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EVALUATING THE POTENTIAL OF METAVERSE AND ITS IMPACT ON PRIMARY AND SECONDARY SCHOOL EDUCATION IN JAMMU & KASHMIR

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Abstract

Augmented and virtual reality (AR and VR) have been used for many years to improve learning outcomes for students. However, the Metaverse, a virtual world that allows for 3D user interfaces, is a relatively new technology that can potentially improve learning even further.

This paper reviews how augmented and virtual reality, as well as the Metaverse, can improve concept understanding with real-life applications and better assessment of learning outcomes for students and teachers in Jammu & Kashmir (J&K), India.

AR and VR assist students in learning more effectively by providing a more immersive experience. The Metaverse offers even more possibilities, such as the ability to create customized classrooms, worlds, and avatars. In addition, it could help students in rural areas who may not have access to good educational facilities.

The Metaverse also offers the potential for better assessment of learning outcomes. For example, teachers can track student progress and understanding more efficiently in a virtual environment than in a physical one. In addition, it could help to identify problems early on and provide support where needed.

Overall, the Metaverse holds excellent potential for improving education standards in J&K. Further research is needed to determine the best ways to use it to achieve the most significant impact

Keywords: *Metaverse, augmented reality, virtual reality, extended reality, second life, education, curriculum*

INTRODUCTION

A recent study from Boston Consulting Group titled "The Corporate Hitchhiker's Guide to the Metaverse" found that the metaverse market could be worth $250-$400 billion by 2025.

In this paper, we examine how Jammu & Kashmir (J&K) can take advantage of emerging technologies in Web 3.0, like Metaverse, to improve education at all levels.

The proposed National Education Policy (NEP) 2020 is an opportunity for the J&K region to significantly improve curriculum, infrastructure, teaching methodologies, student engagement, and students' qualitative and quantitative assessments by introducing blended learning with virtual reality.

The administration of J&K is investing more money and resources with a more significant commitment to catalyzing the overall quality of education and development in the state. The NEP encourages exploring new technologies to assist teachers and improve students' overall learning experience.

While it is true that children are growing more interested in subjects such as science, geography, history, and language arts than they were a generation ago, the traditional content-rich curriculum does not provide enough opportunity for these interests to be expressed and nurtured.

The Pedagogy needs to evolve so that education becomes a more learner-centered process, enabling inquiry-driven and discovery-oriented approaches by students. The objective is to use technology to deliver immersive, interactive, and engaging content for students with varying learning abilities who can access the content at school and home to augment learning at their own pace.

The introduction of 5G technology and broadband satellite Internet services in J&K offer opportunities for early adoption of Web 3.0 to enable the introduction of Metaverse and its associated augmented and virtual reality technologies in school education, positively impacting student learning experience and engagement.

Implementing NEP and 5G offers J&K a tremendous opportunity to transform the education ecosystem by adopting the latest technology and pedagogy. The merging of cutting-edge technologies such as Augmented reality (AR), Virtual reality (VR), Extended reality (XR), and Mixed reality (MR) is bringing together a Metaverse that will revolutionize how we learn, store, obtain, and enjoy knowledge and entertainment.

The educational learning process in schools and colleges already utilizes certain technologies. However, these are at a basic level, with only access to a few students. Meanwhile, the Metaverse is still in its early phases of development and is yet to reach implementation at the school level in India. Nevertheless, its potential applications in education, training, and skill development are virtually limitless.

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According to Marty Resnick, research vice president at Gartner, "vendors are already building ways for users to replicate their lives in digital worlds." "From attending virtual classrooms to buying digital land and constructing virtual homes, these activities are currently being conducted in separate environments. Eventually, they will occur in a single environment – the Metaverse – with multiple destinations across technologies and experiences." Gartner, Inc. states that in 2026, 25% of individuals will spend at least one hour per day in the Metaverse for work-related tasks, shopping, socializing, and entertainment.

Facebook changed its name to Meta, confirming its bet on the future of Metaverse. Meta CEO Mark Zuckerburg told CNBC he predicts over 1 Billion people will be spending at least $100 each on the Metaverse. In addition, Facebook has announced a $50 million investment in global research and program partners to seize the opportunity and create products for the Metaverse.

