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INVESTIGATION OF METAVERSE AND MUSIC EDUCATION

Review article

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INVESTIGATION OF METAVERSE AND MUSIC EDUCATION

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Abstract

Metaverse can be defined as a virtual sharing space created by the integration of augmented reality, virtual reality and mixed reality technologies. Its applications in education are notable for its potential to provide students with personalized and adaptable learning experiences. Music education is constantly evolving as a result of technological advances and changing student needs. Metaverse opens a new dimension in the interaction and learning processes of students and teachers in music education. Metaverse has opened a new dimension in education by bridging the digital and physical worlds. Music education has also benefited from this innovative environment and enriched learning experiences thanks to virtual reality and augmented reality technologies. This study emphasizes that the importance of the metaverse in education has increased, especially after the pandemic, and that applications have diversified in different disciplines. A literature review was conducted for this research, which was conducted as a compilation study. “Metaverse and Education”, “Metaverse and Music”, “Augmented reality and Education”, “Virtual reality and Education” were used as keywords. Regarding the research content, 19 studies covering the period between 2015 and 2024 were used. In line with these studies, the subject was examined from an educator's perspective.

Keywords: Metaverse, Education, Music Education, Metaverse and Music

1. Introduction

The origin of the word Metaverse comes from Ancient Greek. The prefix “meta” means “after” and “beyond”. “Verse” is the abbreviation of the word “universe”, which means universe. (Köse, 2021, as cited in Çelik,2022).

The definition of metaverse was expressed in the dystopian science fiction novel "Snow Crash" written by science fiction writer Neal Stephenson in 1992 (Zakarneh, 2024). This concept, which was first used by Stephenson, has gained great importance in recent years.

Metaverse is a network of 3D-based, immersive, creative and interactive online virtual worlds, in which people are represented through a user identity called an avatar, expanded on the basis of the reflection of the real world, with many new realities such as virtual, physical, mixed and augmented reality (Figure 1). In other words, Metaverse can be said to be the equivalent of the virtual world, which can be accessed through different applications and may be very similar or identical to the real world. In this world, it is possible to experience all the realities of life through avatars (Batu & Kocaömer, 2023).

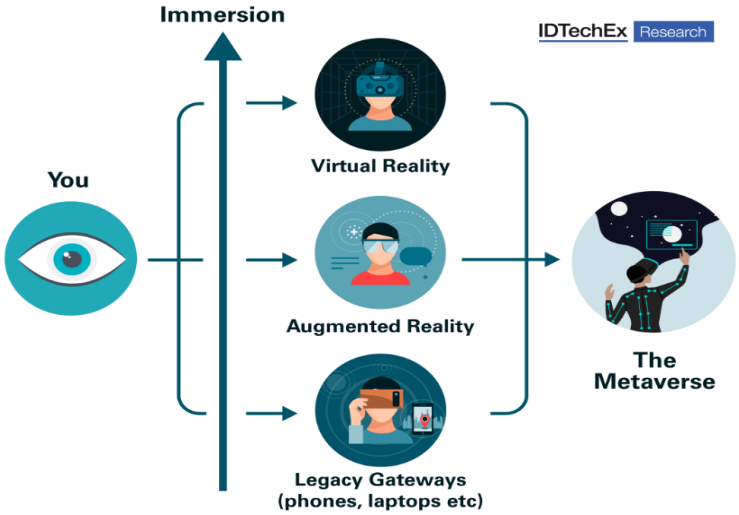

Figure 1. Metawerse Components. (IDTechEx) www.idtechex.com)

The concepts of virtual reality, augmented reality and mixed reality are sometimes confused. While augmented reality is the addition of new functions and realities to physical structures through tools, virtual reality is the virtual presentation of the entire process in a virtual environment, mixed reality involves simulating virtual and physical realities in a mixed way (Göçen, 2022).

