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Art Education in the Metaverse

Educação Artística no Metaverso

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ABSTRACT

Interaction between the physical and digital worlds has become a contemporary challenge and revelation for art education. With metaverse technologies and spaces developing, it is timely to consider how living art education in the metaverse is affecting art education at present and how this may evolve in future. This article will therefore discuss the values, attitudes, challenges, and directions associated with art education in the metaverse. It will connect metaverse experiences with art, new media, and educational cultures to recommend how art education may embrace the metaverse sensitively and flexibly to advance and align the pedagogy, practice, and policy of art education with contemporary and future life. Issues of reluctance, opposition, accessibility, and change will be explored along with metaverse influences on local and global heritage and sustainability to present a current and developing picture of the complexities and opportunities associated with art education in the metaverse.

Keywords: Metaverse; Art Education; Culture; Values; Challenges; Heritage

RESUMO

A interação entre os mundos físico e digital tornou-se um desafio contemporâneo e uma revelação para a educação artística. Com as tecnologias e espaços do metaverso em desenvolvimento, é oportuno considerar como é que a educação artística no metaverso está a afetar a educação artística no presente e como é que isso pode evoluir no futuro. Este artigo, discutirá assim os valores, atitudes, desafios e direções associadas à educação artística no metaverso. Conectará experiências metaversas com arte, novos meios de comunicação e culturas educacionais para expor como é que a educação artística pode associar-se ao metaverso com sensibilidade e flexibilidade para avançar e alinhar a pedagogia, a prática e a política da educação artística com a vida contemporânea e futura. Questões de relutância, oposição, acessibilidade e mudança serão exploradas, bem como as influências do metaverso no património local e global e na sustentabilidade, para apresentar uma imagem atual e em desenvolvimento das complexidades e oportunidades associadas à educação artística no metaverso.

Palavras-chave: Metaverso; Educação Artistica; Cultura; Valores; Desafios; Herança

1. Art Education in the Metaverse

The term metaverse was first proposed in Neal Stevenson's science fiction novel *Snow Crash* in 1992. In the story, the metaverse appears as a virtual space that enables its users to live a life alternate to physical living. Such virtual experiences influence "real" world users positively and negatively. They can also influence how art education is accessed, delivered and engaged with, in the metaverse. Jeon et al. (2021) acknowledged the metaverse as a system that mimics the physical world whilst also being an alternative to it. Now, the metaverse is regarded as a post-reality universe that allows simultaneous user interaction in the virtual setting using technologies like virtual reality (VR) and augmented reality (AR) (Mystakidis, 2022). The metaverse offers a new means of thinking and living for citizens globally, and as such, it offers a new paradigm, system and space in which to experience art education. This paper engages with this idea to present possibilities and limitations for how art education engages with the metaverse presently and in the future.

Facer and Selwyn (2020) have expressed the timely need for academic exploration regarding how art education connects with the metaverse. The metaverse is developing rapidly. It is composed of multiple metaverse environments owned and created by individuals and corporations. Jagatheesaperumal, Ahmad, Al-Fuqaha and Qadir (2022) assert that art education needs to forge a position and stake in this development to prevent the subject's relevance and contribution from being marginalised in education and society. A key question is how to do this effectively, given the metaverse's implied open access. We say implied because funding, expertise and vision are required to forge a stake and often these are not open pursuits. The metaverse is a developing ecosystem with the capacity to forge systems within it (Wang et al., 2022). Therefore, to forge a virtual art education ecosystem that speaks to this subject's core values, practices and ideologies, which are moral, social, global, decolonial, sustainable and developmental (International Society of Education through Art (INSEA), 2023), is incredibly important to subject longevity.