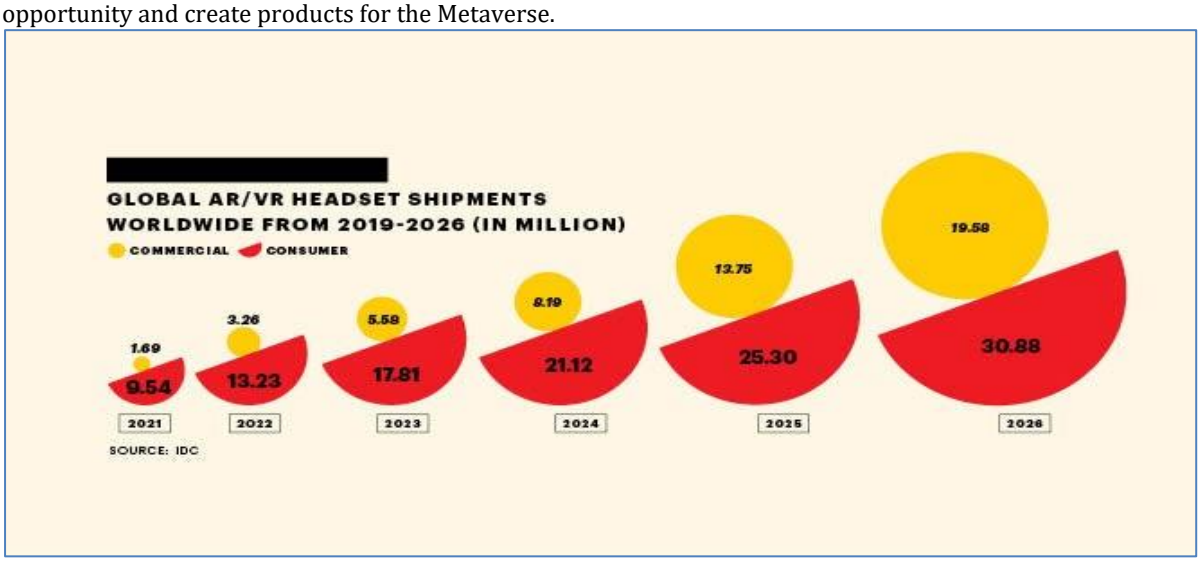

Image 1
Source: Global AR / VR Headset Shipments Worldwide 2019-2026 (in millions)

In India, Facebook announced a collaboration with MeitY Startup Hub to launch the XR Startup Program. The program's purpose is to help 40 businesses in India that are just starting and working on XR technologies. Furthermore, 80 individuals with innovative thinking will be chosen and brought to a Bootcamp to validate their ideas. Out of those startups, 16 innovators will receive support transitioning from research and development to developing products and services that work.

1.1 Emerging technologies: Augmented reality (AR)/Virtual reality(VR)/Extended reality(XR)/Mixed reality(MR)/Mirror worlds

Augmented reality technology offers live and real-time experiences by integrating digital information with the physical environment. For example, the superimposition of digital images or animations onto the real world using a mobile device camera or AR headset creates a virtual world by adding animations, graphics, haptic feedback, sounds, or even smells to imitate the natural world that exists.

The concept and use of augmented reality/virtual reality in education are not new. However, the advent of 5G network services and technological improvements in AR/VR/XR/MR will expand their applications in educational institutions worldwide. Integrating the physical and digital realms through Metaverse, which brings these two dimensions together, is thrilling and intimidating.

The informational technology ecosystem views Metaverse as a new frontier for business applications across diverse sectors. Governments that are early adopters will gain a significant advantage in preparing a workforce that's ready for the future. Metaverse is a fast-evolving technology, and education and training are essential to take advantage of its opportunities.

For example, students can use AR/VR apps to visualize complex concepts such as the solar system or the human body. This visualization can help them understand these concepts better and retain the information for extended periods. Furthermore, teachers can use AR/VR for academic evaluations.

In the early stages of the new content around AR/VR/XR/MR, a few pedagogical methods may confuse and irritate students in the early stages. However, once the students overcome the initial hesitation, the new methodology will enhance interest and lead to higher engagement and comprehension.

For example, students can take augmented reality (AR) tests that require them to identify objects or answer questions by pointing to the correct answers on their AR devices. This testing allows teachers to assess student progress and understanding more accurately.

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The success of Metaverse in J&K schools will depend upon the state's ability to provide reliable technology access, Hardware availability, content usage, and a stable power supply. Additionally, student residences should have battery backup for academic expansion outside the classroom.

The regions of Jammu and Kashmir, located in northern India, boast stunning landscapes and diverse cultures. However, there are topography challenges, physical access, extreme weather, limited infrastructure, distributed population, fluctuating power, and limited opportunities for work and income.

This paper collates and analyses previous studies on Metaverse to explore how Metaverse can be introduced in J&K schools to deliver improved student educational outcomes.

J&K must be an early adopter of this fast-evolving immersive technology and explore ways to incorporate Metaverse into the existing curriculum and develop new applications specific to J&K's culture and history. In addition, J&K should provide adequate training to teachers on how to use augmented reality effects to maximize its benefits.

With proper planning and implementation, Metaverse has the potential to transform education in India and help prepare students for success in the 21st-century workplace.