Virtual Reality (VR) is a digitally created artificial environment. It is an environment where users feel like they are working in a different world similar to their physical lives. Thanks to expanded multi-sensors such as special helmets, VR glasses and omnidirectional treadmills, they experience natural interaction with virtual objects with vision, hearing, touch and movement (Mystakidis, 2022).

Three-dimensional virtual worlds; It can be defined as multi-user and interactive environments represented by avatars, where the real world is imitated with three-dimensional virtual reality. (Demirbağ, 2020).

The expression “Augmented Reality”, usually expressed with the abbreviation -AR-, is a computer interface that blends digital information processed by the computer with real-world information in real time (Dhiraj & Sharvari, 2015).

AR can bridge the gap between real and virtual objects. Therefore, the combination of computer-generated elements and the real world is the definition of augmented reality (Manuri & Sanna, 2016).

As a result, we can say that augmented reality is a combination that combines and enriches the real scene displayed with the images created in the computer environment with additional information.

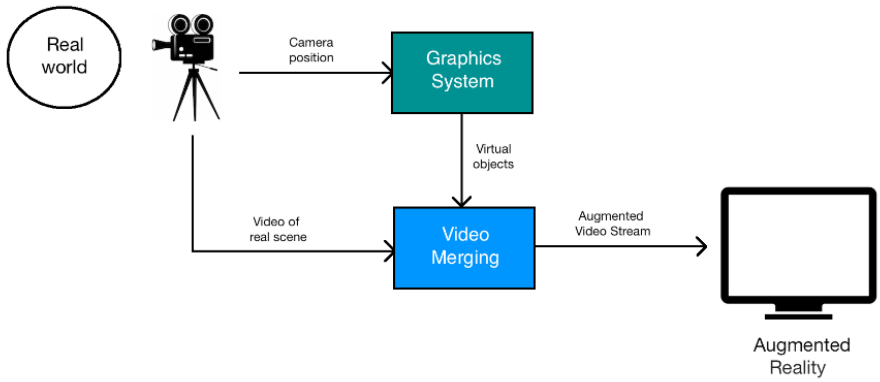

*Figure2.*Augmented Reality (https://subscription.packtpub.com/book/data/9781788396905/10/ch10lvl1sec86/what-does-an-augmented-reality-system-look-like)

Mixed reality (MR) is a combination of applications such as virtual reality (VR) and augmented reality (AR). It was used by Paul Milgram and Fumio Kishino in 1994 to describe the environment between completely real environments and completely virtual environments. Mixed Reality (MR) is sometimes represented as an advanced iteration of AR. The physical environment interacts with the projected digital data in real time. MRI requires special glasses, just like VR (Mystakidis, 2022).

2. Metaverse and Education

In face-to-face teaching, learning can be permanent and effective by supporting visual, auditory and tactile materials. When we look at the Metaverse environment in terms of multidimensional stimuli, it can be seen that it will be possible to make a positive contribution to the success of learning.

The main benefit of metawerse components as an e-Learning tool is its ability to enliven the online learning environment. Educators can create virtual rooms to suit their educational needs. At the same time, fully customizable avatars allow students to interact with realistic objects and put theory into practice (Phongsak and Others, 2022).

Augmented reality, avatar and mirror world etc. The rapid development of systems will ensure the creation of realistic learning environments. In this formation, success depends on the joint work of education experts and engineers who dominate the learning processes (Göçen, 2022).

According to Bailenson (2018), scenarios can be used for four main purposes in the integration of Virtual Reality (VR) into education. First, dangerous activities such as piloting or steering an airplane can be rehearsed and practiced. Surgical operation can be practiced virtually, where the risk of failure is very high and carries serious consequences. Second, managing a situation that may be inappropriate or unproductive can be revived. For example, it could be related to problematic behavior at school or dealing with a difficult work client. A third use case would be to accomplish something impossible, such as observing the internal organs of the human body or virtually traveling back in time to reconstruct archaeological sites.

Fourth, it can be used for very expensive experiences, such as a group trip, such as a tropical forest or an underwater wreck survey.

