain technology. With SSI, people can show their ID without sharing too much personal information, which helps to lower the chance of someone stealing their identity or getting into their private data without permission. This makes it safer and more reliable for schools to keep track of who their students are and what they have achieved. Keeping user data and privacy safe is very important in the digital age. Decentralized identity systems keep user data safe by not storing it all in one place that could be easily hacked or misused. Instead, secret codes allow people to show evidence of their characteristics without giving away the actual information. This method keeps user information safe while still making sure that credentials can be checked quickly and accurately.

Creating common rules for credentialing is important as more people use blockchain for this purpose. Common standards make sure that different blockchain systems can work together and verify credentials easily. Projects such as W3C Verifiable Credentials and Decentralized Identifiers make it easier for different systems to work together, creating a more connected and standardized environment. Making different blockchain networks work together. There are lots of different blockchain networks and platforms. Making sure these different networks can work together is very important to prevent them from becoming separated and to allow information to be easily shared. Efforts like the Interoperability Protocol project want to connect different blockchains so that credentials can be shared and checked between networks. Working together is important in the education industry. Using blockchain for credentials needs everyone to work together - schools, employers, tech companies, and policymakers. Working together to make rules, build trust, and follow laws and moral principles. When people work together, they can change how decentralized credentialing affects education in the future [5], [6].

Blockchain technology has the power to change education by making it easier to verify qualifications and certifications. Blockchain makes sure that what learners achieve is recorded in a secure way and can be easily checked. Also, the use of decentralized identity systems helps to keep personal information private and gives users more power over their own data. The education industry is using blockchain and working together to make it easier for different systems to work together and become more standard. This means that in the future, our qualifications will be easier to share, learning throughout our lives will be more important, and trust and honesty will be important in the education system.

DISCUSSION

As more people want jobs and they change often, it's important to keep learning throughout your life. The usual school records and certificates don't always show everything someone has learned. This looks at how using blockchain for learning records can create a complete and accurate picture of what a learner can do. In the 2000s, people have started learning and gaining skills in new ways. Always learning is important for growing in your personal and work life. Jobs are always changing, so it's important to keep learning new skills to be successful. In this article, we talk about why it's important to keep learning throughout your life, how we can acknowledge the things we learn outside of school, and how blockchain technology can track and show the skills we've learned.

The way people learn is changing. Before, people would finish school, start working, and use what they learned for their whole career. But now, learning is more ongoing. However, as new technologies and industries develop, skills are becoming outdated more quickly. Lifelong learning means always learning and improving your skills to stay competitive in the job market. Not all learning happens in school. Sometimes we learn things on our own or in other places outside of school. Learning on your own, taking online classes, attending workshops, and learning from work experience are all important for getting better at skills. It is important to recognize and approve informal learning experiences to understand a person's skills better [7], [8].

Recording how much someone has learned over their entire life can be done securely and transparently using blockchain technology. When people learn new things, their accomplishments and skills can be saved on the blockchain as proof. These digital files are added to a learner's decentralized learning record. The learner can control it and share it with employers, schools, or other relevant people. Micro-credentials and nano-degrees are smaller learning awards. They are given to show that someone has learned something specific. Instead of getting one long degree that takes a lot of time, students can earn small qualifications for learning specific skills. These small qualifications are flexible and meet the specific needs of the job market. They allow people to show their skills in specific areas quickly.

Recognizing Specialized Skills with Nano-Degrees Nano-degrees are specialized certifications that are tailored to specific industries or job roles. They are a type of micro-credential. These certificates show that a student is really good at a certain skill or technology, like data analysis, artificial intelligence, or blockchain development. Nano-degrees are a way for people to show they are really good at new things. This can help them get a job because the employer will see they have special skills. Creating a diverse portfolio using micro-credentials. Micro-credentials can be stacked together over time to show a range of skills. Employers can easily see how skilled a job applicant is by looking at their micro-credentials. This helps them hire the right person for the job faster.

Competency-Based Education and Assessments are about rethinking how we measure what students have learned. Instead of focusing on finishing classes or meeting deadlines, it's about

making sure students have really mastered the skills they need. In this model, students need to show how good they are at a subject or skill by doing tests, projects, or using what they learn in the real world. Blockchain technology allows for the safe recording of skills and abilities, giving a complete picture of a person's capabilities. Adaptive Learning and Personalized Skill Development are ways to help you learn better. With adaptive learning, you can get personalized learning that fits your strengths and weaknesses. These systems look at how well students are doing and change the lessons to focus on what they need to work on. The blockchain can keep track of how students learn and improve, showing their progress and how they deal with difficult tasks [9], [10].

Displaying Skills on the Blockchain By using blockchain technology, students can show their skills and small certifications on a public record that is spread out across many computers. This process makes sure that these accomplishments are safely kept and cannot be changed, which gives employers and schools a lot of confidence. The fact that the blockchain can't be changed and everything is visible to everyone makes the credentials even more valuable. This means they can be trusted and checked to show what a person has learned. Continuous learning and gaining new skills are very important in the fast-changing work world. As people try to learn and improve, micro-credentials and nano-degrees give them recognition for their skills in specific areas.

Blockchain technology helps to support this change by offering a safe and decentralized platform to record and display these accomplishments. Furthermore, the shift to focusing on specific skills and personalized skill development matches what the job market needs. Blockchain can confirm these skills for students, employers, and schools. As schools and teachers start using blockchain and other new methods, students are better prepared for future jobs.

Fostering Trust and Transparency in Education

Believing in and relying on the educational system is very important. Unfortunately, old ways of checking someone's qualifications can be easily tricked and fooled. Blockchain technology solves these problems by creating a platform that is trustworthy and easy to see through. This looks at how blockchain can help build trust and honesty in education.

Faking certificates and diplomas to pretend to be more qualified is a big problem in the education industry. This dishonest practice hurts schools and puts employers and other people at risk. Blockchain technology helps stop fake credentials by giving secure records and clear verification processes. In this, we look at how blockchain helps stop fake credentials and makes people trust the verification process more. Diploma mills are fake schools that give out phony degrees and certificates without making people do the real work or meet the standards. Fake credentials are being sold to people who are looking for a quick way to improve their job opportunities. Diploma mills and fake certificates make it hard for employers and schools to check if a person's qualifications are real [11], [12].

Immune Records and Preventing Credential Forgery Blockchain's immutability is a big change in stopping fake credentials. Once information is put on the blockchain, it can't be changed or removed later. This keeps the information safe and reliable. Blockchain makes sure that people can't make fake academic certificates or lie about their qualifications because it keeps a clear and secure record of their achievements. Gaining trust in checking qualifications with Blockchain technology that securely stores credentials. Employers, schools, and others can use blockchain to check if a person's qualifications are real, without needing to use centralized databases that could be easily hacked. Blockchain technology makes it safer to hire people or accept students because it can prove if their qualifications are real or not. Blockchain

technology is a good way to stop fake credentials and make it easier to see what information institutions have. Organizations can use blockchain to keep track and share information about accreditations, program rankings, and other institutional data with the public. This transparency makes people accountable and helps build trust among students, parents, employers, and policymakers.

Blockchain is being used to make it easier to access and keep track of information about the accreditation and rankings of institutions. Normally, this information is spread out in different places, but now it can all be found in one place. By using blockchain, organizations can keep track of their credentials and rankings on a secure and trustworthy platform. This allows people to quickly see accurate information about schools and how they are doing. Academic records can be stored on the blockchain as verifiable certificates, which can be checked by anyone, including the person who earned the certificate and the schools or organizations that need to confirm it. These credentials can be things like report cards, certificates, diplomas, and other school accomplishments. People can safely share their school records with employers or schools they want to apply to, making sure it's easy and trustworthy to check. Improving how institutions are responsible: Blockchain's openness and unchangeable nature encourage institutions to keep correct and current records. Any changes or updates to the blockchain can be tracked and checked, which encourages people to be responsible for their actions. Organizations want to give true and reliable information because if they try to change it, people will know and it could harm their reputation. Improved checks Blockchain makes the process of checking credentials easier for employers, schools, and other groups. Employers can quickly check to make sure job candidates are qualified for the job they apply for. This helps speed up the hiring process. This helps both people looking for a job and companies looking to hire, making the hiring process better and more reliable.

Instantly access verified credentials with blockchain technology, eliminating the need for long and difficult verification processes. Employers can quickly check if a job candidate has the right qualifications, so they can make hiring decisions faster and with more knowledge. This easy way to check someone's qualifications makes it quicker and more accurate to hire or admit them. Making it easier to check if someone's qualifications are real. Usually, it takes a lot of work for schools and employers to verify someone's educational records. We can reduce the amount of manual checking by using blockchain technology. Blockchain makes it easier and cheaper to check if credentials are real. It does this by using a computer system that is not controlled by one person or group.

Self-sovereign identities are very important in this big change. They let people change how they are seen online and only share personal information when they want to. This helps to keep their privacy and data safe. Then it talks about how important it is for different blockchain networks to use the same standards for sharing data with each other. We work together in the education industry to make sure we all use the same methods and technology for giving out credentials. This helps us do it in a way that's easy for everyone. In the second part, learning new things and gaining skills are the main focus.

The text looks at the move to keep on learning all the time, recognizing how important it is to keep up with the quickly changing job market. We know that informal learning helps people develop new skills. Blockchain technology can verify and record this learning, giving a complete picture of what someone is good at.

Micro-credentials and nano-degrees are new ways to show that someone has specific skills in small pieces. These credentials can be stacked on top of each other to show what you are good at in different areas. This can make you more attractive to employers. Competency-based

education and assessments are a new way to measure skills instead of just finishing classes or meeting time limits. Blockchain keeps track of what learners are good at, which helps to see all their skills and makes it easier for them to improve in specific areas.

The study shows that blockchain technology is really important for changing education. Blockchain builds trust in digital credentials by getting rid of fake credentials, giving clear information about institutions, and improving the way credentials are checked. The combination of blockchain and learning based on skills helps to create a future where people are encouraged to keep learning and their education is appreciated. This helps both students and schools. The education field is using blockchain technology and working together to make credentials more secure and easy to access. This will change how qualifications are verified and recognized in the future.

Using the Internet of Things in schools and classrooms

In recent years, the Internet of Things has become very important in changing different industries, including education. IoT means that devices, sensors, and systems can talk to each other and share information without people having to do anything. In schools and colleges, IoT can make classrooms and campus safer and improve the experience for students. It can also help the school run more efficiently. This looks at how IoT can change education, and the problems and things to think about when using it.

Modern classrooms and school buildings

Using technology like interactive whiteboards and smart projectors can help students learn in a fun and interactive way. It helps them to get involved and work together with their classmates. Personalized Learning IoT devices can collect information about how each student learns, what they like, and how they are doing in school. This helps teachers adjust their teaching to fit each student's needs. IoT sensors can keep an eye on how the classroom is feeling. They can watch things like how warm or bright it is, and how noisy it is. This can help make the classroom better for learning, and teachers can get feedback right away. Improved security systems that use IoT technology can watch over schools and other campuses in real-time. They can find possible dangers and help respond quickly to emergencies. Smart Access Control IoT technology makes it easier for authorized staff and students to get into campus buildings. This helps make the campus safer by controlling who can enter certain areas. Special wearable devices for students can help to keep them safe at school events and on field trips by tracking where they are on the campus. IoT devices in Facility Management and Maintenance can watch over school buildings to find problems and save energy, which helps schools save money. Schools can use IoT technology to track their supplies and resources, so they always have what they need. Using data from IoT can help leaders and policymakers make better decisions to improve how things work. Smart classrooms and learning spaces are being improved with the use of IoT. This could change the way education is given. By using advanced teaching tools that connect to the internet, teachers can make lessons more interesting and help students understand the subject better.

Interactive whiteboards and smart projectors help teachers teach in new and exciting ways, like using simulations and virtual field trips to make learning easier for students. This active participation can make students more interested and involved, which can help them learn better. One of the best things about IoT in education is that it can help students learn in a way that works best for them. IoT devices can gather and study information about how each student learns, what they are good at, what they need help with, and what they like. With this important information, teachers can change how they teach to fit how each student learns best. This helps make sure that students get the help they need to do their best.

An IoT learning system can change how hard the work is based on how well a student is doing. It can give the right amount of challenge and help when needed. This special way of teaching helps students feel more confident and successful in their learning.

It gives them a sense of control over their education. Additionally, IoT sensors that give real-time feedback and monitoring are really important for making the learning environment better. These sensors can monitor different things like how hot or cold it is, how damp or dry the air is, and how bright it is. They use this information to make a good environment for learning. For example, if a classroom gets too hot or loud, the IoT system can change the temperature or tell the teacher to do something to keep the classroom good for learning. Also, IoT sensors can collect information about how students are participating and behaving in class. This helps teachers see if their teaching methods are working well or if there are areas they can improve. This way of teaching helps teachers make better decisions and improve how they teach to help their students learn better. However, using IoT in smart classrooms also has problems and things to think about. We need to make sure that sensitive student information is kept safe from people who shouldn't have it.

Schools and colleges need to set up strong online safety measures and follow rules about keeping information safe. This will help students and teachers feel secure when using new internet-connected devices. Besides, just like with any new technology being used, there might be some people who are against or find it hard to use IoT in classrooms. Teachers and school leaders might need to learn how to use IoT devices and understand the information they create. Teachers need help and training to use new tools in education. This will help them to make the most of these tools. In general, IoT can change regular classrooms into flexible and advanced learning spaces. By using technology to teach and give feedback, teachers can make learning more interesting and effective for each student. Using IoT in education needs a mix of new technology, using data to make decisions, and focusing on how students learn, so that we can make the most of IoT in schools.

Making sure that students are safe and protected is very important for schools, parents, and the community. The use of IoT technology can help make schools safer for students. Here are some ways that IoT can make students safer and more secure at school. Smart security cameras and sensors using IoT technology can watch over schools in real-time, keeping an eye on classrooms, hallways, entrances, and outdoor areas. These surveillance systems can help find and stop people from getting in where they shouldn't be, possible dangers, or things that seem strange on campus. Moreover, video analytics and facial recognition technology can be used with IoT surveillance systems to find and keep track of specific people, making campus security better.

The Smart Access Control system uses new technology to replace old locks and keys with fingerprint or card scanners. This makes sure that only the people allowed and students can go into certain parts of the school.

By using smart access control, schools can stop people from getting in who aren't supposed to be there and make the campus safer from unwanted people trying to get in. Emergency Alert Systems are special systems that use the Internet to quickly send important information to students, staff, and administrators during emergencies like natural disasters, fires, or threats from intruders. These systems can send alerts using different ways like text messages, emails, mobile apps, and intercoms. This helps to make sure that everyone knows what's happening quickly and can do the right thing. Student safety devices that can track where students are during field trips or activities off school grounds. These devices can be worn as ID badges or

bracelets and use GPS or RFID technology. If there's an emergency or a student is missing, these wearables can help the school find the person quickly and make sure they are safe.

Mobile apps with IoT technology can help students stay safe by giving them panic buttons and quick ways to call for help in an emergency. These apps can be connected to the school security or police so students can ask for help fast if something dangerous happens. Using data from IoT devices can help us understand how students move around and where potential safety issues might be on campus. By looking at this information, schools can find problem areas, put in specific safety measures, and keep making safety procedures better. Making institutions work better is important for schools that want to use their resources well and make their operations run more smoothly. Using IoT technology in schools can help make things work better and make managing the school easier.

IoT devices with sensors can keep an eye on the condition of school buildings and infrastructure all the time. These sensors can find out if the temperature, humidity, air quality, and other environmental things are changing. This helps with fixing problems before they become big issues. By finding problems early, like broken heating or leaking water, schools can fix them before they get worse and cost more money. Moreover, IoT can help save energy in school buildings. Smart thermostats, lights, and power systems can change settings according to when people are around and the weather. This not only saves energy but also saves money on utility bills. IoT facility management systems can do everyday tasks like scheduling cleaning, keeping track of equipment maintenance, and managing room bookings automatically. This automation makes things run smoother and gives staff more time to focus on important tasks.

Smart systems that use the internet to track and manage school supplies are changing the way schools keep track of their things. Small devices called smart tags or RFID chips are put on things like books, equipment, and computers to show where they are at all times. This information helps school staff find and handle resources faster, which saves time and prevents things from getting lost. Furthermore, using IoT to track inventory makes sure that necessary supplies are always on hand, which helps avoid any interruptions in teaching and learning. Managers can keep track of how much stuff they have and order more before they run out.

Using information from the Internet of Things can help leaders and decision-makers make better choices. By studying information from different IoT devices and systems, schools can find trends, patterns, and areas to make things better. For example, information about how classrooms are used and how many students attend can help plan schedules better, so that classrooms are used well and resources are used effectively. Information about how students are involved and how they are doing in school can help teachers figure out better ways to teach and improve what they are teaching. Data from IoT devices helps to see if different programs and initiatives are working well. Schools can use numbers to see how well new technology, teaching methods, or safety measures are helping students.

CONCLUSION

Blockchain technology has brought in a new time of trust and honesty in the world of digital certificates. It promises to change how we check and confirm someone's educational accomplishments. This summary explains how using blockchain-based digital credentials can make things better by building trust, lowering fraud, and making verification easier. In education, using blockchain has a lot of advantages, even though there are some difficulties with making it work better, connecting with other systems, and following the rules. Blockchain-based digital credentials help students keep their academic achievements safe and share them easily. This gives students control over their educational records and credentials. Overall, using blockchain in education has the potential to make credentialing processes more

fair, transparent, and efficient. By using blockchain to create digital certificates, schools and students can make education more secure and easy to access in the digital world. Ongoing learning, working together, and new ideas are necessary to fully use blockchain to change how we give out education certificates in the future.

REFERENCES:

[1] J.-C. Cheng, N.-Y. Lee, C. Chi, and Y.-H. Chen, "Blockchain and smart contract for digital certificate - IEEE Conference Publication," *Proc. IEEE Int. Conf. Appl. Syst. Innov. 2018*, 2018.

[2] J. C. Cheng, N. Y. Lee, C. Chi, and Y. H. Chen, "Blockchain and smart contract for digital certificate," in *Proceedings of 4th IEEE International Conference on Applied System Innovation 2018, ICASI 2018*, 2018.

[3] H. Sun, X. Wang, and X. Wang, "Application of blockchain technology in online education," *Int. J. Emerg. Technol. Learn.*, 2018.

[4] T. T. Huynh, T. Tru Huynh, D. K. Pham, and A. Khoa Ngo, "Issuing and Verifying Digital Certificates with Blockchain," in *International Conference on Advanced Technologies for Communications*, 2018.

[5] Z. C. Li, L. Liang, and Y. F. Sun, "Digital certificate scheme based on lattice signature algorithm," *J. Cryptologic Res.*, 2018.

[6] P. Muthusamy and T. Sheela, "Sybil attack detection based on authentication process using digital security certificate procedure for data transmission in MANET," *Int. J. Eng. Technol.*, 2018.

[7] C. Holotescu, "The 14 th International Scientific Conference eLearning and Software for Education Bucharest, Understanding Blockchain Opportunities and Challenges," *14th Int. Sci. Conf. eLearning Softw. Educ.*, 2018.

[8] Okfalisa, N. Yanti, W. A. D. Surya, A. Akhyar, and A. A. Frica, "Implementation of Advanced Encryption Standard (AES) and QR Code Algorithm on Digital Legalization System," in *E3S Web of Conferences*, 2018.

[9] M. Rouse, "What is digital certificate? - Definition from WhatIs.com," *Whatls*, 2018. .

[10] F. Forsby, M. Furuhed, P. Papadimitratos, and S. Raza, "Lightweight X.509 Digital Certificates for the Internet of Things," in *Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST*, 2018.

[11] M. F. Hinarejos, F. Almenárez, P. Arias-Cabarcos, J. L. Ferrer-Gomila, and A. M. López, "RiskLaine: A probabilistic approach for assessing risk in certificate-based security," *IEEE Trans. Inf. Forensics Secur.*, 2018.

[12] A. Alrawais, A. Alhothaily, X. Cheng, C. Hu, and J. Yu, "SecureGuard: A Certificate Validation System in Public Key Infrastructure," *IEEE Trans. Veh. Technol.*, 2018.

CHAPTER 7

3D PRINTING AND MAKER SPACES FOR EMPOWERING CREATIVITY AND INNOVATION

Gopalakrishna V Gaonkar, Assistant Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- g.gaonkar@jainuniversity.ac.in

ABSTRACT:
The convergence of 3D printing technology and maker spaces has sparked a paradigm shift in the realms of creativity and innovation. This abstract explores the transformative potential of 3D printing and maker spaces in empowering individuals to unleash their creativity, foster innovation, and drive positive change. 3D printing technology enables users to bring their ideas to life by fabricating physical objects layer by layer from digital designs. When combined with maker spaces collaborative environments equipped with tools, resources, and expertise 3D printing becomes a catalyst for hands-on learning, experimentation, and problem-solving. This abstract delves into the diverse applications of 3D printing and maker spaces across various domains, including education, healthcare, manufacturing, and beyond. It highlights how these technologies empower individuals to design and prototype custom solutions, democratize access to manufacturing, and catalyze entrepreneurial endeavors. Furthermore, this abstract discusses the benefits of integrating 3D printing and maker spaces into educational curricula, emphasizing their role in cultivating essential skills such as critical thinking, creativity, collaboration, and digital literacy. Despite the promise of 3D printing and maker spaces, challenges such as access to technology, digital skills gaps, and environmental concerns must be addressed to realize their full potential. However, through collaboration, innovation, and community engagement, these challenges can be overcome.