LITERATURE REVIEW

2.1 What is Metaverse?

The term "Metaverse" was first introduced in Snow Crash (Stephenson, 1992), a science fiction book based on a virtual reality world that would eventually replace the Internet.

Stephenson breaks down the meaning of the prefix "meta," which implies transcending, and how it relates to the word "universe," which describes a parallel or virtual environment linked to the physical world.

Anderson et al. explain "Metaverse" as "the realm of computer-generated, networked extended-reality spaces (XR, which includes VR, AR and/or MR) in which interactions take place among humans and automated entities, some in gaming or fantasy worlds and some in "mirror worlds" that duplicate real-life environments" (196).

The emerging Metaverse will bring together the physical and digital worlds to create a more immersive and realistic experience for users. In the Metaverse, users can interact more naturally and fluidly with each other and digital content (McVeigh-Schultz et al. 2019).

The Metaverse will redefine how we interact with the world and each other and is poised to become the next central platform for social interaction, branding, communication, creativity, and commerce.

2.2 Understanding the Metaverse Value Chain

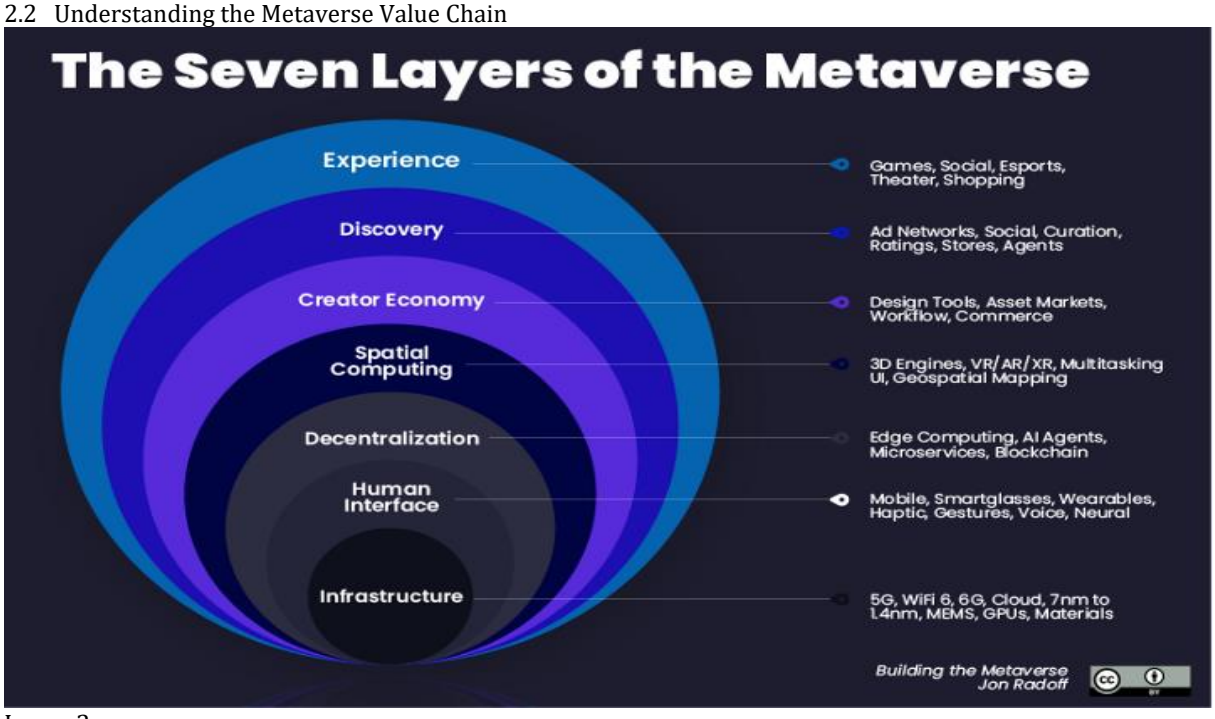

Image 2

Source: Radoff illustrates the Seven Layers of the Metaverse

As per Radoff (2021), the Metaverse Value Chain is a tool for understanding how the Metaverse will generate economic value. He explains the seven layers of the Metaverse Value Chain:

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2.2.1 Experience

Metaverse offers an "immersive experience." In the context of gaming and other digital media, the Metaverse fully engages the senses and allows the user to feel transported into the game world. As a result, users can learn, train, shop, and play games in rich, immersive environments designed to mimic or exceed the natural world. Whether exploring a virtual world or participating in a competitive learning activity, users can enjoy a wide range of experiences that are unlike anything they've ever experienced.

2.2.2 Discovery

Advertising networks can use the Metaverse to create virtual spaces where they can show ads to people in a way that is more engaging and interactive than traditional methods. Likewise, social curation platforms can create virtual spaces where users can give ratings and reviews for products and services.