The Metaverse, with all its components, can help students see hard-to-see things like molecules or biological cells in a microscopic view. It can also simulate ideal conditions in physics, making abstract theories concrete. Experiments can be simulated in physics and chemistry classes. Events that took place throughout history can be revived. Geographical limitations may also be eliminated in education within Metawerse. Students can experience and observe different climates and geographies in a virtual environment (Lin, Wan et al., 2022).

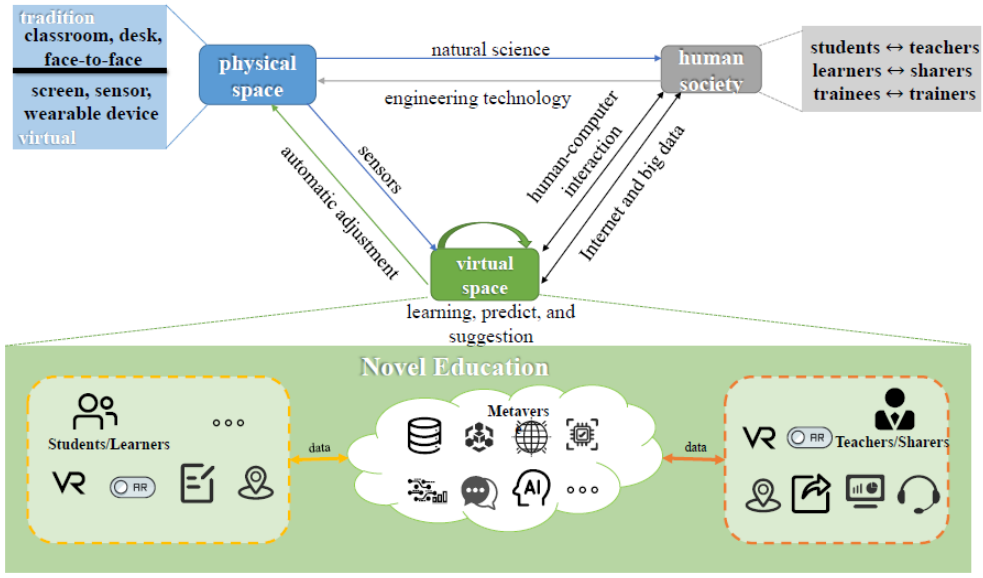

Figure 3. An overview of the Metaverse in education. (Lin, Wan and others, 2022)

In their article titled "The Metaverse and Higher Education Institutions" published in 2022, Kshetri et al. discusses the process of moving the physical campuses of higher education institutions to a virtual online world, an area often called "metaverse". The article provides a detailed analysis and explanation on the adoption of key metaverse technologies such as virtual meeting spaces, virtual reality, augmented reality, mixed reality and digital twins. The author analyzes multiple case studies of ten higher education institutions that integrate the metaverse in teaching, learning and external activities. It develops recommendations that identify some of the drivers driving higher education institutions to adopt metaverse and its effects on student engagement and academic performance. The article highlights that metaverse holds an increasingly important place in the education technology market and has the potential to attract young learners in particular.

In the article titled "An Open, Multi-Platform Software Architecture for Online Education in the Metaverse" written by (Lombeyda et al., 2022), it is stated that the use of online platforms for education is a lively and growing field and that various software platforms and technologies include extended reality modes. emphasizes what it contains. The article introduces the Enhanced Reality Teaching Concierge, an open network hub designed to showcase 3D for academic purposes, providing efficient and easy connectivity with a variety of applications.

The architecture of the system maximizes the natural features of each 3D imaging environment and shares them with common data and control systems, providing an ecosystem to aim for a smooth, extensible, agile education within the virtual universe.