KEYWORDS:

Creative Fabrication, Design Thinking, Digital Modeling, Empowerment, Innovation, Maker Culture.

INTRODUCTION

Protecting student information is the most important thing to consider when using IoT in schools. IoT devices gather and send important information, like personal data about students and teachers. Schools, colleges, and universities need to make sure they protect their data. They should use strong codes, limit who can see the data, and make sure only the right people can access it to keep it safe from any unauthorized use or breaks. Also, schools must follow the rules about protecting information and create clear rules about how they use and keep information. Regular checks on security and finding weak points can help people to identify and fix possible problems and make sure that data stays safe. Connecting IoT devices and systems with current educational technologies can be tricky, especially in schools with different types of technology. Making sure that data can move smoothly between different platforms and applications is very important for IoT to work well. IoT providers and educational technology vendors working together can make it easier for their devices and systems to work well together. Open standards and APIs make it easier for different devices and software to work together and talk to each other.

The digital divide means that some people have better access to technology and digital stuff than others. This is especially true for poorer communities. Introducing IoT technology in schools with limited access to technology can make the technology gap worse. Schools and

colleges need to make sure everyone can use technology equally. This can mean giving help and training to schools that don't have much, giving them internet access, and making sure all students can use IoT technology for learning [1], [2].

Using data from IoT devices raises ethical questions because there is a lot of it. Schools must be honest and clear about how they collect information, and they need to tell students and parents what kind of information they collect and how they plan to use it. Schools should only gather information that helps make school better and keeps students safe. Also, information should be made anonymous and combined whenever it can be to keep individual privacy safe. Teachers and school leaders should be careful about any unfairness in how they look at information and make choices. Artificial intelligence programs that work with data from IoT devices need to be checked regularly to make sure they are not treating students unfairly. This is to make sure that they are not unintentionally discriminating against anyone [3], [4].

The Internet of Things (IoT) has the potential to change education in a big way, but we need to solve some problems and think about things carefully to make sure it's done in a responsible and successful way. Educational institutions need to be careful about data privacy and security, making sure that different systems can work together, and making sure everyone has access to digital technology. They also need to use data in a way that is fair and right. By making sure data is secure, making different devices work together, making sure everyone can use technology, and following the rules for using data, schools can use IoT in education safely and make it help students learn better and make the school work better. By thinking carefully, working together, and following the rules, IoT can help make schools better for everyone. It can make learning easier, faster, and safer for students and everyone involved [5], [6].

DISCUSSION

Lately, 3D printing and maker spaces have become important tools for creativity in schools. These technologies help students go beyond just reading and learning about ideas and turn them into real things they can touch and see. 3D printing and maker spaces are bringing imagination and reality together, sparking new creativity and innovation in education. Hands-on learning is the main idea behind 3D printing and maker spaces. In regular classrooms, students usually just listen and learn without doing much. However, using 3D printing helps students to be more involved in how they learn. They don't just learn about ideas and theories, they also try things out, make things, and build things with their own hands. This hands-on experience helps students understand ideas better, so they remember them more easily. Design Thinking is when students use 3D printing to think about and try out different ideas and improve them over and over again. Design thinking is a way to solve problems by understanding how others feel, coming up with lots of ideas, making prototypes, and trying different versions until it works well. When students have a problem or an idea, they use 3D printing to quickly make models of their solutions and designs. They keep making changes to their work based on feedback, finding out what they are good at and what they need to improve. This way of doing things helps you to think carefully, be flexible, and bounce back from challenges. These skills are useful for more than just 3D printing [7], [8].

Using 3D printing helps students learn different subjects at the same time, making them more excited about learning. Teachers can create projects that combine ideas from science, technology, engineering, art, and math. For example, in a biology class, students can learn about the human body by making 3D models of organs. In an art class, students can make artistic designs using 3D printing to learn about sculpting. Mixing different subjects makes students interested and helps them see how everything is connected, so they can better understand the world.

Encouraging new businesses 3D printing and maker spaces are good places for helping young people become entrepreneurs. Students can make their new ideas real by making models of them that work. This way of learning about starting a business helps students feel like they have control and responsibility. It encourages them to believe in their ideas and to take action to make them happen. Additionally, 3D printing is affordable for students, so they can try out different designs and improve their ideas without worrying about it being too expensive [9], [10].

Inclusivity and Diversity One of the best things about 3D printing and maker spaces is that they welcome everyone. These technologies can be used for many different projects and can be used by all kinds of learners with different ways of learning and abilities. For students who find it hard to learn in the usual way, making something real helps them feel proud and surer of themselves. Furthermore, 3D printing helps teachers create personalized learning activities for each student, making the learning environment more welcoming and supportive for all.

3D printing and maker spaces are changing education by helping students be creative and come up with new ideas. By promoting learning by doing, encouraging creative thinking, exploring different subjects, supporting starting businesses, and welcoming diversity, these technologies change how people learn in school. By using 3D printing and working in maker spaces, students can make their own things and come up with new ideas. This helps them get ready for the future, where being creative and coming up with new things is really important. Let's learn more about how 3D printing and maker spaces help students be creative and come up with new ideas in school. Open-Ended Exploration 3D printing and maker spaces give students chances to explore and find new things. Instead of regular assignments with set results, these technologies help students think in new ways and try out new ideas that are not usual. This ability to explore makes kids curious and excited, and helps them be more creative [11], [12].

3D printing and maker spaces help students connect what they learn in class to real-life uses. When students see that their work can help people or make things better, it makes them feel more motivated and gives them a reason to keep working. Educators help students use what they've learned to solve important problems in the world. Maker spaces are places where people get together to work on creative projects. They help people collaborate and come up with new ideas. When students work together on projects, they can use their different skills and ideas to solve difficult problems. This place helps people work together as a team, talk to each other, and find solutions together. These are important skills for working in the 21st century because working together is really important for doing well.

Encouraging a Positive Attitude

3D printing and maker spaces are great places for developing a growth mindset. Students find out that if they work hard and keep trying, they can improve their skills. When they face problems while designing and printing, they see them as chances to learn and get better. By having a growth mindset, students learn to bounce back from challenges and believe in always getting better.

3D printing and maker spaces allow schools to work with businesses and experts in the industry. When students talk to experts, they learn about how things are done in the real world and what is expected in the industry. Partnerships with businesses can also help students get internships, mentoring, or job chances in design, engineering, or making things. In a place where students use 3D printers and other tools to make things, they can create a collection of their work to show what they have made and how creative they are. This portfolio shows off their skills and achievements. It's important for college, job interviews, and impressing clients or investors later on. Getting involved with 3D printing and maker spaces can help students

stay eager to learn throughout their lives. As they have fun making new things and solving problems with technology, they want to learn more on their own. This means that people who always want to learn new things are really important. It's especially important in the world we live in because things are always changing really fast.

Teachers learning about 3D printing and maker spaces in their professional development also helps them. Teachers can learn new skills and gain confidence by participating in professional development programs that focus on these technologies. They can also try out new projects and learn how to help students with maker-centered learning experiences. Educators who feel confident can encourage and help their students be creative in a good way. This shows how 3D printing and maker spaces help people to be creative and come up with new ideas by letting them explore and create things with no limits. It also helps them to work with others, learn new things, connect with businesses, and build a strong set of work to show their skills.

It also helps them to keep wanting to learn new things for their whole life. "These new technologies make learning more exciting for students and help teachers be more creative and innovative in their teaching. Educational institutions can use 3D printing and maker spaces to encourage creativity and innovation in students, and to help them succeed in a changing world.

Using 3D printing in all areas of learning

To make the most of 3D printing in schools, it's important to use it in different subjects and for different ages. By using 3D printing in schools, teachers can make learning more fun, get students more interested, and help them see how different subjects are connected. Let's find out how we can use 3D printing in different subjects. 3D printing in science makes it possible for students to make real 3D models of science ideas. In biology, students can use 3D printers to make models of cells, organs, or DNA structures. This helps them understand details that are hard to see in pictures or diagrams. In chemistry, you can make models of molecules by printing them out.

This helps people understand how molecules are connected and their shapes. Geology students can make models of land features to show rock formations and natural events. These models help students understand difficult science concepts by feeling and touching them, which makes it easier to imagine and see how they work. 3D printing makes it possible for students to create and print 3D shapes and models, which helps them learn math better. 3D printing can make shapes like prisms, pyramids, and polyhedral. This helps students understand how these shapes work in real life. Math tools and games can be made to help with learning in a fun way. For instance, students can make shapes and puzzles with math blocks and use them to learn and play with math.

3D printing helps students learn about history and social studies in a hands-on way. By using 3D printing to make copies of old things and buildings, students can better understand and value how they have influenced the world today. They can rebuild old objects, special places from history, or things found by archaeologists. This helps show and understand historical events and cultures in a better way. Students can learn by doing and explore history with a sense of amazement and interest. 3D printing in arts and design lets artists create in new ways. Students can use computer programs to make 3D sculptures, pottery, or wearable art, and then print them out using a special kind of printer. Mixing technology and art helps students be more creative and come up with new ideas. Additionally, students can try using both old-fashioned art methods and 3D printing together. This combines sculpting, painting, and digital design to make original and creative artworks. 3D printing is perfect for engineering projects. It lets students bring their ideas to life quickly. Students can create working parts, like gears, pulleys, or levers, and make them on a printer to see how they work in real life. Also, 3D printing makes

it easy to create small engineering models. This helps students try out and improve their designs before making them on a bigger scale. These engineering activities give us a chance to learn by doing, and develop our thinking and problem-solving abilities.

This highlights how important it is to use 3D printing in different subjects to make learning more fun. Using 3D printing in different subjects like science, math, history, social studies, art, and engineering can help teachers improve how students understand, see, and create things. Using 3D printing in different subjects helps students see how different topics connect. This gives students a well-rounded education that includes both practical and theoretical learning. When students use 3D printing to make things, they learn more about the subjects and gain useful skills for the future. Let's keep looking at how we can use 3D printing in different school subjects.

Language Arts

Even though 3D printing may not seem connected to language arts, it can actually help make stories and literature more interesting and exciting. Students can make 3D models of scenes and characters from books, making the stories come to life in a real way. Also, students can create and print objects from various historical periods or cultures mentioned in literature, which helps them better understand and become more involved in the texts they are studying. Studying the environment 3D printing can help students create and print things that are good for the environment. For example, students can make 3D models of things like equipment for renewable energy, tools to save water, or products that break down easily.

Using 3D printing in environmental studies helps students think carefully about environmental problems and allows them to create new and smart ways to help the environment. Learning another language in language classes, 3D printing can help with learning new words and understanding different cultures. Students can make 3D flashcards with pictures of things and their foreign language names to help them connect words with real things. Additionally, students can create and print items that represent different cultures or important places from countries where the language is spoken. This helps to appreciate different cultures and learn the language better. 3D printing can be used in health and gym classes too. Students can make and print models of the human body or make special gear for sports and exercise. For example, students can make special handles for sports gear, personalized workout gear, or tools to help people with physical disabilities. Using 3D printing in health and PE helps to make new and personalized ways to improve health and fitness.

In civics class, students can use 3D printing to make models of government buildings, important places from history, or community projects. For instance, they can make copies of important old buildings or build small versions of a plan to make the city better. This way of teaching civic education helps students understand difficult ideas better and makes them feel more responsible and engaged in their community. Music is something you listen to, but we can also use 3D printing to make learning music more fun. Students can make and print their own special music stand or instrument accessories. Furthermore, teachers can use 3D printing to make music symbols that can be felt, so that students who can't see well can participate more in music lessons. Career and Technical Education 3D printing fits well with CTE programs, providing useful uses in various vocational fields. For instance, in classes about building and design, students can print small models of buildings they want to make. In car technology, students can make their own car parts and pieces. Adding 3D printing to technical education helps students learn skills they need for their careers and makes it easier for them to get a job.

3D printing can be used in many different subjects. It can be used in lots of ways and can make learning more interesting. By using 3D printing in different subjects like language arts,

environmental studies, foreign languages, health and physical education, civics, music, and career and technical education, teachers can give students more hands-on learning experiences. Using 3D printing in all subjects helps students be more creative and solve problems. It also lets them learn how technology works and how it's used in the real world. Students learn how to use 3D printing to connect what they learn in class to real life. This helps them understand their subjects better and get ready for a future where they need to be adaptable, creative, and think ahead.

Project-Based Learning in Maker Spaces

Maker spaces are places where students can learn using new technology and tools to work on projects. In this, we look at all the good things about maker spaces and how they help students learn by doing projects. In these places, students can pick projects that they really like and are interested in. Maker spaces help students to be more interested in learning by letting them pursue their own interests. This makes them more motivated and involved in the learning. This means that students feel more in control of their own learning and are able to take charge of their education. Working together and talking to each other Maker spaces create a culture of working together and talking to each other effectively. As students start their projects, they work together with their classmates, sharing ideas, thoughts, and what they know. In projects where students work together, they learn more about the topic and also improve their ability to work with others in a team. Working together, being creative, and solving problems in the maker space helps students get ready to work together in school, at work, and in their personal lives. Maker spaces provide a place to solve real-life problems. Students are told to find and solve real problems that go beyond what they learn in school. Creating things in maker spaces gives students a feeling of purpose and helps them see the importance of what they learn in school. This can include making things that help people with disabilities, finding new solutions that are good for the environment, or coming up with new inventions.

Solving real-life problems helps students get ready for difficult situations they'll face in the future. In the maker space, students are told to use their imagination and think of new ideas. They try different ways to fix the problems in their projects. This creative freedom helps students to think positively and see their mistakes as chances to get better. Project-based learning in maker spaces helps students become more resilient by teaching them to embrace challenges, keep trying, and improve their designs until they get the results they want.

Maker spaces give students a place to show off their projects and be proud of what they have done. Showing their work to friends, teachers, and the community makes them feel proud and like they have achieved something. This award makes students feel good about themselves and helps them take ownership of their work. Celebrating what students make in the maker spaces helps they feel good about what they are learning and making, making them more interested in school. Maker spaces help people come up with new ideas and start their own businesses. By doing hands-on projects, students can come up with new business ideas and turn them into real product models. They get to learn about making products, creating designs, and testing them for the first time, which helps them become more entrepreneurial. Maker spaces are places where students can come up with new ideas and start their own projects. They can help students think outside of the box and start their own businesses. Let's explore why project-based learning in maker spaces is important and has many advantages.

Thinking and problem-solving in projects with hands-on learning need students to think carefully, come up with new ideas and choose the best option. When students do practical projects, they often come across problems and things they don't know. These situations make students think carefully and solve problems. They also encourage students to look at different

viewpoints, think about different choices, and make decisions based on facts. Project-based learning helps students improve their work by getting feedback and trying different methods. It teaches them to keep learning and not be afraid of challenges. Authentic Assessment Maker spaces provide a great place to see how well students are learning. Traditional tests usually just test on memorizing facts and doing well on the same kind of test, but they might not show how well students really understand or how creative they are. On the other hand, project-based learning helps teachers see if students can use what they've learned in real life. Evaluating student projects in maker spaces helps us see how good they are at solving problems, thinking critically, working with others, and using what they've learned in real life. Maker spaces help students use what they learn in different subjects to solve real problems. In maker spaces, projects often cover a lot of different subjects. This helps people learn in a complete and meaningful way. For instance, a project to create a garden that lasts a long time might combine ideas from biology, environmental science, math, and art.

Engagement and Inclusivity Project-based learning in maker spaces helps students get more involved and interested in their work. They are able to ask questions, come up with their own designs, and make things, which keeps them engaged. Maker spaces are great for all kinds of learners because they let you learn by doing things. It's a hands-on way to learn that works for lots of different people. Maker spaces help students who have a hard time in regular classrooms. They offer a friendly and welcoming place that helps students feel like they belong and become more confident. In the 21st century, maker spaces and project-based learning help people develop important skills for the modern world. These skills are being creative, thinking carefully, talking to others, working together, being flexible, and being good with technology. As students do projects, they learn important skills that will help them in the future when they start working. The skills they learn, like being creative, thinking of new ideas, and solving problems, are really important in today's job market.

Maker spaces at schools give a chance for the community to get involved with education. Students can create projects that help their community or make society better. Working with people in the community, like businesses and groups, can help students learn and get helpful advice. It can also make their projects have a bigger effect outside of school. In project-based learning, the teacher's role changes from being the main source of information to helping and guiding the students. Teachers help students with questions, give them guidance, and support them when they need it. This helps students to take charge of their own learning. This way of teaching helps students to keep learning and be more independent. This highlights how project-based learning in maker spaces is really helpful. It helps with critical thinking, problem-solving, and assessing things in a real way. It also helps connect different subjects and teaches important skills for the 21st century. Maker spaces are places where students can make things and learn in a fun and welcoming environment. It helps them become flexible and always ready to learn new things for their whole life. This helps them be ready for whatever may come in the future. "Teachers who use project-based learning in maker spaces can help students get excited about learning, be more creative, and feel like they can make a difference in their communities and the world.

CONCLUSION

The combination of 3D printing and maker spaces is bringing in a new era where people can be more creative and innovative. By doing things themselves, trying new things, and solving problems with others, people are able to be more creative, test out ideas, and make good things happen. This summary has shown how 3D printing and maker spaces can bring about big changes in many different areas, like schools, hospitals and factories. Even though it might be hard to get technology and there are worries about the environment, using 3D printing and

maker spaces in schools and communities has a lot of good points. By using these technologies, people can learn important skills like thinking carefully, being creative, working together, and using digital tools. This helps them get ready for future jobs and also encourages a culture of creating and coming up with new ideas. In summary, many people using 3D printing and maker spaces can help them come up with new ideas and make things, which could make the future better. By investing, working together, and involving the community, we can use 3D printing and maker spaces to encourage creativity, create new ideas, and solve important problems in today's digital world.

REFERENCES:

[1] O. M. Khessina, J. A. Goncalo, and V. Krause, "It's time to sober up: The direct costs, side effects and long-term consequences of creativity and innovation," *Research in Organizational Behavior*. 2018.

[2] T. de C. Nakano and S. M. Wechsler, "Creativity and innovation: Skills for the 21st century," *Estud. Psicol.*, 2018.

[3] D. J. Hughes, A. Lee, A. W. Tian, A. Newman, and A. Legood, "Leadership, creativity, and innovation: A critical review and practical recommendations," *Leadersh. Q.*, 2018.

[4] L. Y. Y. Kwan, A. K. y. Leung, and S. Liou, "Culture, Creativity, and Innovation," *Journal of Cross-Cultural Psychology*. 2018.

[5] M. Ali Al Qudah, "The Impact of Entrepreneurship Initiatives in Enhancing Creativity and Innovation," *Int. J. Bus. Manag.*, 2018.

[6] H. Syam, H. Akib, A. A. Patonangi, and M. Guntur, "Principal entrepreneurship competence based on creativity and innovation in the context of learning organizations in Indonesia," *J. Entrep. Educ.*, 2018.

[7] P. Buasuwan, "Rethinking Thai higher education for Thailand 4.0," *Asian Educ. Dev. Stud.*, 2018.

[8] S. Narayanan, "A Study on the Relationship between Creativity and Innovation in Teaching and Learning Methods towards Students Academic Performance at Private Higher Education Institution, Malaysia," *Int. J. Acad. Res. Bus. Soc. Sci.*, 2018.

[9] A. Manresa, A. Bikfalvi, and A. Simon, "The use and determinants of training and development for creativity and innovation," *Int. J. Innov. Manag.*, 2018.

[10] E. Revilla and B. Rodríguez-Prado, "Bulding ambidexterity through creativity mechanisms: Contextual drivers of innovation success," *Res. Policy*, 2018.

[11] C. D. Zuber and L. Moody, "Creativity and Innovation in Health Care," *Nurs. Adm. Q.*, 2018.

[12] C. D. Zuber and L. Moody, "Creativity and Innovation in Health Care: Tapping into Organizational Enablers Through Human-Centered Design," *Nurs. Adm. Q.*, 2018.

CHAPTER 8

IMPORTANCE OF CLOUD COMPUTING IN EDUCATION

Meena Y R, Associate Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- yr.meena@jainuniversity.ac.in

ABSTRACT:
Cloud computing has emerged as a transformative technology with the potential to revolutionize education by providing scalable, flexible, and accessible resources and services. This abstract explores the myriad ways in which cloud computing is reshaping teaching and learning paradigms, enabling educators and students to collaborate, innovate, and access educational resources anytime, anywhere. Cloud computing offers a diverse range of services, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), which can be leveraged to enhance educational experiences. Through cloud-based platforms, educators can deliver personalized instruction, facilitate collaboration, and create interactive learning environments that cater to diverse learning styles and needs. This abstract delves into the benefits of cloud computing in education, such as cost-effectiveness, scalability, and enhanced flexibility. By shifting computing resources to the cloud, educational institutions can reduce infrastructure costs, increase accessibility to technology, and adapt more easily to evolving educational demands.

KEYWORDS:

Collaboration, Data Storage, Digital Transformation, Flexible Learning, Infrastructure as a Service (IaaS).