Ecommerce companies can build virtual marketplaces where customers can purchase items and deliver them to their doorsteps. Finally, customer support agents have the opportunity to extend client information and support in real time based on actions and engagement. All of these uses have the potential to generate significant investment, monetization, and engagement opportunities.

2.2.3Creator economy

The Metaverse offers creators a unique opportunity to use design tools and workflows to build virtual asset markets and promote commerce. For example, creators can design and build virtual real estate that is unique and available for purchase. In addition to creating virtual fashion clothing and accessories for avatars, freelance creators will also be able to sell their creations or offer creative services, such as artwork, music videos, etc.

2.2.4 Spatial computing

Spatial computing considers the world's three-dimensional nature to build applications using 3D engines, multitasking UI, AR/VR/XR/MR, and geospatial mapping. One example of advanced computing in the Metaverse is in the area of 3D engines, which help create complex, high-quality 3D engine graphics.

Another use case is in the multitasking User interface (UI). A UI allows participants in the virtual world to perform multiple tasks simultaneously. Geospatial mapping helps create high-quality geospatial maps to navigate the three-dimensional world. These are application areas where the industry has begun investing significantly.

2.2.5 Decentralization

Decentralization is a critical trend in the development of the Metaverse. Advanced technologies such as Edge computing, Blockchain, AI agents, and Microservices are driving this trend by enabling distributed architectures that are more resilient and adaptable than traditional centralized systems.

The Metaverse is decentralized, which leads to a virtual world that is more open and inviting to users. They have greater control over their data and experiences in this environment. In addition, decentralization is helping to create new opportunities for innovation and economic activity.

Decentralized applications built on blockchain platforms offer an alternative to traditional centralized applications and services. It provides better security, privacy, censorship resistance, and new features and capabilities not possible with conventional centralized apps. As the Metaverse continues to evolve, decentralization will be at the core of its development.

2.2.6 Human Interface

As people spend more time in virtual reality (VR), the importance of the human interface is becoming increasingly apparent. As a result, technology companies are investing in developing hardware that provides an immersive, realistic VR experience, and the human interface is a vital part of this effort.

Head-mounted devices (HMDs) like the Oculus, Quest 2, PlayStation VR, Vive Pro, and Gear VR, among others, are capable of providing a high level of immersion, but they are bulky and expensive. On the other hand, the Microsoft HoloLens 2 offers high accuracy and output that suits enterprise-ready applications. In addition, mobile VR headsets like the Samsung Gear VR and Google Daydream View are less bulky and easier to use than HMDs, but they also have limited immersion compared to HMDs.

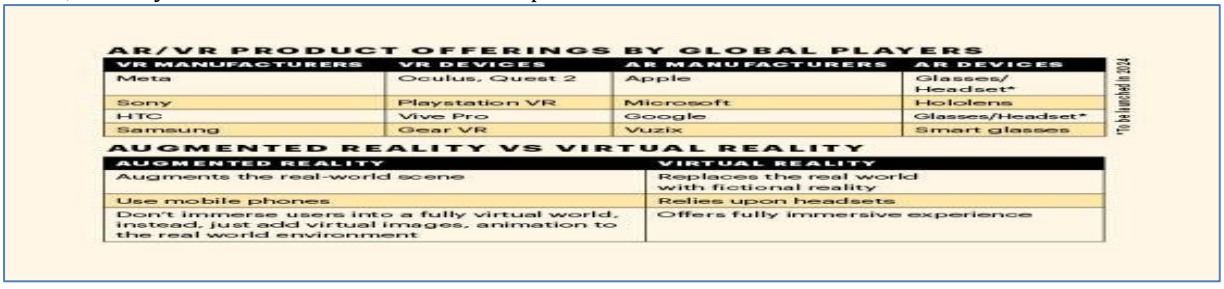

Image 3

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Source: AR/ / VR Product Offerings by Global Suppliers

The haptic sensing, gesture, neural, and voice control capabilities of various devices are all essential factors in determining their level of immersion. For example, haptic feedback allows users to feel sensations like touch and pressure in VR, while gesture controls enable them to interact with virtual objects using their hands. Neural rules allow users to control VR experiences with their thoughts, and voice controls enable users to interact with VR environments using natural language commands.
Each of these technologies is still in its early stages of development, but they are all pivotal to the future of VR. As hardware becomes more sophisticated and user-friendly, the human interface will become increasingly important in driving technology