(Kye et al., 2021) discusses the potential and limits of metaverse applications in education in their study titled "Educational applications of metaverse: possibilities and limitations". The study divides the metaverse into four main categories: augmented reality, life diary, mirror world, and virtual reality. For example, a T-shirt application is mentioned that allows examining the internal structure of the human body in medical education using augmented reality. It is also emphasized that the metaverse carries great potential for the educational environment as a new social communication space, increasing freedom of creativity and sharing, and offering new experiences and a high level of immersion through virtualization. However, there are also limitations such as weakening of social connections, privacy violations, crimes that can be committed in the virtual environment, and difficulties that students whose identities have not yet been fully formed may experience in adapting to the real world. Future tasks for metaverse use in education include teachers carefully analyzing how students understand the metaverse, designing lessons for students to solve problems or do projects collaboratively and creatively, and developing educational metaverse platforms that will prevent misuse of student data.

(Phongsak et al.,2022) in their study titled "The Metaverse in Education: The Future of Immersive Teaching & Learning", discuss six important aspects of the application of metaverse in education. This study focuses on the definition and meaning of metaverse, technologies that empower metaverse, metaverse concepts for education, the potentials of metaverse in education and the future of education. By combining social media with virtual reality and augmented reality technologies, Metaverse promises a transformation from the industrial sector to distance/online education. A new style of meta-education and metaverse-enabled online distance education offers mixed formal and informal learning experiences in a virtual 3D online campus. Online learning in the Metaverse aims to transcend the final frontiers of social connection and informal learning. While physical presence in the classroom will be a privileged educational experience, telepresence of gestures and emotions, avatar body language and precision of facial expressions will make participation equally effective. Additionally, social mixed reality in the metaverse enables mixed active pedagogies that foster deep and lasting knowledge. More importantly, it can become a democratizing factor in education, enabling worldwide participation without geographical limitations.

(Pradana & Hanifah, 2023) in their study titled "Metaverse in education: A systematic literature review", they present a summary of previous studies on the use of metaverse in the education sector. The research examines leading experts in the field, important subtopics, and potential uses of the metaverse in education through bibliometric analysis.

Metaverse offers unique opportunities for architecture and visual arts education. As a three-dimensional, immersive virtual world, the metaverse allows students and instructors to engage interactively without physical presence. This can be critical to overcome the limitations of face-to-face education methods, especially during pandemic situations such as Covid-19. Metaverse can also be used for documentation and education of architectural heritage, giving students and tourists the chance to explore full-scale, interactive virtual models of historic buildings, enriching the educational experience. It also allows architects and designers to develop

innovative designs and solutions without real-world limitations. Metaverse has ushered in a new era for architectural visualization; Instead of 2D plans and static 3D models, architects can now use immersive virtual models to express their designs. This allows students and professionals to better understand their designs and communicate more effectively with clients or other stakeholders. Metaverse offers not only a new tool for architecture and design education, but also a new space for social interaction and collaboration.

Metaverse can offer unique and innovative ways to contribute to language learning. In particular, it allows language learners to experience the culture of the target language and improve their language skills by enabling users to interact with each other through three-dimensional avatars created on virtual reality platforms. Metaverse offers an immersive experience in language education by enabling students to attend classes in virtual realities that recreate historical events or immerse themselves in enrichment activities that involve the culture of the target language. Additionally, metaverse-based education can help encourage students to engage in active learning and increase their motivation. Learning from the mistakes of past two-dimensional educational applications and video games, education technology developers must work to ensure that the metaverse is used efficiently and effectively in education. However, the virtual learning experience is also limited by the degree of digital literacy, and necessary support should be provided by educational institutions and designers of metaverse platforms to improve the digital literacy levels of teachers and students. In light of this information, it is clear that the contribution of the metaverse to language learning has great potential to improve the digital competencies of both students and educators, create immersive and interactive learning experiences, and make language education more effective and interesting.

In the context of education, metaverse adds a special sense of realism to the virtual classroom to enable students to become more involved in the learning process, gain more life skills, and be more satisfied.

3. Metaverse and Music Education

In the context of music education, the use of metaverse environments offers interactive and participatory methods to help students develop their musical skills.