INTRODUCTION

Cloud computing has changed the way schools handle information, work together, and get resources. This looks at how schools use cloud computing, the good things it can do and the worries about keeping information safe. Collaborative learning is when people work together to learn things. Online collaboration tools are tools that help people work together on the internet. Collaborative learning is really important in the digital age. It helps students get involved, think critically, and solve problems. Cloud computing makes it easy for students and teachers to work together at the same time, even if they are far away from each other. This discusses how working together with others helps learning and how online tools make it easier to do group work, talk about ideas, and share knowledge. In today's schools, working together with other students is seen as a good way to get students involved and help them learn better. It says that students should work together in teams to use their knowledge and skills to solve problems and finish projects. Cloud computing has made collaborative learning even better. Now, people can work together without any limits [1], [2].

Overcoming distance is a big benefit of learning together on the cloud. With cloud tools and platforms, students and teachers can talk and work together at the same time, no matter where they are. This means that people from different places can work together on projects, share ideas, and learn from different perspectives, which makes learning better. Cloud computing makes it easy for people to talk and share what they know in one place. With tools like project management systems, online classrooms, and video calls, students and teachers can easily talk and share information and feedback. This constant communication helps people feel like they are part of a group and all responsible for learning. It makes education more fun and interactive. Improved ability to think carefully and solve problems. Working together with others helps to

actively take part and be involved, which helps develop the skills to think critically and solve problems. When students work together on hard tasks or projects, they come across different ideas and face difficult problems that need creative answers. Cloud-based collaboration tools help people work together quickly and solve problems step by step. This helps people to think carefully, understand situations, and come up with new ideas [3], [4].

Promoting feelings and working well with others. Learn to get along and share feelings while using computers for learning together. Working with others in groups helps students learn how to talk to people, understand their feelings, and work well together. They learn how to deal with arguments, show respect for other people's ideas, and recognize the good things about their classmates. These important skills are really helpful in school and in the real world. They get students ready to do well in their jobs and in their personal lives. Cloud-based learning makes it possible for students to have many different types of learning experiences. Teachers can do projects that involve different subjects, talk to experts in different areas, and work with other schools around the world. This means that when students are exposed to different viewpoints and experiences, it helps them learn more and understand things better. Cloud computing helps students to take charge of their own learning. Students have a say in how they learn and can shape their education to fit their needs. With a teamwork tool, students can work together to make things, teach each other, and learn on their own. This way helps you feel like the learning is yours and gives you more freedom, which makes learning more fun and important. More tools are available for students to use to learn. These tools let students easily find and use lots of different learning materials, like digital books, research papers, videos, and online libraries. This means that students can easily and freely find and learn from different kinds of information, which helps them to understand and remember things better.

Finally, working together in education is very important. When cloud computing is used with collaborative learning, it has a big impact and helps connect people from all over the world. By using tools on the internet, teachers can create a learning environment that includes all students and allows them to work together. This helps students to think critically, solve problems, and develop their social and emotional skills. As technology keeps changing, working together to learn using online tools will be very important for the future of education. Online tools make it possible for people to have virtual classes and meetings, even when they are far away from each other. Teachers can give fun classes where they talk to students and have them ask questions. They can also have meetings online and talk to students in real-time. The article explores different online classroom programs and how they might affect how people learn [5], [6].

Online classes and virtual meetings have changed the way teachers teach and students learn. It allows teachers to connect with students from a distance and create fun learning activities. Cloud-based collaboration tools have been important in helping virtual learning, breaking barriers of distance and time and changing traditional classrooms into a dynamic global educational space. Virtual classrooms use cloud technology so that students and teachers can learn from anywhere. This is really helpful for students in faraway or less supported areas who may not have easy access to regular schools. With virtual classrooms, students can learn from good teachers from anywhere in the world, which makes education fair for everyone.

Cloud-based virtual classrooms allow students and teachers to interact in real-time. Teachers can give classes and talk to students in real-time. They can also talk with students and answer their questions right away. This live interaction feels like a regular classroom, helping students feel connected and part of a group. Teachers can have online classes and bring in experts from different areas to teach students. Cloud-based tools help to plan and handle events easily, and also help students to learn about different viewpoints and new knowledge. Virtual classrooms

make it easy to schedule and attend classes because they are flexible and convenient. Students can join live classes, watch recorded lessons when they want, or take part in online discussions on discussion boards. This flexibility allows people to learn in their own way and at their own pace, so they can study when it works best for them. Cloud-based collaboration tools help teachers create fun and interactive learning experiences. They can use videos, games, and virtual activities to help students learn better. This teaching method helps you remember more and understand things better.

Customized Learning Routes Educators can use cloud-based virtual classrooms to follow students' progress and involvement. This allows them to create customized learning routes based on each student's individual needs and interests. Adaptive learning technologies can look at how well a student is doing and give them specific advice and help. This makes sure that students get the support they need to do well. Virtual classrooms bring together students from different cultures and backgrounds to work on projects and share their experiences. This teamwork helps people learn about different cultures, see things from different points of view, and get ready to live and work in a world with many different kinds of people. Cloud-based virtual classrooms allow schools to offer classes where experts in certain subjects teach. Students can take classes that might not be offered nearby, so they can follow their interests and hobbies. Virtual classrooms help the environment by cutting down on travel and using fewer materials. This is good for the planet. This green method fits with the increasing focus on doing things in a way that helps the environment in education.

Online classrooms and virtual meetings on the internet have changed the way we learn. They have lots of good things for teachers and students. These technologies make it easier to connect with people far away, talk to them right away, and have more interesting and flexible ways to learn. As schools use more online learning, they can work with other countries, tailor lessons to each student, and get help from experts. This will change education in a positive and important way.

Cloud-based tools make it easy for students to work together on group projects. They can assign tasks, set deadlines, and keep track of how the project is going. This explores popular apps for managing projects and how they can help teams work better and get more done. Using tools on the internet to work together on projects has become very important in education. It helps students to work well on group projects, assignments, and research. These online tools make it easier for students to work together on projects and get more done.

DISCUSSION

Organizing and keeping track of tasks is easy with cloud-based project management tools. They help to assign tasks to team members and everyone can see the tasks in one place. Teachers can divide big projects into smaller jobs, decide when they need to be done, and give specific jobs to each student or group. This makes sure that people know what they are responsible for and helps everyone see how they are helping with the project. In addition, students can see how their work is going and make sure they finish it on time, which helps them do their projects better. Working and communicating with others at the same time is an important benefit of using project management tools that are based in the cloud. Students can talk to their team members, share news, and talk about ideas right away, which helps create a culture of being open and working well together. Working together at the same time helps us avoid meeting in person and makes it easier to work on projects quickly and effectively. Cloud-based project management tools allow team members to share and access project files and documents in one place. This makes sure that everyone can use the latest information, so there won't be any confusion or problems caused by using old files [7], [8].

Cloud-based project management tools can show Gantt charts and visual timelines of tasks. This helps students see how their project is progressing and what tasks depend on each other. Gantt charts show the whole project schedule so that we can easily see if there are any problems and change the timing if necessary. Working together outside of class is easier with cloud-based project management tools. Students can do group projects from home, which makes learning more flexible and includes everyone, no matter their schedule or how they like to learn.

Improving how you use time and getting more done Students learn how to manage their time better by using online project tools. They learn to decide which tasks are most important, finish their work on time, and use resources effectively to complete projects. These skills can be used in school and at work and are very important. Helping each other learn and work together on projects lets students learn from each other's strengths and support each other when they need help. Students can share what they know, come up with ideas, and give helpful advice to each other. This helps everyone feel like they are all responsible for the success of the project.

Accessing resources and infrastructure through the cloud

Cloud computing helps schools grow without spending too much money on their own computers and servers. This looks at how cloud services are cheap and useful for storing data, using computer power, and running software. They are helpful for both small schools and big universities. Cloud computing helps schools to grow and save money. Cloud services let schools change how much computing power they need without buying expensive equipment. This is about how cloud computing can save money for storing data, using computer power and software. It's good for all kinds of places like small schools and big universities.

Cloud computing helps schools and colleges to change the amount of resources they use depending on what they need. During busy times when a lot of people need to use computers, like when signing up for classes or taking exams, schools can make their computers work faster and store more information.

On the other hand, when things are quieter, they can cut back on what they use and avoid spending money on things they don't need. This way of paying for services allows organizations to use their resources more efficiently and avoid spending too much on traditional in-house infrastructure. Saving money on hardware and maintenance costs is important. Buying on-premises hardware for storing data, servers, and networking can be really expensive for schools, especially smaller ones with not much money to spend. Cloud computing saves money because companies don't have to spend a lot of money on buying and keeping up with computer equipment.

Instead, organizations can pay for the cloud services they use as they go along, which can save them a lot of money in the long run. Cloud service providers work on a very big scale, handling many data centers and infrastructure to help many clients all over the world. This scale helps them save money by spreading the costs of infrastructure and operations across a lot of customers. Cloud services can give schools computers at a cheaper price than if they did it themselves [9], [10].

Having less people to work in IT department. Running hardware and infrastructure from a physical location needs a group of IT workers to take care of keeping things in good shape, making sure all the software is up to date, and solving any problems that come up. Educational institutions can use cloud computing to let someone else take care of their technical stuff, so they don't need as many IT staff. This helps schools use their resources for other important things like improving teaching and learning. Cloud service providers always buy the newest

technologies to make their services better. By using cloud computing, schools can use advanced technology, software, and security without needing to buy new equipment all the time. This makes sure that organizations can keep current with the newest improvements in technology, making their services better.

Cloud providers have strong plans in case something bad happens and they keep extra copies of data to protect schools' information from getting lost if there's a problem with the computers or a natural disaster. Many schools can't protect data like this. So they use cloud computing to keep data safe. Cloud computing makes educational technology more flexible and cost-effective. By using cloud services, schools can make the most of their computer resources, save money on hardware, and use new technology without having to do a lot of IT work [11], [12].

Cloud computing helps both small and big schools to use better and cheaper technology. This helps them to give students the best education in the digital age. Access learning stuff anytime and anywhere with cloud storage and learning systems. Students and teachers can get to their class materials, assignments, and resources from any device with internet. This talks about how important it is for people to have access to resources and how it can affect their learning. Access to learning resources has changed because of cloud storage and learning management systems. Students and teachers can use these resources anytime and anywhere, which makes learning more flexible and convenient. This talks about how important it is to have access to resources and how it can greatly affect the way we learn. Easily access learning materials online, instead of being stuck in a classroom at set times. Students can now get their class stuff like notes and assignments whenever they want, even if they're at home, on the bus, or at a coffee shop. This flexibility helps different types of learners and individual preferences. It lets students study and interact with course material in ways that work best for them.

Help for learning throughout your life is easier with access to learning materials on the internet, because it removes problems with when and where you can learn. Students can use cloud-based resources to help them learn, whether they are in school or learning on their own. This opportunity helps people to keep learning even after they finish school and all throughout their work life. Personalized Learning Paths means you can learn at your own pace and in your own way. You can access learning materials anytime and anywhere to make your learning experience unique to you. Students can work through the course at their own speed, go back over the content when they need to, and learn more about topics they find interesting. Teachers can make learning paths just for you, giving you extra stuff to learn if you need it.

Cloud-based learning tools are made so that everyone, including people with disabilities, can use them easily. These resources can be made easier for blind people to use, have text on videos for deaf people, and have features that make it easier for everyone to use them. This makes sure all students can use and interact with the content in the same way. Online learning systems help students and teachers work together and stay up to date with new information. Teachers can quickly tell students about news, changes in the schedule, and give them extra materials. This helps students always know what's going on. Similarly, students can work with their friends and teachers, join in conversations, and ask for help without having to be in a regular classroom.

Improved interest and encouragement making learning materials available through the cloud helps students become more engaged and motivated. When students can use resources when they want and in ways that work best for them, they are more likely to stay interested in and dedicated to their studies. This increased interest helps people learn better and have a good time learning. Online learning resources help people from all over the world learn and work together. Students can use learning materials and research from different places around the world to get

different ideas and ways of learning. This worldwide connection makes learning better and helps students get ready for a global world. Integrating different types of media like videos, interactive activities, and tests is easy with cloud-based learning tools. Adding multimedia like videos, images and audio make learning more fun and interactive.

To sum up, being able to access learning materials from anywhere at any time because of cloud storage and learning systems has made a huge change in education. This makes it easier for people to learn in their own way, keeps learning going for life, and helps people with different learning needs. Using online tools, students and teachers can work together, find the latest materials, and interact with content that helps them learn and feel motivated in their studies. As technology keeps changing, having access to resources for personalized learning will continue to be important for shaping the future of education.

Cloud-based systems make it easier to do administrative tasks like signing up students, keeping track of who is present, and managing grades. The article talks about how using cloud-based software for keeping track of students can make things run smoother and better in schools. Cloud-based systems for student information have changed how schools do office work. They make things easier and help schools work better. These systems in the cloud help manage student information, do administrative work automatically, and make it easier for people involved to talk to each other. This looks at how using a cloud-based system can make things easier and better in schools. The cloud-based SIS collects and stores all information about students in one easy-to-use place. This includes things like their personal information, grades, and attendance. This one database makes it easier because we don't need as much paper and we only have to enter the data once. This helps make sure the data is the same and correct for all administrative tasks. Automated student registration in the cloud makes it easier for students to sign up for classes. The registration forms are online and can be filled out on any device with internet. Automated registration makes it so people don't have to write things down by hand or use paper forms. This makes things easier for the people in charge and reduces mistakes. Cloud-based SIS allows teachers to take attendance using mobile devices or digital platforms, making it easier to track students' attendance in real time. This new system helps teachers and school leaders keep better track of when students are in school. It helps them have the most recent information about student attendance.

Managing grades just got easier with cloud-based SIS. Teachers can easily enter and organize grades for different tasks and tests. The system uses set rules to figure out the final grades, so teachers don't have to do it by hand. This helps to make sure that grades are fair and consistent for all students. Cloud-based SIS helps people talk and work together easily. It helps teachers, parents, and students work and communicate with each other. The system helps people communicate quickly and easily, and sends messages and alerts to keep everyone up to date on important information like deadlines and how well students are doing in school.

Cloud-based SIS offers strong reporting and data analysis. It gives useful information about how well students are doing, their attendance, and other important data. Administrators can make their own reports, charts, and graphs to study how the institution is doing, find areas that need to get better, and decide what to do based on the data. Cloud-based student information systems often have mobile apps that let school staff and parents see student information and do administrative tasks wherever they are. This movement makes sure that people involved can stay in touch and deal with important matters immediately, making things work better and faster overall.

Improved protection for student information like grades and personal details is a top priority for cloud-based SIS providers. They use strong security measures like encryption to keep data

safe. Backing up your data regularly and having a plan to recover from disasters helps keep your important information safe, so you can keep working even if something unexpected happens. Connecting with Learning Management Systems Some online student information systems work together with learning management systems. This helps to combine administrative and academic tasks in one place. This integration helps teachers see student information and update grades easily from the LMS, making their work more efficient and ensuring that data is correct.

In short, cloud-based student information systems have changed the way schools and colleges handle administrative work. They now have a safe and organized way to manage student information and automate administrative tasks. Cloud-based SIS make it easier for schools to keep track of students, grades, and communicate with parents. This frees up educators and administrators to focus on providing a great education for students. Customizable reports, easy access on mobile devices, and strong data security make cloud-based SIS very important for the future of school administration.

Dealing with worries about keeping data safe

Data privacy and following rules about protecting information are very important when schools keep private student and teacher information in online storage. This talks about ways to protect information and follow privacy laws. It's really important for schools to keep students' and teachers' information safe when they store it online. They need to follow the rules about protecting data and privacy. It's important to have strong plans and rules in place to protect data. This helps to keep the trust of students, teachers and other people involved. This talks about how to keep data private and follow privacy laws. Encryption makes sure that if someone who shouldn't access the data tries to, they won't be able to read it unless they have the right keys. Use RBAC to limit who can see important information. This makes sure that only the right people can see certain information in the school. Make sure only the right people can use cloud systems by using strong ways to prove their identity, like using more than one method to log in. Also, set up rules to control who can see certain information based on their job and permissions.

Regularly check and review the security of cloud-based systems to find any possible weaknesses and things that need to be made better. Regular checks help make sure that the ways we keep things safe are still working well and are keeping important information safe. Use less data by only collecting and storing the minimum amount needed for education. This helps keep sensitive information safe and follows the rules for protecting data.

CONCLUSION

Cloud computing is very important for education today. It gives great chances to change how students learn using technology. This summary shows how cloud computing is changing education in many ways. It gives schools the ability to have flexible technology and personalized learning. It also helps students and teachers work together better in different learning settings. Cloud computing in education has many advantages. It is affordable, can easily grow with the needs of the school, and provides more options for learning. By using cloud-based platforms, teachers can create new ways to be innovative, flexible, and make learning easier for students. As schools use cloud computing, it's important to think about keeping data safe, respecting privacy, and making sure everyone has access to digital technology. By making careful plans, continually learning, and working together with others, teachers and officials can overcome these problems and use cloud computing to make diverse and exciting learning spaces.

REFERENCES:

[1] M. T. Baldassarre, D. Caivano, G. Dimauro, E. Gentile, and G. Visaggio, "Cloud Computing for Education: A Systematic Mapping Study," *IEEE Trans. Educ.*, 2018.

[2] K. B. Nayar and V. Kumar, "Cost benefit analysis of cloud computing in education," *Int. J. Bus. Inf. Syst.*, 2018.

[3] G. Soni Fajar Surya and H. Nugroho, "An evaluation of E-readiness cloud computing service model adoption on Indonesian higher education," in *2018 6th International Conference on Information and Communication Technology, ICoICT 2018*, 2018.

[4] M. B. Ali, T. Wood-Harper, and M. Mohamad, "Benefits and challenges of cloud computing adoption and usage in higher education: A systematic literature review," *Int. J. Enterp. Inf. Syst.*, 2018.

[5] Ali, Wood-Harper, and Mostafa, "Benefits and Challenges of Cloud Computing Adoption and Usage in Higher Education," *Int. J. Enterp. Inf. Syst.*, 2018.

[6] M. A. Isak and B. Elamin, "Identifying the factors of Cloud Computing Adoption in Higher Education Institutions -A case study of Somali Higher Education Institutions.," *J. Zool. Rajshahi Univ.*, 2018.

[7] Y. A. M. Qasem, R. Abdullah, R. Atan, and Y. Y. Jusoh, "Mapping and Analyzing Process of Cloud-based Education as a Service (CEaaS) Model for Cloud Computing Adoption in Higher Education Institutions," in *Proceedings - 2018 4th International Conference on Information Retrieval and Knowledge Management: Diving into Data Sciences, CAMP 2018*, 2018.

[8] N. S. Aldahwan and M. S. Saleh, "Developing a Framework for Cost-Benefit Analysis of Cloud Computing Adoption by Higher Education Institutions in Saudi Arabia," in *2018 International Conference on Smart Computing and Electronic Enterprise, ICSCEE 2018*, 2018.

[9] Z. Baksh, "Effect of Cloud Computing System in Education," *Int. J. Res. Appl. Sci. Eng. Technol.*, 2018.

[10] N. Soroko, "USING CLOUD COMPUTING FOR STEM EDUCATION IN GENERAL SCHOOL," *Порівняльно-педагогічні студії*, 2018.

[11] F. Akram and R. Kumar, "A Systematic Mapping Study of Cloud E-Learning Computing for Education," *Int. J. Comput. Appl.*, 2018.

[12] A. J. Petrosino, M. K. Sherard, J. R. Harron, and W. Stroup, "Using Collaborative Agent-Based Computer Modeling to Explore Tri-Trophic Cascades with Elementary School Science Students," *Creat. Educ.*, 2018.

CHAPTER 9

ROLE OF ROBOTICS AND AUTOMATION IN EDUCATION

Dushyanth V Babu R, Associate Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- vb.dushyanth@jainuniversity.ac.in

ABSTRACT:
Robotics and automation technologies have emerged as powerful tools in reshaping educational experiences and preparing students for the demands of the 21st century. This abstract explores the multifaceted impact of robotics and automation in education, highlighting their potential to enhance learning outcomes, foster creativity, and cultivate essential skills for future success. Robotic systems and automation technologies offer hands-on learning experiences that engage students in problem-solving, critical thinking, and interdisciplinary exploration. From programming robotic kits to designing automated processes, students can develop technical proficiency while mastering core concepts in science, technology, engineering, and mathematics (STEM) disciplines. This abstract delves into the diverse applications of robotics and automation in education, including robotics competitions, project-based learning, and real-world applications in fields such as healthcare, manufacturing, and agriculture. It also examines the role of robotics and automation in promoting inclusivity and accessibility in education by providing adaptive learning environments for students with diverse learning styles and abilities.

KEYWORDS:

Artificial Intelligence, Coding, Computer Programming, Interdisciplinary, Problem-Solving, Project-Based Learning.

INTRODUCTION

Clearly explain how the institution keeps your data private to everyone involved. Make sure it's easy for everyone to find information about how we will use and share data from students and teachers. Create and put into action a plan for what to do if our data is exposed. This plan should explain what to do if there is a data breach, like how to stop it right away, who to tell about it, and how to talk to the people it has affected. Learn and follow the rules about protecting people's information, like the General Data Protection Regulation in Europe or the Family Educational Rights and Privacy Act in the US. Make sure that your organization follows these rules for how data is handled and stored in every way [1], [2].