2.2.7 Infrastructure
Next-generation networks such as 5G and 6G will be essential to support the massive data demands of the Metaverse. These networks will be able to provide the low latency and high bandwidth needed to support real-time interactions in virtual environments. In addition, WiFi 6 and other emerging wireless technologies will play a key role in connecting users to the Metaverse.
These networks' increased speed and capacity will be critical for supporting streaming media and other high-bandwidth applications. Cloud computing will also be a vital component of the Metaverse, providing the scalable storage and processing power needed to support millions of users.
Advanced materials such as graphene and carbon nanotubes will also be necessary for building the infrastructure of the Metaverse. These solid and lightweight materials make them ideal for constructing virtual environments. In addition, they are excellent conductors of heat and electricity, which will be necessary for powering the massive servers that will power the Metaverse.
The evolving metaverse ecosystem will create value by enabling new types of content, applications, and services that are impossible in the physical world. The Metaverse Value Chain provides the tool for understanding how this value will be created and captured.
2.3 Metaverse in education
The rise of the Metaverse is creating further opportunities for VR-based training, upskilling, and collaboration. Most global enterprises are increasing investments in VR and accelerating the transition to VR learning.

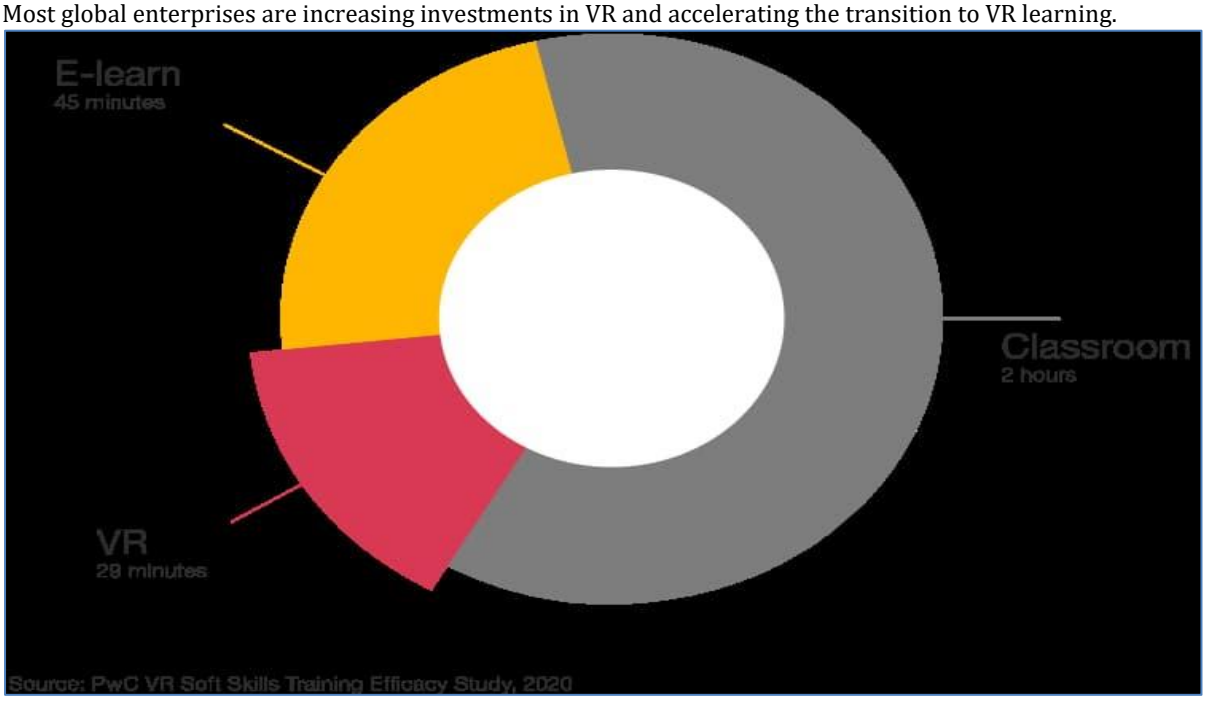

Image 4
Source: PwC VR Soft Skills Training Efficacy Study, 2020

The PwC 2022 Metaverse Survey, July 2022, reveals Virtual Reality learners:
- trained 4X faster than in a classroom
- were 275% more confident in applying what they learned
- 3.75X demonstrated a higher emotional connection to the content than in the regular classroom
- were 4X more focused than their e-learning peers

The education sector is responding to the growing demand.