(Mäkelä, 2023) “Is the Future of the Music Industry in Metaverse?” In his thesis titled, he discusses the future of the music industry in the context of the metaverse. Based on music industries, digitalization and metaverse frameworks, the thesis is a case study focusing on the VR promotional platform called Motel Finlandia and the collaboration with Decentraland. This research aims to examine what kind of position the metaverse can take in the context of business models in the music industry and how artists and music creators can benefit from it. Data were collected for the research through four semi-structured interviews and participant observation at the Metaverse Festival. The findings suggest that the metaverse does not yet have a clear definition and purpose and needs further development. However, there are also new business opportunities such as artist brand development and events hosted in the metaverse.

(Pryor, G, 2022) In his article “Music in the Metaverse,” he discusses the challenges that the metaverse can bring to the live music business. The article examines musical experiences in virtual reality environments, the opportunities this new field offers for the music industry, and issues such as ethics, sustainability and regulatory issues that may be encountered. Additionally, topics such as music licensing laws in the metaverse are touched upon and the opportunities presented by current practices for music stakeholders are discussed. This article highlights that the music-related part of the metaverse is still in its infancy and constantly evolving.

(Cairns &Patrick, et al., 2023) The article titled “Evaluation of Metaverse Music Performance with BBC Maida Vale Recording Studios” focuses on the evaluation of music performance in virtual reality environments. The research involves examining metaverse music performances at BBC Maida Vale Recording Studios from a sound engineering perspective and looks at innovative practices in this field. This study provides important findings on how music performances can be optimized in virtual environments.

(Turchet, 2023) In the study titled "Musical Metaverse: vision, opportunities, and challenges", he discusses the vision of the musical metaverse, the opportunities it offers and the challenges it faces. Turchet examines the opportunities presented by current practices of the metaverse for stakeholders in the music industry and those likely with the emergence of the metaverse, identifying issues that need to be addressed in various areas such as technical, artistic, ethical, sustainability and regulatory issues.

4. Conclusion and Recommendations

Metaverse tools have the potential to transform music education. Metaverse can contribute to students' learning to play instruments in various ways. Technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR) can expand traditional learning methods by providing students with the opportunity to explore musical concepts and techniques. For example, through VR, students can perform in a virtual concert hall or study virtually with artists from anywhere in the world. By adding digital information to real-world environments, AR allows students to learn instruments in more detail.

Metaverse training offers a platform where teachers can transcend the use of digital tools to demonstrate complex music theories or instrument techniques. By immersing themselves in this virtual world, students can grasp musical concepts and techniques more effectively. Additionally, the interactive and 3D virtual classrooms provided by metaverse education can enhance traditional classroom environments and increase student engagement and motivation.

Metaverse can also increase social interaction and engagement in education by creating virtual spaces for students to collaborate on topics such as music theory and composition. These innovative tools from Metaverse can enrich students' learning experiences by making music education more interactive and accessible.

In order for Metaverse technology to be used effectively in music education, a strong infrastructure must first be created. This infrastructure should include high-speed internet connection and servers with strong data processing capacity. In terms of accessibility, metaverse platforms must be compatible with different devices and optimized for various internet speeds. Standardization of training materials is critical to ensure that students and instructors can transition seamlessly between different platforms. These materials should be designed to allow students to develop skills such as playing instruments, composing, and learning music theory in a virtual environment. Additionally, the accessibility and affordability of hardware such as virtual reality glasses will enable metaverse music education to reach a wider audience.

In order to promote equal opportunity in education, metaverse technology must be accessible to everyone. This is especially important for students living in rural and remote areas, and governments and the private sector need to cooperate in this regard and create the necessary infrastructure.

In order for Metaverse technology to be used successfully in music education, educators must receive adequate training on this technology and be aware of integrating the technology for pedagogical purposes. In this way, metaverse technology can become a powerful tool that will shape the future of music education.

As a result, academic studies on metaverse and music education enable the development of creative and innovative educational models in this field. In addition to helping students develop their musical abilities, these studies provide important information about how educators and researchers can be more effective in this new environment. Metaverse emerges as a tool that will shape the future of music education and take learning experiences even further.