Make sure to check if the third-party cloud service provider follows the rules for protecting data and keeping it safe. Check the company's rules about keeping information safe, how they protect against bad things happening and if they have any important certificates. Continuing education and awareness make sure that the school's teachers, staff, and students know how to keep private information safe and why it's important. Encourage everyone to understand and take care of their personal information at the organization. Create clear rules for how long data should be kept and when it should be deleted, to make sure that it is only stored as long as it's needed and gets rid of properly when it's not needed anymore.

In conclusion, it’s very important for schools to protect students' information when using cloud-based systems. They need to follow data protection rules. By using strong codes to protect information, controlling who can access it, checking security regularly, and being clear about privacy rules, organizations can keep data safe and follow the rules. Putting data privacy first not only keeps sensitive information safe, but also helps students, teachers, and others in the education community feel confident and trusting [3], [4].

Educational institutions need to use strong security measures to keep their data safe and prevent unauthorized people from getting in. The research looks at the most effective ways to keep the cloud safe, like using codes to protect information, requiring more than one way to log in, and regularly saving data. Protecting data and privacy in schools is very important. Strong security measures are really important to protect against hacking, unauthorized access, and other online threats. This talks about the best ways schools should keep their information safe on the cloud.

Use strong codes to keep data safe when it's being sent and when it's stored in the cloud. This means that even if someone gets the data without permission, they can't read it because it's scrambled and can only be unscrambled with the right code. Use multi-factor authentication to access cloud systems and resources. MFA makes things more secure by asking users for more than one way to prove who they are, like a password, a one-time code, or a fingerprint.

Use RBAC to control who can access cloud resources. RBAC gives users permissions based on their roles and duties in the institution, which lowers the chance of unauthorized access to important information. Always update and patch security for cloud systems and apps to keep them safe. Regularly fixing security holes helps prevent known security attacks. Make sure that when using cloud-based APIs, they are safely managed and verified. Insecure APIs can be used to access cloud resources without permission. Set up and use cloud systems and services in a way that follows the best security rules and advice given by the cloud service provider. The basic settings might not always be the safest, so it's important to change them to fit the institution's needs. Do safety checks and tests often to find weaknesses in cloud systems and apps. These tests pretend to be cyberattacks to check how safe the institution is and find ways to make it better [5], [6].

Make sure to save your data regularly and have a plan for what to do if something goes wrong. This makes sure that if data is lost or there is a security problem, the institution can quickly get the data back and start working again. Teach employees, workers, and students how to keep information safe in the cloud and protect against online attacks. Mistakes by people are a big reason for security problems, so it's really important to make sure everyone knows how to keep things safe. Use data loss prevention tools and methods to watch and stop sensitive data from being sent or seen by unauthorized people. Watch and study what happens in the cloud. Use strong monitoring and analysis to find any strange or unauthorized activity. This helps the institution to quickly react to possible security problems. Check if third-party cloud providers have good security and a history of reliable security practices. Educational institutions can make their digital information more secure by following these cloud security tips. This will help protect their data and reduce the chances of hackers getting access to it. Keeping cloud data safe is always a job that needs attention and regular updates to keep up with changes in online security. When schools pick cloud services, they need to think about who owns the data and what the service agreements say. This provides information on how to choose vendors so that the institution keeps control and ownership of data.

Choosing the best cloud company is very important for schools. It helps them keep control of their data and ensures that sensitive information is kept safe and private. It's important to think about who owns the data and to follow the rules in the service agreements to keep the institution safe and follow the data protection laws. This gives information about how to choose a vendor to protect the control and ownership of data.

Carefully read the rules about who owns your information on the cloud service. Make sure the institution keeps its data and the provider cannot take it or use it for anything other than the agreed-upon services. Make sure the company you use for cloud services follows the rules for keeping data safe and private, like GDPR, FERPA, or the Health Insurance Portability and

Accountability Act if needed. The provider needs to show they care about keeping data safe and have strong security in place. Make sure the company you use for cloud storage allows you to move your data to a different service if you want to leave. This means the institution can move its data from the cloud platform to a new provider or bring it back in-house without any trouble. It's important to have a plan for leaving to keep control of the data and be flexible. Check the agreements from the cloud company to see what kind of service they promise, how often their service will be available, and what kind of help they will offer. SLAs need to clearly explain what the provider has to do to make sure the data is not changed and can be easily accessed [7], [8].

Make sure the cloud service provider has strong security to keep data safe when it's being sent or when it's stored. Make sure that the data is locked in a way so that the company cannot see it without unlocking it. Know where your data is stored and which laws apply to the cloud service provider. Some countries have rules about where data must be kept, which can affect how a company protects data. Check out what people think about the cloud service provider before you choose them. Search for reviews and feedback from other schools that have used the services to see if the provider is reliable and offers good quality service.

Make sure the company you want to use for cloud services knows how to follow all the rules for schools and understands what they need to do to meet the requirements for education. Make sure the company storing your data has a good backup system to prevent data loss and keep the data safe in case something bad happens. Pick a cloud service provider that tells you clearly about how they handle your data. The provider needs to be ready to answer any questions or worries the institution has about keeping data safe, private, and who owns it.

In conclusion, it's important for schools to choose vendors carefully when using cloud services. This will help them keep control of their data and own it. By looking at who owns the data, how it's kept private and secure, and if it can be moved to different places, organizations can pick a cloud company that meets their needs and keeps their important information safe. Putting a lot of focus on controlling and owning data helps protect the institution's name, makes sure it follows data protection rules, and gives peace of mind when using cloud computing.

DISCUSSION

In the last few years, robots have become more important in schools and are now being used as teaching helpers. These smart machines help teachers with many parts of teaching and managing their classroom. Robotic teaching assistants help teachers by doing repetitive tasks, assisting students, and leading interactive learning activities. This allows teachers to spend more time on important parts of education. Robotic teaching helpers have changed the way we learn by helping teachers and making learning better for students. They can do more than just normal office work. They can also interact with students in fun and engaging ways. Here are different ways that robots help with teaching. Helping with office work, robotic teaching helpers are really good at doing everyday office tasks by themselves. This helps teachers have more time for other important things. They can keep track of who's at school by scanning student IDs or using facial recognition. Also, they can gather and arrange tasks, give feedback, and grade multiple-choice tests. Robotic teaching assistants help with paperwork so that teachers have more time to plan lessons and give personalized help to students [9], [10].

Robotic teaching assistants can give personalized learning experiences, which is one of their biggest advantages. They can help with one-on-one tutoring. These robots have special technology that helps them change how they teach based on what each student needs and how fast they learn. They can see what students are good at and what they need help with, find where they need to learn more, and make lessons that fit what each student needs. This special

way of teaching helps students learn better and achieve higher grades. The robot helpers in the classroom make learning fun by doing quizzes, games, and activities with the students. They can have fun educational quizzes and games to help remember what was taught in class. Students can learn better by doing fun activities that help them remember and understand the lesson. These fun activities make the classroom a fun place to learn and get students excited to learn.

Using interactive storytelling and role-playing can make students more interested in learning. Robotic teaching assistants can make storytelling in class more fun by telling interactive stories. They can act out different roles, making stories come alive by changing their voice and using expressive movements. This storytelling method gets students' attention and makes learning more interesting and easier to remember. Additionally, robot helpers can act out different situations to help students learn hard ideas by giving examples from real life.

Robotic teaching assistants help traditional teachers by doing different jobs and making the teaching better. They use technology in the classroom to make learning more interactive and personalized. However, it is important to find a good mix of using robot teaching helpers and people teaching because people can provide important connections, emotional support, and understanding during learning. As new technology gets better, teachers need to think about how to use robot teaching helpers in their classes to help students learn better [11], [12].

Benefits of using robot teaching assistants

Robot teachers are really good at doing things that take a lot of time, like grading papers and doing paperwork for schools. They can do these things fast and without making mistakes. By taking care of these duties, they help teachers concentrate on important parts of teaching, like making lesson plans, giving personalized lessons, and creating better connections with students. Robotic helper’s help teachers do their job better, which helps students learn more. Robotic teaching assistants always give the same content and feedback to every student, so everyone gets the same attention and instruction. Robots always teach in the same way and grade the same way using set rules. This makes the way they teach and grade very consistent. Unlike people who might teach and grade in different ways. This fairness is very useful in tests where it's important to be fair and objective.

Using smart technology, robots can study how well students are doing and give each one the best way of learning. They can find out where students are having problems and give them extra help with lessons made just for them. This flexibility allows students to learn at their own speed, which helps them stay interested and do better in school. It may cost a lot to buy robot teaching helpers at first, but in the long run, they are worth it because they provide many benefits. Robots can work all the time without stopping, so there is less need for extra teachers in big classrooms or schools that don't have enough resources. In the future, using robots to help in schools can save money and make it easier for kids in areas that don't have a lot of resources to get a good education. Possible difficulties with using and accepting robots in schools. The use of robot teaching assistants needs good technology and support to work well. Schools need strong internet connections, the right technology, and trained IT staff to fix and maintain equipment. It can be hard for schools with not much money or old technology to deal with these technology problems.

Teachers might be hesitant to use robots in their classrooms. Some teachers might worry that machines will take over their jobs or feel unsure about how to use robot teaching assistants in their classes. It is really important for teachers to have very good training and ongoing help to make sure they can successfully use and accept this technology. The use of robots in schools brings up ethical issues, like keeping student information private, making sure students are

safe, and using AI in a responsible way. Schools have to put strong protection in place to keep students' important information safe. Moreover, the way robots are programmed and make decisions should be clear and without any unfair favoritism, to make sure all students are treated fairly.

Dealing with worries about losing jobs and finding the right balance between people and machines working together. Changing the way we see job responsibilities. Instead of taking the place of human teachers, robots that help with teaching should be seen as tools that make teachers better at their jobs. Schools can change teachers' jobs to focus on giving each student special help, being there for their feelings, and teaching them advanced thinking skills that robots can't do. This change can make teachers' jobs more satisfying and important. Robots can help with paperwork at school and give individual help to students. This lets teachers spend more time talking with students and helping them. Teachers can use robots to help make learning more exciting and engaging. This can encourage students to be more creative, think carefully, and work together on their learning.

Encouraging people and robots to work together in the classroom can help students see robots as helpful tools instead of opponents. Teaching kids about what robots can and can't do can make them like robots more, and get ready for a future where people and robots work together.

Robot teaching helpers have many advantages like being efficient, consistent, and giving personalized learning. However, making sure that technology is used well in schools might be hard because of problems with technology, teachers not wanting to use it, and making sure it's used in the right way. By changing how teachers work, improving classrooms, and encouraging people and robots to work together, schools can use robotic teaching helpers while still keeping the important human connection in education. Teaching about robots in science and technology education.

Using robots in education helps students learn about science, technology, engineering, art, and math in a fun and interactive way. These robots are helpful tools that help kids learn and be creative while also solving problems and thinking critically. Here's a close look at how robots are used in STEAM education. Using robots in science experiments and simulations allows students to conduct safe and controlled scientific activities. For example, robots with sensors and moving parts can copy real-life situations. This lets students learn about physics, environmental changes, or chemical reactions. The information collected by the robots in these tests can be studied to learn more about science. This helps us understand scientific ideas better. Using robots to learn about math and algorithms. Educational robots help students understand math in a fun way. By using programming to control the robot, students can learn about shapes, how things are arranged, and angles. They can use math to help the robot move through mazes, find locations, and figure out distances. This helps them understand math better in real life. This hands-on method makes math easier to understand and more interesting.

Creating robots for projects allows students to be more innovative and creative. By using robotics in education, students can become inventors and problem solvers. Creating and making robots from the beginning help people think creatively and solve problems. Students need to think hard, make a plan, and keep trying different designs to get the results they want. Building a robotic arm, a robot that follows lines, or a car that drives itself are projects that ask students to use what they know in creative and useful ways. These activities help students develop a positive attitude towards learning, as they learn from their successes and mistakes while designing and building things. Studying robotics involves different areas of learning and helps students see how these subjects are connected. For instance, making a robot that can move through obstacles might use ideas from physics, math, engineering, and computer

science. The robotics projects help students learn about different subjects and how they can work together to solve real-life problems. Educational robots show how science, technology, engineering, art, and math are used in the real world. Students learn how robots are used in making things, helping sick people, farming, and exploring space when they build and program them. This hands-on experience encourages students to pursue careers in science, technology, engineering, arts, and math, and helps them feel like their learning has a real purpose.

By using robots in STEAM education, teachers can make exciting and hands-on learning. This helps students feel like they can explore, try new things, and come up with creative ideas. Robotics helps us learn important science and technology skills and also teaches us how to work together, communicate, and be flexible. As technology gets better, robots will become more important in education. This will help students become better at solving problems in a changing world.

Learning with Robots in Projects

Learning with robotics projects is a new way of teaching where you do things with your hands to learn. By doing fun robot activities, students are encouraged to be more involved in their learning. This helps them understand science, technology, engineering, arts, and math better, and learn important skills for the modern world. Here's a detailed look at the parts and advantages of learning with projects and robots. Focusing on learning by doing projects with robots. Students are given real-life problems to solve and need to think critically and find solutions. Robotics is a great way for students to learn because they have to make, build and control robots to do tasks or goals. Whether it's finding your way through a maze, finishing a tricky course, or pretending to rescue someone, these robot challenges put students in real-life problem-solving situations. By facing these challenges, students learn to take control of their own education and become more involved in their learning.

Encouraging people to work together and communicate while doing robotic projects. Robotic projects help people work together and cooperate. Students work together in teams to create and build their robots. They need to talk and plan together so that they can work well as a team. Each person on the team has different ideas and abilities that help the project. This makes a friendly and cooperative learning atmosphere. Collaborating with others helps students learn how to work together, communicate, and find solutions - important skills for doing well in school and at work.

Displaying how robots are used in real life to make students interested Incorporating real-life examples of robots in projects can make students excited and inspire them by showing how what they are learning is useful in the real world. For instance, making a robot to explore a "strange planet" might be similar to the work NASA does with its Mars rovers. In the same way, making a robot to help people with disabilities can show how robots can be good for society. These examples show students how cool robots are and make them want to learn more about science, technology, engineering, art, and math. They might even want to have jobs in these fields when they grow up.

Learning with robotics is more than just learning about specific subjects. It helps develop important skills for the future. It helps people learn important skills for the 21st century, like thinking, being creative, solving problems, and being able to change. Students need to think hard and keep making their robot designs better when they face problems. This way of trying and fixing things helps us to be tough and to have a positive attitude towards learning and growing. Also, students need to be creative when they try to solve problems and change their plans if they don't work at first. These skills can be used in many different parts of their lives, not just at school. Project-based learning with robotics helps teachers see how well students

are doing. Instead of just giving tests and quizzes, teachers can see how students work together and solve problems in their project. They can also look at how creative and good at communicating the students are. This type of test helps teachers understand what students are good at and where they need to get better. It also helps teachers give specific advice to help students improve.

Teachers use hands-on projects involving robotics to make learning more engaging and focused on students. Students play an important role in their education, making connections between what they learn and how it applies in real life. They also learn skills that are important for being successful in a world that is always changing. By doing robotics projects, students learn about science, technology, engineering, art, and math. They also get excited about learning and feel like their education has meaning.

CONCLUSION

Robots and technology that can do things automatically are changing education. They give students a chance to learn by doing things and develop important skills they'll need in the future. This summary shows how robots and automation can be used in education to help with STEM learning and to encourage creativity and problem-solving. As jobs change, schools need to change too, to get students ready for the new types of work that are done by machines. By using robotics and automation in teaching, teachers can help students learn new skills and be more prepared for different jobs. In addition, robots and automation can help more students with different needs learn by creating adaptable learning spaces. Teachers can use these technologies to make learning fun and include everyone, so that each student's talents and interests are taken into account.

REFERENCES:

[1] K. Prettner and H. Strulik, “The Lost Race Against the Machine: Automation, Education, and Inequality in an R&D-Based Growth Model,” *SSRN Electron. J.*, 2018.

[2] M. Golob and B. Bratina, “Web-based control and process automation education and industry 4.0,” *Int. J. Eng. Educ.*, 2018.

[3] K. Gunasekera, A. N. Borrero, F. Vasuian, and K. P. Bryceson, “Experiences in building an IoT infrastructure for agriculture education,” in *Procedia Computer Science*, 2018.

[4] M. B. N. Wajdi *et al.*, “Advancement of E-Book through automation system in department of Islamic education (STAI) Miftahul Ula Nganjuk,” *Int. J. Eng. Technol.*, 2018.

[5] R. Bentaouet Kattan, K. Macdonald, and H. A. Patrinos, *Automation and Labor Market Outcomes: The Pivotal Role of High-Quality Education*. 2018.

[6] A. V. Bobryakov *et al.*, “Features of development and using interuniversity scientific and educational network «SYNERGY» for training of engineers in the field of automation, robotics and mechatronic systems,” *EAI Endorsed Trans. Energy Web*, 2018.

[7] P. Hessel, S. Christiansen, and V. Skirbekk, “Poor health as a potential risk factor for job loss due to automation: The case of Norway,” *Occup. Environ. Med.*, 2018.

[8] T. A. Campbell, “A phenomenological study of business graduates’ employment experiences in the changing economy,” *J. Labour Mark. Res.*, 2018.

[9] H. Coelho, “The robot take-over: Reflections on the meaning ofautomated education,” *Educ. Policy Anal. Arch.*, 2018.

[10] C. Vagt, "Education Automation," 2018.

[11] A. Taryana, I. Setiawan, A. Fadli, and E. Murdyantoro, "Pioneering the automation of lnternal quality assurance system of higher education (IQAS-HE) using DevOps approach," in *Proceedings - 2017 International Conference on Sustainable Information Engineering and Technology, SIET 2017*, 2017.

[12] N. W. Gleason, *Higher Education in the Era of the Fourth Industrial Revolution*. 2018.

CHAPTER 10

DEVELOPING COMPUTATIONAL THINKING AND CODING SKILLS

Meena Y R, Assistant Professor
Department of Civil Engineering, Faculty of Engineering and Technology, JAIN (Deemed-to-be University)
Ramnagar District, Karnataka - 562112, India
Email Id- yr.meena@jainuniversity.ac.in

ABSTRACT:
In an increasingly digital world, computational thinking and coding skills have become essential competencies for success in various fields. This abstract explores the importance of developing computational thinking and coding skills in education and highlights effective strategies for empowering learners to become proficient problem solvers and creators of technology. Computational thinking involves breaking down complex problems into smaller, more manageable parts and devising algorithmic solutions to solve them. Through coding, learners translate computational thinking concepts into tangible actions, gaining proficiency in programming languages and computational concepts. This abstract delves into the diverse benefits of developing computational thinking and coding skills, including fostering creativity, enhancing problem-solving abilities, and promoting logical reasoning. It also examines the role of computational thinking and coding in interdisciplinary contexts, such as science, mathematics, and the humanities, highlighting their relevance across various domains.

KEYWORDS:

Code Literacy, Debugging, Problem-Solving, Program Design, Programming Languages, Sequential Thinking.

INTRODUCTION

Taking part in robotics competitions, whether in your town or in other countries, gives students a special and exciting experience that teaches them more than just what they learn in regular classes. These events allow students to show how creative, good at solving problems, and skilled in technology they are. It also helps them to develop a love for science, technology, engineering, and math. Here is a close look at how robotics competitions and events can make students more interested in science and technology, and create a positive place for learning. Taking part in local and worldwide robot competitions gives students a chance to use what they've learned to solve real-life problems. These events usually involve hard tasks like creating robots that can move by themselves through obstacles or do certain jobs. When students join competitions, they learn how to do engineering, programming, and work well with others. They learn how to work with pressure, use time well, and change their plans based on competition needs. These events are competitive, which encourages students to try their hardest and do their best. Robotics competitions make students more interested in STEM fields and motivated to learn about them. Building and programming a robot is exciting. It feels great to see it do tasks and challenges well. It makes you want to keep going. Students get more interested in STEM subjects when they see how the things they learn in class can be used in real-life projects. Contests make students feel good about themselves and help them believe in their abilities. This makes them want to learn more about science, technology, engineering, and math jobs [1], [2].

Helping young people grow and learn by supporting them in solving problems and coming up with new ideas Robotics competitions help students feel motivated to try new things and be creative. Schools and educational institutions that focus on robotics competitions give students the tools and support them need to do well. Teachers, mentors, and parents are very important

in helping young innovators because they give them help, advice, and praise for what they do. This place where people work together helps them feel like they belong, and encourages them to be creative and solve problems [3], [4].

Learning and improving skills in robotics competitions helps students to have a positive attitude about growing and learning throughout their lives. When students face problems and difficulties, they learn to keep trying, make changes to their designs, and get better at what they do all the time. Learning and getting better at things is something that we continue doing for our whole lives, not just to reach a goal and stop. Always learning and getting better is really important in everything you do in life. Making connections and getting noticed joining robotics competitions lets students meet and connect with other students, industry experts, and teachers. Talking to people who have similar interests and hearing different points of view can inspire new ideas and working together on projects. Students can learn about the different jobs in science and technology. This could encourage them to explore different career options outside of the usual school path.

Encouraging Different Kinds of People Robotic contests can help bring in all kinds of people and make them feel welcome in science and technology. By asking students from different backgrounds, genders, and ethnicities to join in, these events help to get rid of stereotypes and make a more fair and welcoming STEM community. Recognizing everyone's contributions makes people feel like they belong and encourages people from all backgrounds to be interested in and work in science, technology, engineering, and math (STEM). Competitions and events about robots help students get excited about science, technology, engineering, and math. In addition to technical skills, these events help students learn to think in new ways, be creative, work well with others, and solve problems. These are important qualities that students need to be successful in the modern workplace.