As per Donastorg (2021), Facebook is investing $50 million to partner with Howard University for research and development in Metaverse. Additionally, Clark Atlanta University announced an $11.8 Million Grant from EON Reality Awards Clark Atlanta University to establish a Knowledge Metaverse Hub (2022).
EON Reality, a leading company in Augmented and Virtual Reality-based learning for industry and education, has partnered with Meharry Medical College to introduce world-class XR solutions in the Metaverse that will enable them to bring interactive teaching into their classrooms.
As Kala (2022) discusses, the potential for Metaverse in healthcare and medical education is personalized, interactive, immersive, and recreational. For example, medical students can walk through a three-dimensional model of the human body with patients, discussing diagnoses and treatments that simulate the effect of a proposed treatment on the patient's body before it is applied. It creates a more personal and informative experience compared to what is currently possible with two-dimensional images on a screen.
Mystakidis (2022) finds potential for new, innovative distance education models to emerge from the Metaverse. These new models could break through the limitations of 2D platforms and provide students with a more immersive and interactive experience.
Meta-education can enable rich, hybrid formal and informal active learning possibilities in virtual 3D campuses that are always available, alternative, and online. As a result, students can be co-owners of the virtual environment and co-creators of fluid, customizable coursework.
Metaverse is a social media platform that uses VR and AR immersive technologies to create unique experiences for its users.If their correspondence is collected inventively, it pledges to change many industries, including distance online education.
Wu (2019) presents the 6E Design model, digital game-based learning for students of STEAM - Science, Technology, Engineering, Art, and Mathematics. The six STEAM phases involve- Engage, Explore, Explanation, Engineering, Enrich, and Evaluation. The potential of adapting and deploying this model in school education in India is significant.
Online educators can use new tools and technologies to create educational models that blend the best of formal and informal learning experiences.Metaverse-powered virtual worlds offer a rich, immersive educational experience that simulates real-world campuses. Students can access and engage with these environments from anywhere in the world, making education more accessible than ever.Online learning in the Metaverse will be able to break the final frontier of social connection and informal learning.
Physical presence in a classroom will cease to be a privileged educational experience. Instead, telepresence, avatar body language, and facial expression fidelity will make virtual participation equally effective.
Mixed social reality in the Metaverse can enable blended active pedagogies that foster more profound and lasting knowledge. But, more importantly, it can become a democratizing factor in education, encouraging worldwide participation on equal footing, unbound by geographical restrictions.

2.4 Implications of Metaverse

Metaverse is at the core of Web 3.0, and the future of the Internet is getting shaped by the emerging disruptive technologies that challenge the existing paradigms of how the Internet is accessed, information gathered, stored, and processed, how contracts are recorded and honoured, and how commercial transactions are completed.

2.4.1 Regulation and conflict

Governments, institutions, organizations, and other stakeholders face the challenge of defining how Web 3.0 will evolve and how to regulate, govern, and protect the stakeholders. In a boundaryless virtual world, the contradictions and conflicts between local, national, and international laws need definition and clarity for the successful transition to Web 3.0 and its frictionless evolution.
In *"Legal implications of a ubiquitous metaverse and a Web3 future,"*Garon Jon M. tackles the legal problems associated with agreements between metaverse enterprises and their customers, including antitrust issues, copyright protections, biometric data privacy rights, and customer speech in metaverse environments.

2.4.2 Personal Data Security

This massive volume of data creates several challenges in data protection and cybersecurity, such as collecting user consent or protecting against identity theft (Palona et al., 2022).
Web 2.0 witnessed the spread of Online Social Networks (OSNs) like WhatsApp, Facebook, Instagram, Snapchat, and Telegram. However, ease of access and use raised unforeseen privacy problems, trolls, and data storage under centralized architectures.
Web 3.0 presents several concerns as it evolves. Protecting personal information - access, storage, and control, is a significant issue for stakeholders and remains a priority. Internet users need the option and freedom to asses which personal data they need to share online. Therefore, it is essential that they
Since the web is a big part of daily life, searching and browsing it has become second nature for most people. However, our loss of privacy is an inherent result of how we currently use and monetize the Internet. As advertising, localization, and customization of services have increasingly required more personal data collection, people have become worried about how this information is used. Windl. (Maximiliane et al., 2022).

Vojinovic (2022) highlighted how cybercriminals use the latest technology to breach highly secure firewalls to steal personal information, cryptocurrency, and industrial and commercial-related proprietary information. Yahoo witnessed the most significant data breach, with compromised 3 billion user account details.

2.4.3 Real-life vs. Avatar: Ownership, responsibility, and Accountability

An avatar is any digital representation of a user in the "Second life" or virtual world. The term "Avatar"is frequently used for the three-dimensional characters in virtual worlds and video games.

These avatars can be highly customized, allowing users to control everything from their physical appearance to clothing and voice. In recent years, avatars have expanded beyond the virtual world, with a growing number of people using them in augmented and mixed-reality applications. For example, avatars often interact with other people in online meetings or social spaces. As new ways of interaction develop with technology, avatars will likely play an increasingly important role in our lives.

With commercial transactions becoming popular in the Metaverse, the differentiation and merger between real-life identities and Avatars highlight the present ambiguities in cross-referencing, ownership, legal implications, and consequences of actions or inaction.

Additionally, the absence of clear cryptocurrency regulatory frameworks will hold back exploiting the Metaverse for its full potential (Chohan, 2020).