References

Bailenson, J. (2018). Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do. W. W. Norton & Company.

Batu, M. & Kocaomer, C. (2023). What is the Metaverse? A New Definition Proposal in the Context of the Literature Background. Journal of Selçuk University Social Sciences Institute, (51): 92-112

Cairns, Patrick, Hunt, Anthony, Johnston, Daniel et al. (2023). Evaluation of Metaverse Music Performance With BBC Maida Vale Recording Studios. Journal of the Audio Engineering Society. pp. 313-325. ISSN 0004-7554

Demirbağ, İ. (2020). Three-dimensional virtual worlds. Journal of Open Education Applications and Research (AUAd),6(4), 97-112.

Dhiraj Amin & Sharvari Govilkar (2015). Comparative study of augmented reality sdk's.International Journal on Computational Sciences & Applications (IJCSA) Vol.5, No.1,February2015

Çelik, R. (2022). What Is The Metaverse? Conceptual Evaluation And Overview. Balkan and Near Eastern Journal of Social Sciences 2022, 08(01)

Göçen, A. (2022). Metaverse in The Context of Education. International Journal of Western Black Sea Socialand Humanities Sciences , 6(1):98-122, e-ISSN: 2602-4594

Kye,B., Han,N., Kim, E., Park, Y., Jo, S. (2021).Educational applications of metaverse: possibilities and limitations. Journal of Educational Evaluation for Health Professions. J Educ Eval Health Prof 2021;18:32 • https://doi.org/10.3352/jeehp.2021.18.32

Mystakidis, S.(2022). Metaverse. Encyclopedia 2022, 2, 486-497. https://doi.org/10.3390/encyclopedia2010031

Lin, H., Wan, S., Gan, W., Chen, J., Chao, H (2022). Metaverse in Education: Vision, Opportunities, and Challenges. 2022 IEEE International Conference on Big Data (Big Data).

Lombeyda, S., Djorgovski, S.G., Tran,A., Liu, J., Noyes, A., Fomina, S (2022). An Open, Multi-Platform Software Architecture for Online Education in the Metaverse. Web3D '22, November 02–04, 2022, Evry-Courcouronnes, France arXiv:2211.05199 https://doi.org/10.48550/arXiv.2211.05199

Mäkelä, M (2023). Is the Future of the Music Industry in Metaverse. Master's Thesis Sibelius Academy, University of the Arts Arts ManagementHelsinki, Spring 2023

Manuri, F. & Sanna,A.(2016). A Survey on Applications of Augmented Reality. ACSIJ-Advances in Computer Science: an International Journal, Vol. 5, Issue 1,No.19 , January 2016 ISSN : 2322-5157

N. Kshetri, D. Rojas-Torres and M. Grambo,(2022). The Metaverse and Higher Education Institutions. IT Professional, vol. 24, no. 6, pp. 69-73, 1 Nov.-Dec. 2022, doi: 10.1109/MITP.2022.3222711.

Onu, P., Pradhan, A. & Mbohwa, C.(2023). Potential to use metaverse for future teaching and learning. Educatin and Information Technologies (2023). https://doi.org/10.1007/s10639-023-12167-9

Phongsak, P.,Prapatpong, S., Suriya Wachirawongpaisarn, S. (2022). The Metaverse in Education: The Future of Immersive Teaching & Learning. RICE Journal of Creative Entrepreneurship and Management, Vol.3, No.2, pp. 75-88,

Pryor, G.(2022). Music in the Metaverse. Intellectual Property & Technology Law Journal, (34), 2, February 2022

Turchet, L.(2023). Musical Metaverse: vision, opportunities, and challenges. Pers Ubiquit Comput 27, 1811–1827 (2023). https://doi.org/10.1007/s00779-023-01708-1

Zakarneh, B., Annamalai, N., Alquqa, E., Khaled, M. (2024) Virtual Reality and Alternate Realities in Neal Stephenson's "Snow Crash". World Journal of English Language (14) ,2; 2024