By making a welcoming and fair learning space, teachers and schools can help kids become creative thinkers and problem solvers. This can motivate them to become leaders in science, technology, engineering, and math in the future [5], [6].

DISCUSSION

In today's fast-changing digital world, knowing how to code and think logically is very important. It's not just for computer experts anymore. These abilities are very much wanted in today's job market because many industries are using technology more and more. Teaching coding in different subjects helps students become better at solving problems and thinking critically. This will help them deal with difficult tasks and do well in the digital world. Here is a detailed look at why coding and computational thinking are important and how we can teach them in schools.

The importance of coding and thinking logically is very important in today's job market. It doesn't matter what job you have, these skills are needed. In today's world where technology is everywhere, companies want to hire people who are good at using digital tools. Coding helps people make computer programs and tools like websites and apps for people and businesses. In addition, computational thinking means breaking big problems into smaller parts and finding systematic solutions. This is a very useful skill for solving problems in different fields. These skills are very important for jobs in data science, artificial intelligence, cybersecurity, web development, and software engineering. These jobs are in high demand [7], [8]. Teaching coding in different classes, not just computer science, makes it easier for all students to learn. For example, math classes can use coding activities to help understand geometry, algebra, and statistics better. In science class, students can use coding to study data from experiments, recreate scientific events, or create models of nature systems. In language arts class, students

can use coding to make fun stories, digital projects, or even write poetry using code. By adding coding to different subjects, students can see how coding can be used in different areas and how it can help solve real problems.

Creating programs and solving problems through coding helps people get better at thinking critically and finding solutions to problems. When students do coding projects, they face problems and have to figure out how to fix them by trying different things until they get it right. They learn how to find and correct mistakes, fix code problems, and improve their solutions step by step. Doing coding projects helps students be creative and find different ways to reach their goals. This problem-solving method isn't just for coding, it's useful in all parts of life. Learning to code can make students feel surer of themselves and help them have a positive attitude towards learning and growing. When students finish coding tasks and projects, they feel proud and more confident in their skills. Even when things get hard, coding helps students see problems as chances to learn and get better. These tough and flexible abilities will help students in their school and work lives [9], [10].

Working together and talking to each other is important in coding projects. Students usually work in groups to solve difficult problems or create big software projects. Working together, students learn how to talk to each other, share their thoughts, and find a middle ground to reach a goal. Working together and talking to others are very important skills that are needed in almost any job. This is why coding projects are a great way to practice and develop these skills.

Learning to think logically and solve problems with computers is very important for students to succeed in today's job market. Incorporating coding activities and programming challenges into different subjects makes coding easier to do and shows that it's connected to many different subjects. Doing coding projects helps students learn how to solve problems, think critically, and have a positive attitude towards learning. This can help them do well in a world that relies on technology. By teaching these abilities from a young age, teachers can give students the necessary tools to do well in a quickly changing world that relies on technology. Using robots and technology in education doesn't mean we have to give up on being creative and coming up with new ideas. Instead, these tools can help students be more creative and think of new ideas. Teachers can create an innovative classroom by balancing technical knowledge and creativity, promoting critical thinking, and trying new ideas. Also, using robotics as a way to create art gives students new opportunities to use their creativity. Let's look more closely at each part. Balancing knowing how things work with being creative and thinking about design is important. We need to understand how technology and robotics work, but we also need to use our creativity and think about how things look and feel.

Motivating students to play with robot parts and come up with new solutions helps them use both their technical skills and their imagination. Design thinking helps students to find problems, understand how people feel, come up with new ideas, and create new designs. Using good design, making things look nice, and considering how users will interact with technology makes robotic projects better and helps us understand technology better. Encouraging students to think hard and find new ways to solve problems Robotics projects give students real problems to solve that need them to think hard and be creative. Encouraging students to try new ideas means making a place where they feel they can experiment, take risks, and think of different ways to solve problems. When students face problems and challenges, they learn to think carefully and come up with new ideas to fix them. Giving students chances to work on projects without strict limits helps them come up with new and creative ideas. This encourages them to keep trying to make things better and think of new ways to do things [11], [12].

Using robots for art and creativity, not just for technical stuff, can be really cool and new. Students can create their own robots with different shapes, colors, and movements to express their creativity. Cool art pieces made by robots, moving sculptures, and things you can play with show how tech and creativity can come together to make you feel things and use your imagination. Motivating students to try out telling stories, making art, playing music, and dancing with robots helps them see technology as a way to be creative and come up with new ideas. Robotics can also be a form of art and it allows students from different areas to work together to make cool experiences. Doing art with robots helps students be creative and think about how technology affects society and culture.

By teaching students about robots, we help them learn new and creative ways to use technology to solve problems and improve people's lives. Focusing on creativity and design thinking helps students see technology as a way to make good changes. It also encourages them to be inventors and makers who can shape the future.

Soft skills are the personal attributes, communication abilities, and social qualities that can help people work well with others and perform better in their jobs. Emotional intelligence is the ability to understand and manage your own emotions, as well as understand and respond to the emotions of others.

In a world where technology is used more and more, soft skills are really important. Soft skills are things like good communication, teamwork, and problem solving that are just as important as knowing how to do a job. Helping students to understand and control their feelings, to care about others, to be able to adjust to new situations, and to communicate well are important for students to do well in the future. Teachers can help students succeed in a changing world by teaching them important skills and giving them chances to improve those skills. Let's explore each part more.

Understanding how important it is to have good people skills in a world that is becoming more automated. As machines and artificial intelligence change the way things are done, having good people skills becomes a way to stand out from the machines. Although technology can do things well, it doesn't have emotions, empathy, creativity, or flexibility. Soft skills are really important for making good relationships, working well with others, and leading teams. They are essential in many different jobs. Furthermore, being good at things like communication and getting along with others is really important for dealing with tough situations and changes, especially in a busy and fast-changing world.

Helping to understand and deal with our own feelings and being able to understand and care about other people's feelings - that's emotional intelligence. Developing emotional intelligence (EQ) helps students understand their own feelings, control their emotions, and show empathy. This can help them communicate better and build stronger relationships with classmates, teachers, and others in the community.

By creating a friendly and welcoming learning space, teachers can help students learn how to understand and manage their emotions, and be flexible in dealing with problems and changes.

Understanding and caring about others is important, and empathy helps with that. Students who can understand and share the feelings of others are better at working together, respecting different points of view, and making a good impact in their communities. Learning to be adaptable helps students to be okay with change, to learn from mistakes, and to change their plans when things get tough. These are important skills to have in a world that is always changing. Creating chances to work together on projects and talk to each other. It's best to learn teamwork and communication through hands-on experiences. Working on projects together

helps students to use their strengths, work with each other, and agree on ideas to achieve their goals. By working with others in a group, students learn how to listen carefully, share their thoughts clearly, and solve problems with others in a positive way.

Projects that focus on communication encourage students to share their ideas, convince others, and speak clearly. These tasks could be done as slideshows, discussions, or videos. Developing good communication skills helps students to share their thoughts clearly, motivate others, and work together better. In addition, projects that involve different subjects and skills give students a chance to learn about many things at once. Teaching students how to work well with others, talk about their ideas, and understand what people want helps them learn better while working with robots.

Having good people skills and being able to understand and manage your feelings are really important for students to do well in a world where machines do a lot of the work. By understanding how important these qualities are and giving students chances to improve them, teachers can help students become well-rounded people who can handle problems, work together with others, and communicate in different situations. Teaching students to understand their own emotions, understand others, be flexible, work well with others, and communicate effectively helps them to do well in school and work in a changing world.

Adaptive Learning Systems

Personalized Learning Pathways

In a regular classroom, teachers find it hard to help all students with different learning needs and skills. Some students learn fast and need harder work, while others need extra help and time to understand the same things. This difference in how students learn and how fast they learn makes it hard for teachers to help all of them. Adaptive learning systems help solve this problem by giving each student personalized learning plans. These systems use data analysis and smart computer programs to learn about how each student is doing in school. They can tell what subject's students are good at and where they need more help. By keeping track of how well students are doing and how much they are involved in learning, adaptive learning systems can make personalized learning experiences for each student based on their needs.

Adaptive learning pathways help students learn better

Gathering information about how students use the learning materials and platform is a key part of adaptive learning pathways. We gather this information from different sources like online tests, quizzes, homework, watching media, and how long it takes to do certain things. The smart learning system can also think about things outside of school, like when the student likes to learn, or what ways of teaching work best for them on the computer. AI and machine learning help to process and analyze a lot of information after it has been collected. The system's smart features help it find patterns, trends, and connections in the data. Machine learning algorithms keep getting smarter as they learn from data analysis, making them more accurate and effective as time goes on. Customized suggestions are made for each student by the adaptive learning system using data analysis. These suggestions are customized to meet each student's unique learning needs and preferences. For instance, if the system sees that a student is really good at math but has trouble with language arts, it will give them harder math work and extra help with language arts. Tailored teaching: As students learn, the learning system changes based on how they are doing. If a student needs help with something, the system can give them extra help, different explanations, or practice exercises to help them understand better. The aim is to give students the right amount of difficulty and help so they can understand the material well. On the other hand, if you are really good at something, the system will give you harder stuff to

learn so that you stay interested and motivated. The system makes sure that each student learns at the right speed and with the right information, so they feel proud of what they've done and not too stressed or bored. By collecting data, analyzing it with AI, and giving personalized recommendations and instruction, adaptive learning pathways make a unique and customized learning experience for each student. As students use the system and show what they know, the platform keeps getting better at suggesting helpful learning activities. This helps students to learn more and do well in school.

Advantages of Customized Learning Paths

Better learning results. Customized learning plans are made to fit each student's specific needs and preferences. By customizing the teaching materials and activities to match what students are good at and what they need help with, they get specific lessons that match their own skills. This individualized method helps students understand things better and improves their school work. Students can go through their studies at their own speed and learn more about the subjects they like. This helps them understand the material better.

More involvement happens when students feel like their classes are made for them. They are more likely to be interested and motivated to take part in their learning. Customized learning paths help students see how their education connects to their real life, which makes learning more important to them. Therefore, students will be more interested in learning and will be eager to explore new things, which will have a good effect on their enthusiasm for learning. In a personalized learning setup, students can learn at their own speed, which helps them remember and understand things better.

They can spend extra time on hard subjects or go over things they find tough until they understand it well. This way of learning on your own helps you remember more and become an expert. The students are not hurried to finish the school work. They are given enough time to understand and remember what they learn. This can help them remember and use what they have learned for a long time.

Personalized learning helps students become more responsible for their education and gives them more control. It also helps them become better at learning on their own. When students can choose what they want to learn, they learn how to be responsible for their own education. This feeling of control helps students to believe that they can grow and learn by taking the initiative to seek knowledge, set goals, and keep track of their progress. As a result, students feel more able to work on their own and feel sure of their skills as learners.

Teaching in a regular classroom can be hard because students have different learning needs and come from different backgrounds. Customized learning paths, made possible by smart learning systems, can effectively change teaching to meet each student's specific needs. The system can figure out what each person needs to learn better and how they like to study. Then it gives them special things to help with their learning, like exercises and tests. This helps teachers to concentrate on helping students learn and give extra help when necessary, instead of trying to help every student at the same time. Continuous Improvement Adaptive learning systems always gather information about how well students are doing and how they are using the educational materials. This way of teaching uses information about how students are doing to always check how they are learning and improving. As students use the system, it gets better at giving suggestions, so that the learning experience stays helpful and useful. This process helps students and teachers by making the system better at giving personalized and meaningful learning experiences personalized learning plans have lots of good effects on students' grades, interest in school, and how much they learn. Customized learning can change education by adapting lessons to each student, making them feel responsible for their learning, and always

improving how they learn. This helps prepare students to succeed in a changing and diverse world. As technology gets better, the idea of personalized learning in education looks even more exciting for the future.

Although personalized learning paths have many advantages, there are also difficulties and things to think about, like data privacy and security are really important when it comes to personalized learning. This is because collecting and analyzing student data is a big part of personalized learning. We need to make sure that this data is kept private and safe. Schools and tech companies need to put strong security in place to keep students' private information safe from anyone who shouldn't have it.

It's really important to follow the rules about keeping people's information private, like the Family Educational Rights and Privacy Act in the United States and the General Data Protection Regulation in the European Union. Openly telling students, parents, and others about how data is collected and why it's important is really important for building trust and keeping personalized learning systems honest.

Algorithmic bias happens when AI algorithms are used in adaptive learning systems. These algorithms make personalized recommendations and instructional choices. However, these programs are not perfect and can be influenced by unfairness in the information they are taught with. If the information used to create the algorithm is biased, the system may unintentionally keep unfair ideas alive or treat certain student groups unfairly. To reduce unfairness in computer programs, developers and teachers need to carefully check for problems and keep watching the system to fix any unfairness. Using different strategies to include everyone and make everyone feel welcome in the process of gathering data and creating algorithms can make it fairer for all students.

Teachers need to be trained and continue learning to effectively use adaptive learning technology in the classroom. Teachers should know how to use the adaptive learning platform well and understand the data it shows. They should use the data to make good decisions. Good training helps teachers use technology to help students learn in the best way. Principals and school leaders are important in providing support and time for teachers to learn and grow. This helps teachers feel sure and capable in using personalized learning methods.

Finding a good balance between using technology for learning and talking to people is important. Even though technology can help with personalized learning, it's still really important to interact with other people when learning. Teachers do more than just understand information and follow suggestions. They help people feel better, think carefully, work together, and as they get better at talking to others. It is important for students to have a good mix of using technology and talking to other people. This will help them get individualized help and also learn from each other. Teachers need to be aware of when to use technology and when to have in-person discussions to give students a complete education.

Solving these problems and thinking about them requires teachers, tech experts, leaders, and other people involved in education to work together. By using strong privacy rules for data, watching out for unfair computer programs, training teachers well, and finding a good mix of technology and human contact, personalized learning can really change education and give each student a special and important learning experience. Immediate evaluation and advice is one of the best things about adaptive learning systems. Traditional ways of testing, like exams and quizzes, can take a long time to get the results. This makes it hard for teachers to help students right away. Adaptive systems make it easy to include assessments as part of learning. This helps to keep track of how well students are doing all the time.

CONCLUSION

In conclusion, argues that we should focus on teaching kids how to think computationally and how to code in schools. It's important because these skills will help students get ready for the digital world. By teaching students how to think and code, teachers can help to create a new group of creative problem solvers who are ready for the modern world. In addition, this summary talks about good teaching methods for including computer thinking and coding in school lessons. This includes doing projects, hands-on activities, and coding competitions. It also looks at things like fairness, having different kinds of people, and making sure that everyone can learn about computers and coding.

REFERENCES:

[1] P. Tuomi, J. Multisilta, P. Saarikoski, and J. Suominen, "Coding skills as a success factor for a society," *Educ. Inf. Technol.*, 2018.

[2] G. V. F. Fabic, A. Mitrovic, and K. Neshatian, "Investigating the effects of learning activities in a mobile Python tutor for targeting multiple coding skills," *Res. Pract. Technol. Enhanc. Learn.*, 2018.

[3] F. J. García-Peñalvo and A. J. Mendes, "Exploring the computational thinking effects in pre-university education," *Computers in Human Behavior*. 2018.

[4] C. K. Looi, J. Multisilta, L. Wu, and P. Tuomi, "Teacher's perceptions and readiness to teach coding skills: A comparative study between China, Finland and Singapore," in *Proceedings of International Conference on Computational Thinking Education*, 2018.

[5] G. N. de Souza *et al.*, "The Adventures of Amaru: Integrating learning tasks into a digital game for teaching children in early phases of literacy," *Front. Psychol.*, 2018.

[6] J. Wiora and A. Wiora, "Measurement uncertainty calculations for pH value obtained by an ion-selective electrode," *Sensors (Switzerland)*, 2018.

[7] I. A. Alshaye, N. F. Jumaat, and Z. Tasir, "Programming Skills and the Relation in Fostering Students' Higher Order Thinking," *Asian Soc. Sci.*, 2018.

[8] S. Park, H. Kaplan, R. Schlaf, and E. Tridas, "Makecourse-Art: Design and Practice of a Flipped Engineering Makerspace," *Int. J. Des. Learn.*, 2018.

[9] H. Mei, W. Chen, Y. Ma, H. Guan, and W. Hu, "VisComposer: A Visual Programmable Composition Environment for Information Visualization," *Vis. Informatics*, 2018.

[10] A. Arora, A. Garg, V. Arora, M. Rizvi, and N. Desai, "National Survey of Pediatric Care Providers: Assessing Time and Impact of Coding and Documentation in Physician Practice," *Clin. Pediatr. (Phila).*, 2018.

[11] F. J. García-Peñalvo, D. Reimann, and C. Maday, "Introducing coding and computational thinking in the schools: The TACCLE 3 – coding project experience," in *Computational Thinking in the STEM Disciplines: Foundations and Research Highlights*, 2018.

[12] R. Scherer, "Technology and the Mind□: Does Learning to Code Improve Cognitive Skills□?," *Dl.Acm.Org*, 2018.

CHAPTER 11

ROLE OF EDUCATORS IN ADAPTIVE LEARNING ENVIRONMENTS

Mamatha G N, Assistant Professor – 1
Department of Electronics and Communication Engineering, Faculty of Engineering and Technology
JAIN (Deemed-to-be University), Ramnagar District, Karnataka - 562112, India
Email Id- gn.mamatha@jainuniversity.ac.in

ABSTRACT:

As education evolves to meet the diverse needs of learners in the digital age, adaptive learning environments have emerged as a promising approach to tailor instruction to individual students. This abstract explores the critical role of educators in facilitating and maximizing the effectiveness of adaptive learning environments, emphasizing the importance of pedagogical expertise, empathy, and ongoing professional development. Adaptive learning environments leverage data analytics and artificial intelligence to customize learning experiences based on learners' individual strengths, preferences, and progress. However, educators play a central role in interpreting data insights, providing targeted support, and fostering a positive and inclusive learning culture. This abstract delves into the multifaceted responsibilities of educators in adaptive learning environments, including designing personalized learning pathways, facilitating meaningful interactions, and fostering metacognitive skills. It also examines the importance of building rapport with students, cultivating a growth mindset, and promoting self-regulated learning habits to empower learners to take ownership of their education.

KEYWORDS:

Customization, Data Analysis, Individualization, Instructional Design, Learning Analytics, Personalization.

INTRODUCTION

Continuous checking of progress through ongoing assessment is a key part of adaptive learning systems. Formative assessments happen while you are learning, not just at the end of a unit or semester, like traditional tests. They are made to give immediate feedback to both students and teachers, giving important information about what the student knows and how well they understand the material. In adaptive learning, students do different kinds of learning activities like quizzes, interactive simulations, videos, and practice problems. As students do these activities, the system collects information about how they are doing, what they are saying, and how they are interacting. This information is looked at by computer programs to see how well each student is doing in school. Finding out what you don't know is one of the main advantages of keeping an eye on things all the time. When students have trouble or make mistakes while learning, the system pays attention to these problems. By looking at the mistakes or areas where the student is not doing well, the platform can figure out what subjects or ideas the student needs help with [1], [2].

Focused help and support when we find out what you don't understand. Adaptive learning systems can give you specific help in the areas where you need it. For example, if a student has a hard time with a certain math idea, the website might give them more practice problems, videos, or explanations that are focused on that idea. This special help makes sure that students get the help they need exactly when they need it, so they can learn as much as possible. Making tests less scary Tests and big exams often make students very nervous. This is called "test anxiety. It can make students do worse on their tests and not show what they really know. Adaptive learning platforms make tests easier by giving smaller quizzes along the way [3], [4].

Because students get feedback right away and chances to do better when they use the adaptive system, the stress of important tests is reduced. Students can learn and get better without worrying about one test deciding how successful they are. This method encourages thinking that mistakes are a chance to learn and grow, not something to be ashamed of. Using data to track progress can help teachers make better decisions.

Teachers can see detailed reports and data that tell them how each student is doing, show what the whole class is struggling with, and highlight common problems. With this information, teachers can change how they teach, make lessons that help each student, and give help to students who are having a hard time with learning. In summary, keeping track of how students are doing with regular tests in adaptive learning systems is changing education by giving us immediate information about how well students understand and do in school.

By finding out what students don't know, giving them help in those areas, and helping them feel less worried about tests, these platforms help students feel more in charge of their learning and encourage them to have a positive attitude towards education. Teachers, who use facts to guide their teaching, can help each student learn better, which means all students will do better in school. Finding the right mix of computer and human involvement in education is a hot topic right now, even though computer-based learning has many advantages. Technology should help teachers do their job better, not take over their job in teaching [5], [6].

DISCUSSION

Adaptive learning environments use technology and teacher knowledge to make learning better for each student. Adaptive systems give good advice, but teachers are still very important to make sure these systems work well. Here are important parts of a teacher's job in a flexible learning environment. Helping students personalize their learning is an important job for teachers.

They help students by learning about what they are good at and what they need help with. They also find out how each student likes to learn and what they are interested in. Teachers can learn about each student and create learning goals that fit with what each student can do and wants to achieve. These goals can include doing well in school, learning new things, and becoming a better person. Teachers can create and choose learning materials that fit each student's needs. This helps keep students interested and motivated in their learning [7], [8].