2.4.4 Digital currency: Value, Stability, Security, Settlement

Non-fungible tokens (NFT) and cryptocurrencies will most likely support business deals in the Metaverse, which poses problems concerning ownership, proper use, interoperability, and portability.

Non-fungible Tokens (NFT) are used for online real estate transactions, including virtual housing, popular retail stores, and iconic public properties. Owners of these digital properties and assets trade and barter on negotiated values using NFTs to settle the contracts. The question of settling a disagreement in the virtual world with real-world consequences is still unanswered.

To address the problem of privacy policies and data protection, Aderibigbe (2021) explored a decentralized approach that included using cryptographic, hashing, and plenum byzantine fault tolerance algorithms, which present a consensus-driven platform that innovatively uses blockchain technology.

Blockchain is an information security system that makes it difficult to change, hack, or cheat recorded information. A blockchain is a digital ledger of transactions duplicated and distributed across the entire network of computer systems on the blockchain (Euromoney, 2020).

2.4.5 Metaverse: Social and psychological impact

In Packham's (2022) study, social and ethical issues were raised regarding the Metaverse. The concept of risk must be explored, and a legal basis for accountability must be developed to ensure safety in the Metaverse.

Metaverse can potentially exacerbate cognitive, emotional, and behavioral problems (Popescu, Alexandrina-Mihaela, et al.). School students are more vulnerable to the negative consequences of the Metaverse, which can be addictive. Reclusive behaviour and social isolation resulting from excessive time spent inside the Metaverse is

According to Lamba, Metaverse can hurt teens vulnerable to problems associated with loneliness, depression, cyberbullying, body shaming, and performance shaming (gaming).

Groups such as women, LGBTQ individuals, and ethnic minorities often get marginalized in social VR settings since these platforms are commonly male-dominated with an English interface (Blackwell et al., 2019).

RESEARCH OBJECTIVES

The Metaverse has the potential to provide immersive and interactive learning experiences. However, several issues must be addressed before it can be widely adopted, such as data privacy and security, regulatory frameworks, and social and psychological impact. This paper seeks to study these issues based on existing literature to better understand the Metaverse and its potential applications in education, specifically in Jammu & Kashmir.

The objectives of this study paper are to:

1. Review existing literature on Metaverse and its potential applications in education
2. Understand the state of Metaverse development in India, specifically Jammu & Kashmir
3. Analyze the feasibility of Metaverse adoption in mainstream curriculum educational institutions in Jammu & Kashmir
4. Propose a Metaverse adoption plan for educational institutions in Jammu & Kashmir.

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RESEARCH METHODOLOGY

The literature review was initiated with a search in Google Scholar and Academia and for the keywords "Metaverse," "implications of the metaverse," "the metaverse value chain," and "metaverse in education." Based on the results, relevant papers were shortlisted and studied within the framework of the research objectives.

RESEARCH FINDINGS AND DISCUSSION

The Literature Review showed many opportunities and challenges to successfully implementing Metaverse in education and training.
The literature review did not reveal many use cases of the Metaverse in the school curriculum or vocational skill development. However, virtual learning of basic concepts in the classroom is already in use in elite schools but is mainly restricted to developed economies.
The review did not reveal adequate data on school students' responses to the Metaverse or its accessibility, understanding, engagement, testing, and assessment outcomes.

The following challenges need to be addressed for schools in India and J&K before Metaverse is made part of the curriculum:

5.1 Hardware availability

Students need access to head-mounted devices, VR controllers, and wearable sensors to learn in a virtual environment effectively. To ensure that there are enough of these resources available on demand, they must be manufactured within the country and made available at least at the district level.

5.2 Hardware cost

A significant challenge to the widespread adoption of the Metaverse and virtual learning in schools is the present hardware costs. The high price tags of required hardware place it out of reach for most schools and students. Therefore, the government needs to incentivize the industry under the "AtmaNirbhar Bharat Abhiyan" by investing in R&D, manufacturing products in India and exporting them to other countries (Vijayamohan, 2020).

5.3 Content creation at an affordable cost

Content for the Metaverse needs to be affordable so that more people can access it and use it for different purposes. India has a large pool of IT professionals, trained and ready to lead the content creation revolution for the Metaverse. However, as with hardware, software companies need incentives from the government to unleash India's creative talent. Here is where the J&K government can seize, initiate, and promote local content development.

5.4 High-speed Internet (5G)

India is rapidly transitioning from 4G to 5G, and it is set to unlock massive potential for content and application development for 5G. However, the mountainous terrain and many people living in rural, difficult-to-reach areas make last-mile optical fiber connectivity a challenge in J&K.
India is paving the way for introducing low-orbit satellites, providing high-speed internet access in more rural areas. In addition, it offers the possibility of leapfrogging technology with virtual learning content and metaverse applications that can bring positive change to the economy and social dynamics of the state.