In a smart learning system, information is always being made and looked at to see how well students are doing. Teachers are really important in understanding the information from the adaptive system. Teachers learn important things about what each student is good at, what they need help with, and how they like to learn by looking at the information. This information helps teachers make smart choices about how to teach students who need extra help. For instance, if a student doesn't understand something, the teacher can give them extra help or different ways to learn it better. Encouraging people to learn from each other is important. Technology is helpful for learning, but talking to and being with others is also really important. Working and learning together with others, like talking in groups, doing projects with others and talking to classmates, are very important for helping students work together, talk with others, and develop social skills. Teachers help students to work together and have meaningful conversations so they can learn from each other. Teacher’s help students learn together and create a friendly classroom where students can share their ideas, ask for help, and work with each other. Teachers not only help with schoolwork, but they also help students with their feelings and provide support. Customized learning can be hard for some students, especially if they have problems or struggles with school work. In these situations, teachers are very important in giving support, giving helpful advice, and helping students have a positive attitude towards

learning. Teacher's help students feel better and do well in school by creating a friendly and happy place to learn. This helps students become strong, believe in themselves, and feel like they fit in, which is important for their health and doing good in school [9], [10].

Teachers keep track of how students are doing and how much they are learning in a flexible learning environment. Teachers can keep an eye on how well students are doing and celebrate when they do well. They can also figure out what students need help with. This constant checking helps teachers change how they teach and give students feedback quickly. It helps students stay on track and keep getting better at their learning. Teachers are really important for making adaptive learning work well. They do more than just analyze data. They also help personalize learning, encourage social learning, give emotional support, and keep track of students' progress. Teachers use their skills, care, and hard work to make school a great place for students to learn and grow. They make sure every student can do their best and be successful in the changing way we learn.

As adaptive learning becomes more popular in schools, teachers, leaders, and tech developers need to think about the right way to use it fairly and responsibly. These thoughts are about keeping personal information safe, being fair with computer programs, and the need to stay connected with people while learning. Adaptive learning systems use a lot of data to give you a personalized learning experience. This means they collect information about you to make the learning better for you. This information can include how well students are doing in school, what they like to learn, and other private details. It's very important to put strong privacy and security measures in place to keep this information safe from anyone getting in without permission, hacking, or using it in the wrong way. Schools and tech companies have to follow rules and do things the best way possible to protect student information.

They have to make sure data is safe and get permission from students to use it. It's important to communicate openly with students, parents, and others about how we collect data so that they trust us and believe in the fairness of the learning system. "Algorithmic Bias" means that AI programs use data to make choices and suggestions. But if the information used to teach these computer programs has unfair opinions, the system might keep making the same unfair thoughts or treat some student groups differently. Algorithmic bias can cause some people to get better education than others, which can make the unfairness in the system even stronger. To reduce prejudice, the people who make computer programs and teachers need to carefully check the algorithms and choose and prepare data very well to decrease prejudice. It is important to check the system's results regularly to find and fix any unfairness. Using different strategies to include everybody and collect information can make learning fair for all students [11], [12].

Keeping in touch with people is important. Even though technology can help us learn better, it's still really important to connect with other people when we're learning. Personal connections between teachers and students help create a strong community and provide important emotional support for students to grow and develop. Teachers have a special job. They help students by giving them personal help, keeping them motivated, and understanding their feelings. They don't just help with school work, they also care about how students are feeling. It is important to use technology to make learning personal, while still keeping a human connection in education. Using technology to help students learn and interacting with them in a purposeful way makes for a well-rounded and student-focused learning environment.

The important things to think about in adaptive learning are how we use data, make sure we are fair with the computer programs, and keep real connections with people. By focusing on keeping personal information safe, fixing unfair computer patterns, and making sure people are

still involved, teachers and tech experts can make learning experiences that fit each student and are fair for everyone. Using adaptive learning technology in a good and fair way helps students learn better and makes sure that everyone can be successful and feel supported in their education.

Cell phones and tablets have changed the way we find information and connect with others. In education, using mobile devices for learning is a strong way to continue learning outside of the regular classroom. This looks at how using mobile devices is changing education. Students can now use their smartphones and tablets to easily access a lot of educational resources. These resources include electronic books, research papers, educational apps, and classes on the internet. In the past, people used books and libraries to learn. But now, with mobile devices, people can learn anywhere at any time, without being stuck to a specific class schedule. This way of getting information helps students learn more about things they are interested in, do research, and learn more about subjects at their own speed. In addition, being able to get educational stuff whenever and wherever helps people keep learning and take charge of their own education. Constant Learning Opportunities: Mobile learning allows you to learn anytime and anywhere, making it very flexible. People can learn outside of the regular classroom, so education is available to anyone, no matter where they are. Students can learn wherever they are, whether they are on a train, at home, or even during breaks between classes. This widespread access to learning opportunities removes barriers, allowing students to make the most of their free time. By using mobile devices for learning, students can easily access education anywhere and anytime. This helps to create a culture where students are always learning, even outside of school.

Customized Learning Experiences Mobile apps and platforms can adjust to each person's learning needs and likes, giving them special learning experiences. By using new technology, these tools can follow how students are doing in school, find out what they are good at and what they need help with, and suggest the best learning materials and activities for each student. Personalized learning makes sure that students stay interested and motivated by giving them material that connects with what they like and how they learn. It helps students learn at their own speed and in the way that works best for them. This way of learning helps students improve more because it takes into account their differences and customizes the learning experience for each person.

Using phones or tablets to learn allows students to do real-world activities and play games that help them learn. For example, on a field trip, students can use their phones to find out interesting information about the places they go to. This new experience makes them understand the topic better and helps them get more involved. Mobile simulations let students learn about difficult ideas using interactive and fun learning. Traditional ways of teaching can't do this as well. Mobile devices make learning more interesting by using real-world examples. They help connect what we learn in theory to how it's used in real life.

Mobile devices help students and teachers talk and work together easily. Online classrooms, online chats, and apps help students talk to their classmates and teachers even when they're not in the same place. This better connection makes people more likely to join in and share their ideas, which helps everyone learn together. Furthermore, using mobile devices for working together allows students to communicate at different times, so they can work in groups even if they are not together in person.

By using phones and tablets to talk and work together, teachers can make interactive learning groups that make learning more fun and supportive. Using mobile devices for learning has many benefits for education. It helps students learn in new ways by giving them quick access

to learning materials, allowing them to learn from anywhere at any time, tailoring the learning experience to fit each student, using knowledge in real life, and improving how students work together and talk to each other. By using mobile technology, education can be more exciting and customized to fit the needs of students in the 21st century.

Navigating Challenges of Mobile Devices in Education

Although mobile learning has a lot of opportunities, there are also problems that teachers and schools need to deal with. This explores the main problems of using mobile devices in schools. Technology and internet access is not available to everyone. Some people or places have less access to it than others. Not all students can use mobile devices or have good internet, which makes it hard for them to take part in mobile learning. To fix this problem, schools and leaders should take action to close the gap in access to technology. This might mean giving students devices to borrow if they don't have their own, or making sure schools have enough things for students to use in class. Also, providing ways to learn without internet, like downloadable stuff or educational materials that don't need internet, can make sure all students have the same access to learning materials.

Mobile devices have many good things for learning, but they can also make students lose focus. The urge to do other things like go on social media, play games, or message friends during class can make it harder to learn. To fix this problem, teachers and schools need to make rules about how to use devices in class. Using good ways to manage the classroom, like telling students when they can use their devices and making a good environment for learning, can help reduce things that distract and keep students paying attention to their school work. Worries about Safety and Privacy Using mobile devices, especially when students bring their own to school, can be risky for security. Bringing personal devices to school can put important information at risk of being stolen or hacked. Schools and other organizations need to focus on keeping student information safe and private. Using strong security measures like encryption, secure network access, and regular checks can keep important information safe and make sure that students' privacy is protected.

Effective use of mobile learning needs good teaching strategies. Just bringing mobile devices into the classroom without planning and training for teachers might not be helpful. It could mean that the devices are not used well, or that they replace traditional methods without making the most of what mobile technology can do. Teachers should learn how to use mobile devices in a creative way to help students learn better. They should also learn how to include mobile technology in their teaching. By using mobile devices in a smart way, teachers can make learning more interesting and exciting. This will help students learn better and meet their educational goals.

Newer technology like smartphones and apps improve quickly. This can cause problems with old equipment and software in schools. To solve this problem, schools need to make sure they update and replace devices regularly so that students can use the latest technology. Furthermore, it's important to regularly check and change educational materials to make sure they stay useful and easy to use for a long time. Focusing on making sure mobile learning works well with different devices and can be easily changed helps students use the newest technology without problems. Although mobile learning has many benefits, it's important to deal with challenges like not everyone having access to digital technology, getting distracted easily, making sure everything is secure, integrating it with teaching methods, and keeping up with new technology. Educational institutions can use mobile learning to help all students succeed in the digital age. They can do this by dealing with any problems early and making sure that learning is safe and welcoming for everyone.

Mobile apps and online learning tools

Many mobile apps and platforms are available to help with teaching and learning in the education field. This looks at the different kinds of educational apps and platforms and the good things about them. Educational apps are different kinds of mobile apps that help people learn about different subjects and skills. They are for people of different ages and school levels, so everyone can use them. These apps can teach you many different things like languages, math, science, history, art, and coding. Language learning apps help you get better at languages by giving you fun lessons, while math games give you interesting activities to help you understand math better. Science simulations help students do virtual experiments to understand scientific principles better. These apps use game-like features, interactive tools, and customized learning paths to keep students interested and motivated. Educational apps use mobile devices to make learning fun and more effective by turning it into an interactive experience.

Learning Management Systems are like all-in-one platforms that make it easier to organize and share educational material. LMS platforms are really important for schools and online learning. They help with organizing courses, sharing materials, testing, and talking between students and teachers. They are like central spots where you can find and organize all your school stuff like homework, tests, and grades. Teachers use online learning systems to make and give classes, check how students are doing, and give them helpful feedback on time. LMS analytics give helpful information about how students are doing in their classes. Teachers can see if students are having trouble and need extra help. Also, LMS platforms help students to learn at their own pace by allowing them to access course materials whenever they want. This is very helpful for classes that are partly in person and partly online or fully online.

Collaboration tools like mobile apps help students communicate and work together as a team. These apps help students collaborate on group assignments, share materials, and share ideas no matter where they are. Video apps let students have meetings online in real time. They can talk face-to-face even if they are not in the same place. Virtual whiteboards are like a digital chalkboard where students can work together to come up with and share ideas. They can draw, write, and brainstorm together, which helps them to stay involved and work as a team to solve problems. Working together using apps helps people learn from each other, feel like they belong to a group, and improve how they talk and work with others. These are important skills to have for jobs today.

Content creation apps help students to actively take part in their learning. These apps help you make videos, slideshows, and other school projects. By making content, students can show what they know, be creative, and learn digital skills. Students can use these apps to make videos, charts, audio shows, and interactive online activities, so they can make their work more interesting and personal. Content creation apps help students learn by working on projects. They can use these apps to explore topics and show what they've learned in their own creative ways. Augmented Reality and Virtual Reality apps bring new and fun ways for students to learn by using virtual environments and objects. AR puts digital information into the real world, while VR makes completely fake worlds that students can explore. These technologies provide new and exciting chances to learn by doing. For instance, students can use AR apps to see and change 3D models of complicated buildings or old objects. VR apps can take students to places from history, space, or very small things. This helps them understand difficult ideas that they might not get from normal ways of learning. AR and VR apps make learning more interesting, help students understand things better, and provide special experiences that have a big effect on their learning. Educational apps, online learning platforms, tools for working together, apps for making things, and virtual reality apps show how mobile technology can change education. By using these tools well, teachers can make fun and interesting ways for students to learn.

This helps different kinds of learners, encourages creativity, and helps students understand new things. Using phones and bringing your own device to school can change education by allowing students to learn even when they're not in the classroom. However, in order to make use of these technologies, teachers and schools need to overcome the difficulties and come up with good plans for using them. By using the best mobile apps and online tools, teachers can make learning more personal and fun. This will help students do well in a world where everyone uses mobile devices and is connected all the time. In the modern time, schools have a lot of information from students, teachers, and online learning tools. Using this information in a smart way can change how teachers teach and students learn in a big way. This looks at how using data analytics in education can help improve the learning experience for everyone involved. Data analytics is really important in changing the way we teach and learn in schools. By using data, teachers can learn more about how students learn and what they're good at and where they need help. This helps teachers understand each student better. This looks at how data analysis can help us understand what each student needs, so we can give them better and more personal learning experiences.

Using data to understand education is about gathering and understanding a lot of information from different learning activities. Main sources of data are students' tests, their use of online learning tools, and how well they do on their homework and quizzes. This big amount of information gives us new chances to understand how students learn in ways that were never possible before. Customized learning for each student is one of the best things about using data analysis in education. It helps make learning experiences unique to each student. Teachers can use information about how students learn and what they like to do, as well as how they do in school, to make lessons that suit each student's needs. This way of learning understands that students learn at different speeds and have different ways of learning. It helps teachers to meet the needs of all students.

Figuring out what students are good at and what they need help with by using data analysis in education. Educators can figure out where students are doing well and where they need help by looking at test scores and how they are doing in class. This information helps teachers change how they teach to give more help or challenges when needed, so students can have a better learning experience. Helping struggling students by figuring out how they learn and noticing signs early. Finding out about learning problems early helps teachers to help students before they fall behind in school. This can make students feel better about their ability to learn. Improving how much students are involved in their schoolwork. Data analysis can show how interested students are in different kinds of learning. Teachers can make lessons more fun and interesting by learning what methods and materials students like. This will help students stay interested and focused on learning.

Constantly improving how teachers teach by using data to make changes. By looking at the data often, teachers can see if their teaching is working well and make changes to help students learn better. Analyzing data can help find unfairness in how students are learning. By looking at how well students from different backgrounds are doing in school, teachers can see if there are any unfair differences in grades. They can then help these students by giving them extra help or support to make sure everyone has the same chance to do well in school. Using data analysis can change the way we teach and learn. It helps us understand how students learn and what they are good at or struggle with. It also shows how each student prefers to learn. By using these ideas, teachers can make individual and interesting learning experiences that focus on students' special needs. Data-driven insights help create a fairer and more equal education for all students, giving them a chance to do their best.

Personalized learning uses data to help teachers customize lessons for each student. Adaptive learning systems change the content and speed of learning to suit each student's needs, making learning more interesting and effective. Personalized learning changes the way students learn by making their education fit their specific needs, interests, and abilities. Using information to understand what each student needs is very important for making personalized learning possible. It helps teachers create flexible and customized learning environments for every student. This looks at how using data to understand students better can help them learn in a way that works best for them.

It makes learning more interesting and helps students to learn better. Understanding Personalized Learning: Personalized learning is different from the usual way of teaching where everyone learns the same thing in the same way. It recognizes that students learn in different ways and come from different backgrounds, so they need different ways of being taught. By using data analytics, teachers can learn a lot about each student's learning style and what they are good at and what they need help with. This helps create personalized learning for each student.

Using data analytics in personalized learning means using information from different sources, like tests, online learning, and how well students are doing in real-time, to help students learn better. This information shows how students learn and understand things, how they are improving, and what teaching methods work best. With this information, teachers can change how they teach and what they use to help each student learn better. Adaptive learning systems are important for personalized learning. These systems use smart computer programs to change the content and difficulty of learning materials to match how well each student is doing and what they like. Adaptive learning systems look at data as it happens and give students custom learning plans to keep them interested and motivated as they learn.

CONCLUSION

The way we teach is changing to fit each person's needs. This shows how important teachers are in making learning fit each person. This summary has shown the many tasks teachers have in guiding students through adaptive learning. It highlights their role as helpers, role models, and supporters for students. In adaptive learning, teachers help students by using their teaching skills to understand data, create personalized learning plans, and offer specific help. Furthermore, teachers promote a culture of understanding, working together, and making sure that all students have the same chances to learn in their own way. Even though there are difficulties in setting up adaptive learning, like keeping student information safe and doing things ethically, teachers are still very dedicated to helping students do well. When teachers use adaptive learning methods, they help students think for themselves, grow their minds, and become better at learning on their own.

REFERENCES:

[1] F. Santoianni and A. Ciasullo, “Adaptive Design for Educational Hypermedia Environments and Bio-Educational Adaptive Design for 3D Virtual Learning Environments,” *Res. Educ. Media*, 2018.

[2] V. Balasubramanian and S. Margret Anouncia, “Learning style detection based on cognitive skills to support adaptive learning environment – A reinforcement approach,” *Ain Shams Eng. J.*, 2018.

[3] B. M. Alexander *et al.*, “Adaptive global innovative learning environment for glioblastoma: GBM AGILE,” *Clinical Cancer Research*. 2018.

[4] L. Çetinkaya and H. Keser, "Adaptation of interaction in web environments with educational content," *World J. Educ. Technol. Curr. Issues*, 2018.

[5] L. Zhang, S. Lu, and Z. H. Zhou, "Adaptive online learning in dynamic environments," in *Advances in Neural Information Processing Systems*, 2018.

[6] M. Momenzad, B. Majidi, and M. Eshghi, "Deep Summarization of Academic Textbooks for Adaptive Gamified Virtual Learning Environments," in *2018 2nd National and 1st International Digital Games Research Conference: Trends, Technologies, and Applications, DGRC 2018*, 2018.

[7] R. M. Golden, "Adaptive learning algorithm convergence in passive and reactive environments," *Neural Computation*. 2018.

[8] A. C. Lagman, M. A. Ballera, J. O. Contreras, and J. G. Raviz, "Development of converted deterministic finite automaton of decision tree rules of student graduation and adaptive learning environment," in *ACM International Conference Proceeding Series*, 2018.

[9] B. Vesin, K. Mangaroska, and M. Giannakos, "Learning in smart environments: user-centered design and analytics of an adaptive learning system," *Smart Learn. Environ.*, 2018.

[10] S. Rodríguez, C. G. Palomino, P. Chamoso, R. A. Silveira, and J. M. Corchado, "How to create an adaptive learning environment by means of virtual organizations," in *Communications in Computer and Information Science*, 2018.

[11] S. A. Cardona Torres, J. B. Vélez Ramos, and S. Jaramillo Valbuena, "Adaptive virtual learning environment for assessment management," *Espacios*, 2018.

[12] H. C. Chu, W. W. J. Tsai, M. J. Liao, and Y. M. Chen, "Facial emotion recognition with transition detection for students with high-functioning autism in adaptive e-learning," *Soft Comput.*, 2018.

CHAPTER 12

CREATING ENGAGING AND IMPACTFUL LEARNING EXPERIENCES

Dr. Hannah Jessie Rani R, Assistant Professor
Department of Electrical and Electronics Engineering, Faculty of Engineering and Technology
JAIN (Deemed-to-be University), Ramnagar District, Karnataka - 562112, India
Email Id- jr.hannah@jainuniversity.ac.in

ABSTRACT:
Engagement and impact are central pillars of effective education, yet achieving them in today's digital landscape presents both opportunities and challenges for educators. This abstract explores strategies and best practices for creating engaging and impactful learning experiences that captivate learners' attention, foster deep understanding, and inspire lasting change. In the digital age, educators have access to a wide array of tools and resources to enhance learning experiences, from interactive multimedia content to collaborative online platforms. This abstract delves into the importance of leveraging technology judiciously to create dynamic and interactive learning environments that cater to diverse learning styles and preferences. Moreover, this abstract examines the role of active learning strategies, such as project-based learning, inquiry-based learning, and flipped classrooms, in promoting engagement and deep learning. It also explores the importance of incorporating real-world relevance, authentic assessment, and personalized feedback to make learning experiences meaningful and impactful for students.

KEYWORDS:

Experiential Learning, Gamification, Immersive Technology, Personalization, Problem-Based Learning.

INTRODUCTION

Getting to know what students like and how they learn best makes school more interesting and fun for them. This is called personalized learning. This increased interest can help you remember more and understand the topic better. Students learn better when they get materials and teaching that are made for them. This helps them understand and remember what they are learning. This leads to better learning results and doing well in school. Learning at your own speed is called personalized learning. It helps students understand every concept completely and gives them the time and help they need. This flexibility lets people learn at their own pace without feeling stressed about keeping up with a set class schedule. Using information about student performance, teachers can find where students are struggling and help them quickly. Personalized learning helps students when they have problems, so they don't get worse and can reach their full potential. Information from data helps teachers create personalized learning experiences that meet the needs, interests, and abilities of each student. Teachers can use special technology and data to make learning more interesting for each student.

Personalized learning is a big change in education. It wants to help students learn as much as possible and become independent learners in the digital age. Using data analysis to help find students who are having a hard time early, so teachers can help them right away. Teachers can help students do better in school by noticing when they are having trouble with certain things and when they are not paying attention. This way, they can help them before it becomes a big problem and make it more likely that they will do well in their classes. Providing help early is really important for helping students who are having trouble learning. It can make a big difference. Data analytics helps teachers to see when students are having trouble with school

work and losing interest early on. This looks at how using data to help students early on can make it much more likely for them to do well in school [1], [2]. Using data analytics helps teachers keep a close eye on how well students are doing on tests and homework. By looking at this information, teachers can find out where students are having trouble understanding things or showing what they've learned. Noticing these differences quickly helps teachers figure out what to do to help students in certain subjects they are struggling with. Finding signs of students not being involved Data analysis can show ways that students are not interested or involved, besides just their grades. Teachers can tell if students are not paying attention by keeping an eye on how they interact with their school work, their attendance, and how much they participate in class. Finding out if students are losing interest in school early allows teachers to help them before it starts to affect their learning. This helps students stay engaged and focused on their education [3], [4].

Using data analytics can help teachers see how students are doing right away and quickly take action if they need help. Teachers can see how students are doing and help them quickly if they need it. Students get help on time so their problems don't get worse and affect their grades. Using data analytics, teachers can make special plans to help each student with their own problems and how they learn. By making specific plans to help each student, teachers can make sure that the help they give is really helpful for them. This will make sure that the students get the best help possible.

We can help students do better in school by finding out what they're struggling with and giving them extra help early on. This can make a big difference in their grades. Helping students with their problems early on can help them keep up with their classmates and feel surer about their schoolwork. Getting students more interested and motivated can help stop them from losing interest in school. Early help can prevent this problem from getting worse. Teachers should quickly figure out why students are not interested in learning, so they can get them excited about learning again and help them have a good attitude about school. Helping students when they need it makes them feel surer of themselves. As students get help and do well, they feel more confident in their school work. This helps them to be open to learning new things and taking on difficult tasks. Using information to help students early on could make fewer students quit school. Teachers can help students who are having a hard time with their school work before it becomes too much for them. This can help them from feeling like they can't do it and wanting to quit. Helping teachers Data analytics helps teachers understand what students need and how they are doing in school. This information helps teachers decide how to teach, what materials to use, and how to support students better. It helps them do a better job [5], [6].

Using data to help with problems early is really important for teachers. By using data analysis to find out where students are having trouble and when they lose interest, teachers can give extra help to those who need it. This way of doing things makes it more likely that students will do well, gets them more interested and motivated, and makes sure that each student gets the special help they need to do well in school and in life. By using data and acting early, teachers can make school better for all students.

Improving Instructional Design

Information from data can help us create better lessons and study materials. Educators can make learning more interesting and effective by watching how students use content and which resources they like best. Data insights give us a lot of information that can really affect how we teach and what we teach. This looks at how teachers can use data analysis to make learning more interesting and effective for students. Studying How Students Use Learning Materials Data analytics helps teachers see how students use different learning materials like books,

digital resources, videos, and online platforms. By studying this information, teachers can learn which topics are interesting to students, which ones are difficult, and which resources are used the most.

Finding the best ways to teach by looking at the information. For example, information may show that doing activities together, talking in a group, or working on projects with your hands helps you learn better. With this information, teachers can improve how they teach to match the methods that work best. Customizing content for different students thanks to data-based information helps teachers to better meet the needs of each student. By studying what students are good at and what they need help with, teachers can make lessons that help them learn better and give them enough challenge. Analyzing data can show us which learning materials work best for helping students learn. Teachers can use this information to pick the best books, websites, videos, and other things that match what their students need and like [7], [8].

DISCUSSION

Designing lessons based on data allows teachers to create personalized learning paths for students, taking into account how they are doing in school, what they are interested in, and how they like to learn. Adaptive learning systems can change the material and make it easier or harder to make sure each student is challenged and helped. Encouraging students to actively participate in learning. Insights from data can help teachers find ways to promote active learning. Teachers can use fun and practical activities to help students learn and understand things better. This includes using games, real-life examples, and hands-on experiences in the classroom. Encouraging formative assessment is important for teaching. Data analytics can help teachers check how well students are doing all the time. This instant feedback helps teachers change how they teach and give help right away when it's needed.

Encouraging teamwork and helping each other learn. Information can show how students work well together and learn from each other. Teachers can use this information to help students work together in groups and on projects, so they can learn from and help each other. Constantly improving how we create learning materials using data-driven methods helps us get better and better over time. Educators can use data about how students are doing in school to make decisions about how to improve what they are teaching. This helps make sure that the lessons are always useful and helpful for the students [9], [10].

Using data to make decisions helps teachers improve how they teach and make learning more interesting and effective. By studying how students learn and figuring out the best ways to teach, teachers can make a plan that meets each student's needs, choose the best resources, and encourage students to work together and participate in the learning process. Using data to make decisions about how to teach helps students learn better. It gives them more control over their education and helps them become better at learning for their whole lives. By using information to understand students better, teachers can create an exciting learning space that helps students learn the skills and knowledge they need to do well in the modern world.

Using information to make choices in education

Using data to make decisions in education helps schools and colleges make smart choices based on proof instead of just guessing. This looks at how teachers and school leaders can use information to make education better in many ways. Creating a curriculum and making sure it matches what students need. This can be done by looking at how well students are doing on tests and using that information to improve the curriculum. Teachers can use it to figure out where students are having trouble and change things to help them learn better. In order to give students a good education, it's important to plan the school lessons carefully. This helps shape

how students learn. When teachers use data on how well students are doing in school to plan what they teach and make sure it matches with what students need, they can make learning better and more helpful for each student. This looks at how using data analysis can help make the curriculum better and make sure it matches what students need to learn, which can help students do better in school.

Understanding how students learn is important. Looking at how well they do in school helps us learn about their study habits. Looking at test scores, grades, and teacher comments can show where students are good and where they need help. Teachers can find out where students are having a hard time, figure out things they don't understand, and see where they need to learn more so they can do better in school. Finding out what students need to learn and what they should be able to do by looking at how well they are doing in school. They can also find out if there are things that need to change to keep up with new trends or changing educational needs. This way of doing things makes sure that the lessons are still important and current [11], [12].

Creating customized learning plans based on student data is a big benefit of using data to design the curriculum. Teachers can change what they teach and how they teach based on how each student is doing and how they like to learn. This method helps students get more involved and understand the subject better. Analyzing data helps teachers figure out if different ways of teaching are working well. By looking at how students are doing in class, teachers can figure out which teaching methods work the best. This knowledge helps them improve the way they teach to get better results in learning.

Introducing help and support Student performance data can show teachers which students may need extra help or support. By finding students who are having a hard time in school early, teachers can give them extra help with their specific problems. This plan wants to stop students from having problems in school and help them do well. Working together to make a curriculum for the school. Analyzing data helps teachers and leaders work together to plan lessons. By working together and using information from analyzing data, people involved in education can make small changes to the curriculum to reach the same educational goals. This working together way helps students learn a lot in school.

Tracking how well the new curriculum is working by looking at data regularly. Teachers can see how well students are doing and how much they are learning by keeping an eye on their performance and progress. This helps them make changes to their teaching if needed. Analyzing data can help improve how teachers plan lessons and organize what students are learning in school. Teachers can learn a lot from looking at how students are doing in school. This helps them figure out better ways to teach and see where they can do better. This way of planning ensures that the school lessons change to fit the students' needs. It helps students do their best and makes schools better all the time. As technology and data analysis get better, using data to make decisions about what to teach will become more important in shaping the future of education.

"By looking at how resources are used and what students need, schools can make smart choices about where to put their resources. " This means making sure that money, tools, and people are used in the best way to help students do well in school. Making sure that schools use their resources wisely is important for giving students a good education. Educational schools can use data to figure out how to best use their money, technology, and staff to help students do well. This looks at how using data to make decisions can make it easier to use resources in the best way and make the learning environment better. Studying Resource Use Data analysis helps schools see how they are using their resources. This means checking if the current programs,

buildings, and services are helpful or not. By looking at how resources are used, organizations can find where they are doing things in a way that's not very good or where they have too much or too little of something. By looking at information, schools can learn what their students need. This means knowing how well students do in school, how they like to learn, and their families' money situations. This information helps schools figure out how to give students what they need and make sure everyone feels included.

Education institutions can figure out where to put their money by looking at how much they're using their resources and what the students need. For instance, if information shows that many students have trouble with a certain subject, providing more teachers or programs to help with that subject can make learning better. Distributing money for education is an important part of managing schools. Data analysis helps organizations figure out where they need more money and see how previous spending has affected things. This method uses data to make sure that money goes to the things that help students learn and grow the most. Using technology more effectively in schools can help improve the way students learn. Data analysis can help schools figure out which technology tools work best. By looking at how different educational technologies affect how much students engage and how well they perform, schools can decide which tools to invest in.

Assigning the right staff members and analyzing data helps schools and colleges use their staff in the best way. By looking at how many students each teacher has and how well they teach, schools can put teachers where they are needed to make sure every student gets enough help. Constantly checking and changing how we use resources is an ongoing process that needs to be evaluated and adjusted regularly. Using data to make decisions helps schools to see how their money and resources are being used. They can then make changes based on what the data shows in order to make things better. Using information to make decisions helps schools use their resources better and make the learning environment better. By looking at how resources are used and what students need, schools can decide where to put their money, technology, and staff. They can also keep track of how well their choices are working. This way of using data helps students a lot. It also helps schools make decisions based on evidence. This helps schools change and make a good environment for students to do well in school and grow as a person.

Finding out which teaching strategies work best using data analysis. Teachers can improve how they teach by looking at which methods help students do better in school. Teaching is always changing, and teachers are always looking for ways to help students learn better. Data analytics helps us figure out which teaching methods work best by looking at how different ways of teaching affect how well students do in school. This looks at how using information to analyze student performance can help teachers improve how they teach and get students more involved, leading to better education overall. Using data to design lessons helps teachers see how different teaching methods affect student learning. Teachers can figure out what works best for teaching students hard things and getting them interested in learning by looking at test scores, homework, and how students act in class. Finding out how students like to learn. Each student has their own way of learning that is different from others. Data analysis helps teachers figure out what teaching methods work best for different students, so they can customize their lessons to fit different learning styles.

Using data analytics helps teachers change their teaching to fit each student's needs. Teachers can use information about how students are doing in school to help those who are having a hard time. They can change the way they teach to give those students extra help and make things more interesting for them. Measuring the Effect of Technology is being used in education, and data analysis can measure how well it works. By looking at how students do with and without using technology, teachers can decide which tools help learning the most. Data analytics helps

teachers to do formative assessments, which means they can get feedback on how students are doing right away. Getting quick feedback on how well students are doing helps teachers change how they teach right away. They can focus on the things students aren't good at or help them get even better at the things they're already good at.

Professional development helps teachers learn new things to be better at their jobs. Data analysis helps them see what works and what doesn't in their teaching, and it also helps them improve their skills. "By finding out what works well in different classrooms and grade levels, schools can give specific training and help to make teaching better overall. " Data analytics helps teachers work together and share their best ideas for teaching. Teachers can learn from each other, use proven methods, and work together to make their teaching better. Using data analysis in teaching helps us to keep getting better and come up with new ideas. Teachers can use information to try out new ways of teaching and see how it affects how well students do in school. This helps them keep getting better at what they do.

Data analytics helps to improve education by showing how to teach better and making teaching methods better. By looking at how different ways of teaching are related to how well students do in school, teachers can change the way they teach to help all their students do better. This method uses data to help students get more involved in learning and to make sure each student gets the right kind of learning for them. It also means always trying to make education better. By using data analysis, teachers can improve their teaching to help students learn better and be ready for the future. By using data to evaluate how well they are doing, schools can make improvements to help students succeed.

A really good learning experience for students. Using data to check how well a school is doing helps the people in charge understand what's working and what's not. This helps them make smart decisions and make their school better all the time. This looks at how using data analytics can help schools and other educational institutions to understand how well they are doing, keep track of important measurement, and work on getting better all the time. Data analytics helps schools keep track of how many students are graduating each year. By looking at the information about students graduating, school leaders can find out what helps students to do well. This information helps schools figure out why students do well and stay in school, and helps them come up with ways to help more students finish their studies. Measuring how many students stay in the school is important to see if the school is doing a good job of keeping students involved and supported. By looking at why students drop out, school leaders can come up with ways to help more students stay in school and graduate.

Analyzing data from students is important to see if they are happy with their school. Surveys and studying people's feelings can help us understand how well the teachers are teaching, how good the campus services are, and the general mood on campus. This information helps bosses to deal with problems and make things better to make students happier. Assessing how well faculty and staff are doing is part of evaluating how well the institution is performing. By looking at information about how well teachers are doing their job, how they are trained, and how productive they are in their research, bosses can see where staff are doing well and where they need to do better.

Data analytics helps us see how well we are using our resources in the institution. Administrators can look at how money is being used and where resources are going to see if they are being used in the best way. If not, they can make changes or put more money into those areas. Compare how well an institution is doing with similar ones to see what it's good at and where it can get better. Comparing things helps schools set achievable goals and make plans to do their best. Accreditation and Compliance Data analytics is very important for

meeting accreditation rules and showing that educational standards and regulations are followed. By keeping detailed records and checking how well they are doing regularly, institutions can make sure they are meeting accreditation standards.

Using information and data to make decisions and improve performance in education. Administrators can make better decisions by using data instead of guessing. This helps the institution and the people involved. Using data to evaluate how well an educational institution is doing is very important. It helps the institution make their services better and become really good in education. By keeping an eye on important measures like how many students finish school, how many stay in school, and how happy students are, school leaders can figure out what the school is good at, fix what it's not so good at, and make specific plans to do better. Data analytics helps schools make better decisions based on evidence, so they can provide a great learning experience for their students. By continuously checking and getting better, schools can make sure they meet the changing needs of students and keep providing a high-quality education. As schools gather more data, it's important to use it ethically. This talks about how it's important to be ethical when using data analytics, especially when it comes to students. We need to make sure we protect students' privacy and keep the trust of the educational community. Educational institutions need to use strong security measures to keep student information safe from people who aren't supposed to see it and to prevent any data from being leaked. It is important to follow the rules about protecting data and have clear rules about how data is collected, stored, and shared. People should know about how data is collected and why it's being collected. This includes students, parents, and teachers. Clear and honest communication about how data is used helps people trust and decide if they want to share their data.

Reducing Bias Data analysis can accidentally continue biases that exist in society. To make sure things are fair for everyone, teachers and people who look at information must be careful to notice and fix any unfair ideas that might come up when collecting and analyzing data. Anonymization and Aggregation. When using student data for research or reporting, it's important to combine and make the data anonymous to protect the privacy of individual students. This practice keeps students' information private while still getting useful information. Using data analytics can change education a lot. It can help students learn in a way that is best for them and help schools make decisions based on data. However, we must make sure to use data in a responsible way and think about what is right when we do educational activities. Educational institutions can create a better future for students and teachers by using data in a fair and ethical way. This can help them to improve how they teach and how students learn.

CONCLUSION

Creating fun and meaningful ways to learn is really important for teachers who want to help all kinds of students learn using technology. This summary has looked at different ways to reach a goal. It says it's important to use technology, encourage students to be active in their learning, and create a supportive environment for learning. Using exciting videos, games, and group activities can grab people's interest and help them really understand the topic. Furthermore, making sure that what students are learning is related to the real world, testing them in real situations, and giving them individual feedback, helps students connect with what they are learning and achieve important outcomes. A positive and inclusive learning culture is important for creating fun and impactful learning experiences. It's all about making students feel valued, confident, and supported in their learning. By teaching students to have a positive attitude towards learning, work together, and take initiative, teachers can create a community of people who love to learn and are ready to handle the challenges of today's world.

REFERENCES:

[1] J. Bacca, S. Baldiris, R. Fabregat, and Kinshuk, "Insights into the factors influencing student motivation in Augmented Reality learning experiences in Vocational Education and Training," *Front. Psychol.*, 2018.

[2] C. Lai, X. Hu, and B. Lyu, "Understanding the nature of learners' out-of-class language learning experience with technology," *Comput. Assist. Lang. Learn.*, 2018.

[3] P. Schwarzenberg, J. Navon, M. Nussbaum, M. Pérez-Sanagustín, and D. Caballero, "Learning experience assessment of flipped courses," *J. Comput. High. Educ.*, 2018.

[4] A. Engel, C. Coll, A. Membrive, and J. Oller, "Information and communication technologies and students' out of-school learning experiences," *Digit. Educ. Rev.*, 2018.

[5] Z. Aghajari *et al.*, "The relationship between quality of learning experiences and academic burnout among nursing students of Shahid Beheshti University of medical sciences in 2015," *Electron. J. Gen. Med.*, 2018.

[6] K. B. Yusuff, "Does personalized goal setting and study planning improve academic performance and perception of learning experience in a developing setting?," *J. Taibah Univ. Med. Sci.*, 2018.

[7] J. Jung, "Learning experience and perceived competencies of doctoral students in Hong Kong," *Asia Pacific Educ. Rev.*, 2018.

[8] C. Beard, "Learning experience designs (LEDs) in an age of complexity: time to replace the lightbulb?," *Reflective Pract.*, 2018.

[9] K. Nilsson, F. Bååthe, A. Erichsen Andersson, and M. Sandoff, "The need to succeed – learning experiences resulting from the implementation of value-based healthcare," *Leadersh. Heal. Serv.*, 2018.

[10] R. P. Lopes, C. Mesquita, M. de la Cruz Del Río-Rama, and J. Álvarez-García, "Collaborative learning experiences for the development of higher-order thinking," *Espacios*, 2018.

[11] J. G. Peery and C. Pasalar, "Designing the learning experiences in serious games: The overt and the subtle—the virtual clinic learning environment," *Informatics*, 2018.

[12] K. Hajhashemi, N. Caltabiano, N. Anderson, and S. A. Tabibzadeh, "Multiple intelligences, motivations and learning experience regarding video-assisted subjects in a rural university," *Int. J. Instr.*, 2018.

CHAPTER 13

ASSISTIVE TECHNOLOGIES FOR INCLUSIVE EDUCATION

Dr. Hannah Jessie Rani R, Assistant Professor
Department of Electrical and Electronics Engineering, Faculty of Engineering and Technology
JAIN (Deemed-to-be University), Ramnagar District, Karnataka - 562112, India
Email Id- jr.hannah@jainuniversity.ac.in

ABSTRACT:
Assistive technologies have emerged as powerful tools in promoting inclusive education by removing barriers to learning and providing support to students with diverse abilities. This abstract explores the transformative impact of assistive technologies in creating inclusive learning environments and empowering learners to reach their full potential. Assistive technologies encompass a wide range of tools and devices designed to accommodate the unique needs of individuals with disabilities, including but not limited to physical, cognitive, sensory, and learning disabilities. From screen readers and speech-to-text software to adaptive keyboards and sensory aids, assistive technologies offer personalized solutions that enable students to access educational content, participate in learning activities, and demonstrate their knowledge and skills. This abstract delves into the diverse applications of assistive technologies in education, highlighting their role in facilitating communication, promoting independence, and enhancing learning outcomes for students with disabilities. It also examines the importance of universal design principles and accessibility standards in ensuring that educational materials, platforms, and environments are inclusive and accessible to all learners.

KEYWORDS:

Braille Technology, Communication Aids, Digital Accessibility, Inclusive Design, Screen Readers, Speech Recognition, Text-To-Speech Software.

INTRODUCTION

In schools that have more different kinds of students and are more welcoming to everyone, it's really important to use technology that helps students with disabilities. This makes sure that all students get the same good education. Assistive technologies use new ideas to help students with different challenges learn better and be more involved in their education. This looks at how helpful tools can help all students learn better together, regardless of their differences, and make school fairer for everyone. Assistive technologies help students with disabilities by meeting their specific needs, such as physical, sensory, thinking, and learning challenges. This research looks at different tools that can help students with different disabilities. One example is devices that help people who have trouble speaking to communicate better. These devices are helpful for people who have trouble speaking, have nonverbal autism, cerebral palsy, or have difficulty with language because of brain problems. AAC devices are tools that help people who have trouble talking to communicate what they want to say. Some types of AAC devices are Picture-based Communication Boards. These boards have pictures or symbols that represent different words, actions, or objects. People can use their fingers to show what they want by pointing at the pictures [1], [2].

Text-to-Speech Software lets you type or choose messages, and then it turns them into speech that you can hear. This helps people talk without having to speak. Speech devices are special tools that have buttons or screens you can touch, and they talk using recorded or made-up voices. People can press the buttons to make them talk and say words or sentences. People who have trouble speaking or understanding can use AAC devices to join in conversations, social situations, and school activities more easily. These gadgets help people do things on their own

and give them more control over their lives. They also help people communicate and interact with others [3], [4]. Screen readers and voice recognition programs are important tools for students who have trouble seeing or reading. They help them to use computers and access different types of content. These technologies allow people to use their voices to control computers and access digital information. Screen readers and voice recognition software have some important features. Screen readers can change what's on a screen into speech or Braille. People who have trouble seeing can use a screen reader to listen to websites, documents, and emails and move around them. Voice Recognition Software, also called speech-to-text software, lets users speak and turn their words into written text. It changes what people say into written words, so it's easier for people who have trouble reading or moving their body to write things down without having to type like usual.

Screen readers are really helpful for students who cannot see well. They help them use educational stuff and things on the internet, so they can learn like everyone else. Voice recognition software helps students who have trouble reading or writing. It allows them to join in class activities and tests in a different way. Learning Management Systems are computer programs that teachers use to organize and teach their classes online. The LMS has features to help all kinds of learner's access educational materials. LMS platforms with closed captioning show text on the screen at the same time as video or audio. This helps students who have trouble hearing to understand the content. Written transcripts help students who have trouble hearing or who like to read instead of listening, to understand the information in audio or video content. LMS platforms with adjustable font sizes can help people who have trouble seeing or reading by letting them change the text to make it easier for them. By adding these accessibility features to online learning platforms, schools make sure that all students can access the educational materials, no matter their abilities or what they like. This helps include everyone in learning.