5.5 Availability of stable power supply

Virtual learning requires a steady power supply and battery back for the devices. Power fluctuations will disrupt content access, disturb learning experiences, and damage the associated hardware. The state administration will require significant investments to address adequate availability of stable power supply throughout the state and region.

5.6 Teacher training in Metaverse, along with pedagogy for student tests, assessment, and grading

The Metaverse is a new technological tool, and its adoption will require changes in school curricula, teaching methods, and assessments. Currently, J&K lacks the trained human resource necessary to support such an ambitious project. The state needs to set up training institutes at the district level for prospective teachers in the Metaverse and its assessment protocols.

Qualification-wise Number of Un-trained Teachers in All Schools (J&K)
Unit: Numbers

Year	Post Graduates		Graduates		Under Graduates		Total		Grand total
	Male	Female	Male	Female	Male	Female	Male	Female	
2018-2019	**8684**	**6691**	**16779**	**14308**	**10101**	**8760**	**35564**	**29751**	**65323**

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Figure 1

Percentage of Trained Teachers in School for General Education (J&K)

Unit: Percentage

Year	Primary Schools			Middle Schools			High / Higher Schools			All Schools		
2018-2019	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
	45	52	48	60	61	60	74	72	73	62	64	63

Figure 2

Teacher Pupil, School Pupil & School Teacher Ratio in Educational Institution (J&K)

Year	Teacher Pupil Ratio			School Pupil Ratio			School Teachers Pupil Ratio		
	Primary Schools	Middle Schools	Secondary Schools	Primary Schools	Middle Schools	Secondary Schools	Primary Schools	Middle Schools	Secondary Schools
2018-2019	30	9	8	73	57	127	2	7	16

Figure 3

Literates and Literacy Rate (J&K) - Census 2011

Sector	Total Population (excluding 0-6 year)			Literate			Literacy Rate		
	Persons	Male	Female	Persons	Male	Female	Persons	Male	Female
Rural	7515052	3920336	3594716	4747950	2891749	1856201	63.18	73.76	51.64
Urban	3007345	1635971	1371374	2319283	1372922	946361	77.12	83.92	69.01
Total	10522397	5556307	4966090	7067233	4264671	2802562	67.16	76.75	56.43

Figure 4

5.7 Proactive government subsidy and infrastructure support

Hardware and software support and maintenance are vital for successfully introducing a metaverse in schools. Therefore, special Annual Maintenance Contracts (AMC) will need to be written and signed with respective vendors to ensure timely and periodic hardware and software support and maintenance.

5.8 Need for regulatory and accountability laws to govern the Metaverse

The Metaverse is vulnerable to digital manipulation, currency fraud, violent ideologies, racial abuse, and pornography. Therefore, it is clear that the Metaverse needs governance and accountability laws to protect all users.

Digital manipulation involves using technology to alter or falsify data. It can have severe consequences in the Metaverse, where users rely on data to make crucial decisions. Digital currency fraud is another serious issue in the Metaverse. It occurs when someone creates fake currency and tricks people into investing in it. Like digital manipulation, currency fraud can lead to financial losses for unsuspecting investors.

Minors must be protected as they risk exposure to extreme violent depictions, ideologies, and pornography in the Metaverse. For example, some virtual worlds include features that allow users to create avatars that resemble real-life children. Predators can use these avatars to lure children into private chat rooms, where they may be exposed to sexually explicit material or subjected to grooming behaviour. Similarly, violent ideologies can be spread through the Metaverse via chat rooms and other social media platforms. In some cases, these ideologies can lead to real-world violence.

It is imperative for all stakeholders to collectively address establishing laws of access, governance, regulation, and accountability to allow the Metaverse to evolve and deliver its full potential.

CONCLUSION

The Metaverse is an emerging new technology that has the potential to revolutionize education in Jammu & Kashmir and beyond. By providing a virtual space that can be used for learning, the Metaverse could help to overcome some of the limitations of traditional education systems.

Virtual learning as part of the Metaverse has the potential to connect students from all over India and the world, enabling them to learn and collaborate on projects. Jammu & Kashmir is ideal for developing Metaverse-based education and content development as it has a large population of young people willing to learn and train. However, the shortage of quality educational staff remains a challenge.

The Indian government needs to frame laws for the virtual world. In contrast, the government of Jammu & Kashmir should invest in developing the Metaverse-based education ecosystem and promote its use in schools and universities. It will improve the quality of education in the state and help prepare young people for future jobs.

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Tables

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[4] Image 4 Source: PwC VR Soft Skills Training Efficacy Study, 2020. https://www.pwc.com/us/en/tech-effect/emerging-tech/virtual-reality-study.html