Tactile graphics and Braille embossers help blind or visually impaired student's access visual information through touch. These technologies provide different ways to show information instead of just using pictures. This helps people who have trouble seeing to access learning materials and graphics. Tactile graphics are pictures with raised surfaces that students can feel with their hands. These pictures are made in different ways, like heating or pressing, so that blind students can touch and understand visual information like maps, graphs, or diagrams. Braille embossers are machines that change digital text into Braille and make Braille documents on paper. Students who can't see well can read these documents by touching them with their fingers, which helps them access written materials. Educational institutions help blind or visually impaired students by giving those tactile graphics and Braille embossers. This helps them access the same educational materials as their sighted classmates, making the learning experience more inclusive for everyone [5], [6].

Adaptive input devices help students with movement problems use technology and take part in school activities. These special devices have different features to help people who have trouble controlling their movements. They might have bigger keys, different layouts, or need less force to use, which can help students with motor challenges to type more easily. Switches are devices that students can use instead of using their hands to operate computers or other electronic devices. They can press, tap, or interact with the switches using different parts of their body like hands, feet, or head movements. It makes using electronic devices easier for students.

Eye-tracking technology lets people use a computer by moving their eyes. This helps people who can't move much to use technology. By using special tools that change to fit each student's needs, teachers help kids with mobility issues join in with technology and have the same learning opportunities as everyone else. This makes school more welcoming and empowering for all students. Different tools and technologies help all kinds of students, including those with

disabilities, to participate and learn together in school. With these tools, teachers and schools create a place where all students can join in and do their best in school, no matter what difficulties they may have. Accessibility and Universal Design for Learning is a way of teaching that makes sure all students can learn easily, no matter their needs. It's about creating fair learning spaces for everyone. This talks about UDL principles and why it's important to make sure educational materials and practices are accessible for everyone [7], [8].

UDL has three important ideas: how things are shown, how students stay interested, and how they share what they know. Teachers can use these ideas to make lessons, materials, and tests fit the needs of all students, so everyone feels included in school. Making sure that every student can use their school materials is a very important part of including everyone in education. Accessible educational materials include different ways to access information, like books, papers, and videos. By giving students AEM, teachers help students with disabilities learn on their own and feel included.

Creating tests that work for students with disabilities is really important to make sure that everyone can be included. Assessments that include everyone help all students show what they know and can do well. Teachers can use different ways to check how well students are learning. This helps to make sure that everyone has a fair chance to show what they have learned.

Teaching teachers about UDL and assistive technologies is important in creating a learning environment where everyone feels included. Faculty training and professional development programs help teachers learn how to use assistive technologies, follow UDL principles, and meet the needs of all their students. Using tools to help people and making sure that learning materials can be used by everyone can really make a difference in making education more inclusive. Educational schools can create a welcoming environment for all different kinds of learners, make sure everyone can learn equally, and encourage a culture that celebrates every student's special talents. By using helpful technologies and UDL ideas, we can make education inclusive and empowering for everyone [9], [10].

Encouraging everyone to feel welcomed in schools and learning places involves more than just using tools to help people with disabilities and providing easy-to-use materials. This is about making sure everyone feels included and looking at different ways to do that, like working together as a team in school. Collaborative and cooperative learning mean students with different skills work together in groups to learn together. These activities help students understand and appreciate each other better. Collaborative and cooperative learning has many benefits.

Better Learning Results When students work together, they can combine what they know and can do to solve problems and handle difficult tasks. Working together helps us understand things better and learn more. Learning with others helps us to talk, listen and work well as a team. Participating in these activities helps students get better at working with others and learning how to work together well. These are important skills for doing well in school and at work. By working together, students learn to understand and care about the different abilities and viewpoints of their classmates. They become more understanding and supportive by recognizing the difficulties others may have, which helps create a welcoming and helpful learning atmosphere. Working in groups can make students more interested and motivated. They feel like they are responsible for the things they do together. Creating a supportive classroom culture is very important. It helps to make sure that every student feels valued, respected, and accepted. This caring environment is created by being able to understand and relate to others, and feeling like you are part of a group. Important things for creating a friendly classroom atmosphere. Encouraging students to be kind and respectful towards each other, and

to follow the example of their teachers. Encouraging open communication is about making students feel safe to share their thoughts and concerns. This helps everyone understand each other better. Recognizing and including people from different backgrounds and cultures makes the classroom a welcoming place for everyone. Giving help and praise to students for their hard work and improvement, no matter how good they are, helps them feel sure of themselves and think positively about learning [11], [12].

In student-centered learning, students are the most important part of the educational process. It knows that every student is good at different things, likes different things, and learns in different ways. Supporting student-centered learning means making sure that all students, no matter their learning style or ability, can understand and be involved in the lessons. Personalization means giving students some control over their learning, like letting them pick what they want to learn about or set goals for themselves. This helps them feel more responsible for their education. Being flexible means students can learn at their own speed and in a way that they like. They can explore what they are interested in and what they are good at. Using what you already know and have experienced can help you understand new ideas better and learn more completely. Making a curriculum that includes everyone means making learning materials and experiences that show different ideas and experiences. Encouraging teachers to create inclusive lesson plans has a lot of benefits. Inclusive curricula include different voices and points of view, which helps all students feel like they belong and are being recognized for who they are. This can make learning feel more personal and meaningful.

Learning about different cultures helps students understand and respect other people's beliefs and customs, making the learning environment more accepting and understanding of everyone's differences. Creating a curriculum that includes everyone means making sure the materials used for learning are not unfair or disrespectful. It's important to avoid stereotypes and biases. Encouraging Critical Thinking Different views make students think hard and talk about complex topics. Creating a school environment where everyone feels welcome is about more than just using tools and materials that everyone can use. This means making a friendly classroom where everyone is treated with respect and can work together. Students will be encouraged to talk to each other and appreciate each other's special abilities. Teachers can create a better learning environment by focusing on students' needs and including different perspectives in their lessons. This will help students feel more valued and respected, and they will have a more positive experience in school and learn better. Overcoming obstacles to use educational technology in schools and institutions can be hard. In this article, we will talk about things that make it hard for schools to use technology and ways to make it easier.

Using technology in schools can make learning better and help students get ready for the future. However, this big change is usually difficult and comes with many problems that need to be solved to make sure it is successful. In this, we will talk about things that stop schools from using technology and find ways to fix them. Problems with internet, limited access to devices, and unreliable network can make it hard to use EdTech tools and resources. Simple Words: Steps to Make Infrastructure Better First, check all the existing infrastructure to see what needs to be improved. Invest in good internet that works well and think about getting better internet to handle more devices. Use a mix of methods so that you can still use some EdTech resources when you don't have internet access. Use educational apps that work well on mobile phones, use less internet data, and can run on basic devices. Limited budget can make it challenging for schools to use EdTech. Simplify: First, decide which EdTech tools are most important for the school's goals. Then, spend money on those tools. Look for grants and partners. Try to get money or support from EdTech companies to get resources at lower prices. Consider using

open-source EdTech solutions instead of expensive software that you have to pay a lot of money for. These open-source options are cheaper and can still do the same things.

Some teachers and school leaders might not want to use technology in the classroom because they're scared of something new, they don't know how to use it, or they're worried it will change how they teach. Suggested Simplified Text: Ways to Improve as a Teacher Offer training programs that teach about using technology in the classroom. b) Share stories of success Share stories of success from other teachers who have used EdTech effectively. Show how it has helped students learn better. Encourage teachers to slowly start using EdTech in their teaching and become comfortable with it.

Not enough training and help can make it hard for teachers to use EdTech tools well. This can lead to not using them enough or not using them effectively. One strategy is to provide training that is designed for the specific needs and skill levels of teachers. This will help them feel more confident in using technology for education. b) Peer mentoring is when experienced teachers help other teachers learn about new technology and teaching methods. We will provide ongoing help like workshops and online resources to keep teachers up to date on the latest technology for education. Worries about keeping student information safe may stop schools from using EdTech. Strategies a) following rules and being clear make sure all EdTech tools and platforms follow data protection laws and explain how they handle data. Choose EdTech companies carefully by checking how they keep data safe and their privacy rules before using their products. c) Teach stakeholders like students, parents, teachers, and school leaders about why keeping personal information private is important and what is being done to keep it safe.

By knowing and dealing with these things that make it hard to use EdTech, schools can make a good environment for using EdTech successfully. Making the roads, buildings, and other things better, and keeping track of money, teaching people, managing changes, and protecting information will help technology be used in schools in a smooth way. This will help students learn new things and be ready for a future with lots of new ideas and technology.

Educators need to learn new skills and knowledge to be successful at using technology in teaching. The success of using technology in education depends on how well teachers are trained. As technology gets better and better, teachers need to keep learning and getting help to use new technology tools in their classrooms. We will look at important things that teachers need to learn about using technology in their teaching.

Customized training programs are important to make professional development effective. It's important to design training that meets the specific needs and skills of educators. This individualized approach understands that teachers come from different backgrounds and have different levels of experience with technology. Ways to customize professional development are doing a pre-test to see what educators already know about EdTech. This helps to find out what you don't know and where you can get better. Creating specialized workshops and training sessions for teachers based on their specific needs. These sessions can be either basic or more difficult depending on how much each person is ready to understand. Self-Paced Learning means you can learn at your own speed using online modules and tutorials. You can go back to the materials whenever you need to. Personalized Help Offering special coaching or mentoring for teachers who need extra help using EdTech in their teaching.

Working together and building a community is important for making EdTech work well. When teachers work together, share their experiences, and help each other, it makes the school better and more creative. One way to help people work together and build a community is to create groups of educators who are interested in using technology for teaching. They can meet often to talk about their problems, share their successes, and work together to find solutions.

Encouraging teachers to share their experiences and knowledge with other teachers through presentations, workshops, or webinars so they can learn from each other. Creating online places where teachers can talk, ask for help, and share ideas about using technology in education. Encouraging teachers to join EdTech conferences and events, so they can learn about new ideas and technology in education. Continual Help for EdTech is always changing, so teachers need ongoing help to stay updated. Creating a system for continuous help is really important to make sure that teachers stay informed and feel sure about using technology in education. Ways to keep giving help over time include.

Creating a plan for teachers to learn new technology skills throughout the school year. Gathering a collection of online materials like articles, videos, and webinars about EdTech for teachers to easily use. Inviting smart people who know a lot about technology in education to come talk at our workshops and seminars. Encouraging teachers to work together and help each other after professional training, so they feel like they belong to a community even when they're not at a formal meeting. Good training for teachers is very important for using technology in schools. By creating training programs, working together, and supporting teachers, schools can help them learn how to use EdTech to make a big difference in education. When teachers feel comfortable using technology to help students learn, it will make education more interesting and tailored to students' needs. This will help students be ready for the future. Successful Case Studies and Best Practices mean examples of how things were done well and worked out successfully.

We can learn a lot from real-life examples of how EdTech is used in education. It's important to study successful case studies and best practices. This will show different schools' success stories and best ways of doing things. As schools start using more technology for learning, it's important to learn from how it's been done well before so we can make good plans for the future. In this, we will look at some real-life examples and good ideas that show how technology has been used well in schools. We will see how it has helped teachers, students, and school operations in a good way.

Case Study: A High School's New Way of teaching A high school tried a new way of teaching called the "flipped classroom" approach. They used videos and interactive online activities for homework. This allowed students to learn at their own speed. In the classroom, we talked about things, worked together, and solved problems.

The use of technology in education made the learning experience more focused on students, and helped them to be more active and engaged. A school district used special computer programs in math classes to help students learn better.

The programs looked at each student's skills and challenges and gave them individual lessons to help them improve. The platform used data analysis to find where students needed help and changed the learning material to fit their needs. As a result, students got much better at math and teachers were able to help individual students more. The university uses special tools like screen readers, speech-to-text software, and accessible learning platforms to help students with disabilities. This research shows how using technology in education can help all students learn better, including those with different needs. It helps make school more open to everyone.

The college got a new system that made it easier to do administrative things like enroll students, give grades, track attendance, and talk to students and their parents. This change reduced the amount of paperwork staff had to do, so they could spend more time helping students and working on new educational projects.

Study of how a school district's use of technology in education has affected students in the long run. The district gave teachers training and tools, put technology in classrooms, and encouraged new ideas. Over time, this program helped students get more involved, do better in their classes, and graduate more. Moreover, students learned important computer skills that will help them succeed in a world that relies on technology.

The future of new technologies in education

Upcoming Technological Trends in Education As technology keeps getting better and better, there are a few changes coming to the way we learn. These changes will make a big difference in education soon. This talks about new technology that could change the way we learn and teach. Extended Reality Integration means using different technologies to mix the real world with computer-generated experiences to make them more immersive.

This involves Virtual Reality, which puts users in a made-up world; Augmented Reality, which adds digital things to the real world; and Mixed Reality, which mixes fake and real things together. In schools, XR is going to become more important because it can help students be more interested and understand things better.

With XR technology in education, students can visit historical events, places on a map, or scientific simulations that they wouldn't be able to experience otherwise. For instance, history lessons can help students experience key moments in the past and engage with historical events through virtual means. We can have fun learning about different countries and cultures in geography class. In science and engineering, using computer simulations helps people understand scientific ideas better.

DISCUSSION

By using XR technologies, teachers can make learning more fun and interactive for all kinds of learners. This commitment can make students feel more excited and make them want to stay in school longer. Additionally, XR allows students to learn together in virtual spaces, even if they are far apart. This helps them work as a team and improve their communication skills. Artificial Intelligence and Machine Learning have improved a lot in the last few years.

They are having a big impact on education. AI technology is helping to make learning experiences that work best for each student. With the help of AI, teachers can collect information about how each student is doing in school, how they are progressing, and how they learn. This information can be used to create special learning paths that help each student with their strengths and weaknesses. Adaptive tests change the level of difficulty based on how the student is doing, so the questions are always at the right level for them.

Smart teaching systems use computer technology to help students learn and give them feedback right away. This helps teachers support their students better. These systems can give more explanations, tips, and extra practice exercises to help you understand and become really good at the ideas. Additionally, AI can help teachers find patterns and trends in students' performance data, which can help them make more informed decisions based on the data. Teachers can use this information to change the way they teach, find students who are having difficulty, and give them the help they need.

Quantum Computing is a new kind of technology that uses quantum mechanics to do difficult calculations much faster than regular computers. Quantum computing is new, but it could change a lot of things, including education. In education, quantum computing could change how we keep information safe when it's sent over the internet and protect important data in the digital age. Quantum encryption and secure communication methods could provide better

security than regular ways of keeping information safe. Also, quantum computing can help make scheduling, resource allocation, and curriculum design well in education. Finding better ways to solve problems could help make school better for students and make things run smoother for schools.

The Internet of Things is when devices are connected and share data with each other through the internet. In schools, IoT can make campuses smarter and create personalized ways of learning. IoT devices can be used to make college campuses safer by keeping an eye on places like classrooms, libraries, and labs. Smart lights and temperature control systems can save energy and make campuses more sustainable. We can make learning more personal by using special devices that can collect information about how students act, what they like, and how well they are doing. This information can be studied to make learning experiences better for each person. This can help people learn more and feel happier with their school work. IoT technology can also help manage resources in education. By keeping track of how much we use books and lab tools, schools can make sure they are using them efficiently and not wasting anything. "5G technology makes internet faster and more reliable. This will really help students learn on their phones and collaborate online for school. With 5G, students and teachers will have faster internet and be able to access educational stuff easily on their phones. This will make it easier for more people to learn from anywhere at any time, making it easier to get an education. Working together with others and using internet tools on the cloud will be easier with 5G internet. Students can work together on projects and talk in real time, even if they are far apart. Furthermore, 5G can help make Virtual and Augmented Reality experiences in education grow. Fast internet will help you watch videos and use interactive content easily, making learning more fun.

The future of education will be influenced by new technologies like Extended Reality, Artificial Intelligence, Quantum Computing, the Internet of Things, and 5G connectivity. These technologies have great potential to change the way we teach and learn, so that education is more interesting, tailored to each person, and available to people all over the world. Teachers and leaders should carefully support these new ideas. This can make education more fair, creative, and empowering for everyone.

As technology becomes more involved in education, teachers' jobs will change a lot. In this, we look at how teachers' jobs are changing because of technology. In today's digital age, people can easily find information online. Because of this, teachers are no longer the main source of knowledge. Instead, they help people learn in new ways. Teachers will help students find information instead of just giving it to them. They will motivate students to learn, ask questions, think carefully, and solve problems. With lots of information available, teachers can inspire students to learn about things they like and do their own research. Teachers will help students learn how to tell if sources are trustworthy or not by having discussions and giving advice. This will help students become better at finding good information and knowing the difference between what's true and what's not. Teachers can help students think for themselves and learn on their own. This can help students become better learners for life. Instead of just taking in information, students will join in and take part in their learning. This will help them understand their subjects better.

People who take care of online stuff have a lot of work. There is a lot of online stuff and this is good and bad for teachers. Teachers will play an important role in choosing and showing digital resources to help their students learn better. By selecting and organizing online materials, teachers can make sure that the resources they use fit with what they are teaching and what students need to learn. They can also adjust the material to suit each student's needs, likes, and the way they learn. This customization makes students more interested and excited

about learning because they can understand and connect with the material better. As teachers, we also check the quality and correctness of online content to make sure it's good for education and has the right information. They will tell students to use different types of resources like videos, articles, podcasts, and interactive activities to learn about their subjects.

In the digital age, educational technology platforms gather lots of information about how students are doing in school, how much they are participating, and how they are improving. Teachers can use information from these platforms to help them teach better. By looking at information about students, teachers can figure out what each student needs to learn and how they like to learn. This method uses information to help teachers teach each student in a way that suits their strengths and helps them improve where they need to. Adaptive learning systems can give students personalized learning paths. They show content at a speed and difficulty level that matches the student's skills. Using data to teach also helps teachers keep track of how students are doing and find any problems with learning early. By knowing how each student is doing in school, teachers can help them when they need it so no one falls behind. Working together and connecting with people from all over the world is easier because of technology. Teachers can work with other educators from different countries and help their students meet other kids from different cultures.

Teachers can work together on the internet and through video calls to share their teaching techniques, ideas, and research with each other. This sharing of knowledge around the world helps teachers learn new things and get better at their jobs. It also keeps them informed about new trends and ideas in education. Additionally, technology helps students connect with people from different cultures. By talking to students from other countries online, students can learn more about the world and understand different cultures. This can help them become more compassionate and aware of global issues.

CONCLUSION

Including assistive technologies in schools helps to make sure that all students, no matter what their abilities are, can take part in learning and feel more empowered. This summary has talked about how helpful tools can make school fairer for students with disabilities. It also shows how these tools can make learning easier and better for them. Assistive technologies help students with special needs use personalized tools to learn and show what they know in school. Furthermore, they are very important for helping people to talk to each other, do things on their own, and learn better. However, making assistive technologies work well needs teamwork between teachers, technology experts, and people involved. Teaching, learning new skills, and creating rules are important to make sure that all students can easily use assistive technologies.

REFERENCES:

[1] E. Walton, “Decolonising (Through) inclusive education?,” *Educ. Res. Soc. Chang.*, 2018.

[2] N. Muthukrishna and P. Engelbrecht, “Decolonising inclusive education in lower income, Southern African educational contexts,” *South African J. Educ.*, 2018.

[3] V. Marín-Díaz, “The relationships between augmented reality and inclusive education in higher education,” *Bordon, Rev. Pedagog.*, 2018.

[4] E. Asamoah, K. Ofori-Dua, E. Cudjoe, A. Abdullah, and J. A. Nyarko, “Inclusive Education: Perception of Visually Impaired Students, Students Without Disability, and Teachers in Ghana,” *SAGE Open*, 2018.

[5] Z. G. An, X. Hu, and E. Horn, "Chinese Inclusive Education: The Past, Present, and Future," *Interv. Sch. Clin.*, 2018.

[6] T. Lüke and M. Grosche, "What do I think about inclusive education? It depends on who is asking. Experimental evidence for a social desirability bias in attitudes towards inclusion," *Int. J. Incl. Educ.*, 2018.

[7] H. M. Low, L. W. Lee, and A. Che Ahmad, "Pre-service teachers' attitude towards inclusive education for students with Autism Spectrum Disorder in Malaysia," *Int. J. Incl. Educ.*, 2018.

[8] E. Walton, "Inclusive education in the academy: pedagogical and political imperatives in a master's course," *Int. J. Incl. Educ.*, 2018.

[9] E. Walton, "Decolonising (Through) Inclusive Education? Setting the Scene: Inclusive Education in International and South African Contexts," *Educ. Res. Soc. Chang.*, 2018.

[10] F. V. M. Bazon, E. G. M. Furlan, P. C. de Faria, D. Lozano, and C. Gomes, "Training of university professors and their meaning for inclusive education," *Educ. e Pesqui.*, 2018.

[11] I. M. Pit-Ten Cate, M. Markova, M. Krischler, and S. Krolak-Schwerdt, "Promoting Inclusive Education: The Role of Teachers' Competence and Attitudes," 2018.

[12] M. R. Husnutdinova, "Basic models for the development of inclusive education in Moscow," *Obraz. i Nauk.*, 2018.