Art education is being called to be more humanising, caring, and fair (Broome, Bobick, Ruggiero & Jesup, 2019; Heaton & Chan, 2023), which is often considered oppositional to the priorities of technological advancement. Stakeholders consequently need to consider how these practices can be implemented in metaverse development. Art education is also being asked to welcome posthuman ideas and practices, like artificial intelligence (Leonard, 2020), to stay abreast of universal change. With art education being a dialogic space (Chappell & Craft, 2011), there is room and opportunity to merge human and non-human advancement to ensure a relevant and timely art education experience for all. Metaverse involvement may provide means for this, especially if it can navigate and nurture art education's affective (Heaton, Burnard & Nikolova, 2020) provision and manage its carbon footprint (Guo & Liu, 2023).

Art education should look to voice a response towards human, non-human and metaverse developments. Not to counter progression, but to ensure intersections between art, education, life, and the metaverse develop with purpose, consciousness and the subject's best interests

at the core. Art education is presently in dangerous territory, where life developments (like the metaverse) are occurring so fast that the subject can not keep up. As Leonard (2020) advocates, art educators must therefore embrace new methods for intra-action. This paper, therefore, opens a dialogue about areas of consideration and concern that may need addressing as art education evolves in the metaverse. As authors, we do not claim to know the most productive ways forward for art education metaverse engagements, but we acknowledge that without dialogue, progression will not occur. This paper unfolds to voice relationships between art education and the metaverse. It discusses potentials and concerns associated with metaverse encounters. And to conclude, it proposes art education's potential for future establishment in the metaverse, with consideration of influence on local and global heritage.

2. Art Education's Potential in the Metaverse

Kapp and O'Driscoll (2010) suggest the immersive internet metaverse has great potential to change people's lives. In the metaverse, people can communicate and cooperate regardless of physical distance. They can separate physical and virtual spaces but, equally, connect them. Virtual environments, people, and interactions can mimic real-world spaces and identities and personas can be created to achieve new, diverse, or fantastical desires. As voiced in *The Art Newspaper* (2022), the metaverse will be sculpted by the art world. The metaverse connects art, entertainment and crypto-currency to reach greater audiences. If the art world can shape the metaverse, art education can too, because it connects similar partners and ecosystems, perhaps just with different principles and intentions.

The metaverse's creative freedom offers potential and concern to art education. As a potential, art education environments can be extended, artistic experiences can grow in them, and these can respond to educational needs. For example, picture a virtual art studio or habitat where learners can visit and create different time periods, art movements and cultural settings. Or an environment where learners can interact with and be global artists, audiences and learners. Learners who dialogue about, problematise and make, trade and exhibit art virtually. Imagine taking your avatar on a creative world journey to learn about the lives and circumstances, or lifeworlds (Barritt, 2021), of other avatars to make socially just or community-orientated art. With the development of Extended Reality technology (XR), including Virtual Reality (VR) and Augmented Reality (AR) (Meccawy, 2022), these immersive and diverse metaverse-orientated learning scenarios are not far off.

Art education meta ecosystems that use XR technology can be designed to enable learners to experience the immersive internet whilst investigating virtual worlds mentally and physically through art education pursuits. These processes and outputs can also be documented and stored in the metaverse eternally. Such documentary techniques also open alternatives for art education assessments, like using an avatar to experience, guide and explain a body of virtually exhibited work. However, research is already raising issues in this domain concerning presence, experience, time and loneliness (Ayiter,

2010). We must remember, though, that the metaverse is a virtual space based on human society. User behaviour in the metaverse can affect a human's physical life and vice versa. For example, users may purchase and receive goods from virtual markets and redesign goods for sale in the metaverse space. Knowledge and emotion gained in the metaverse may filter into real or artistic experiences (Barrera & Shah, 2023; Kozinets, 2023) or the other way around. With limited control or parameters, metaverse learning could cause a loss of control (Kun, 2022). It could expose learners to undesired content and experiences (Nikas, 2022) and negatively influence thought processes (Ge, 2022). Control loss can also happen in the physical world when learning parameters are not managed.

Metaverse art education offers a specific lens on learner placement and engagement with hybrid worlds and therefore presents new challenges and opportunities for art education stakeholders and provision. The metaverse is bringing change to art education in the ways people teach, learn, think and experience. Therefore, people need to be open and prepared to embrace, play with, perhaps co-create and navigate its creative possibilities (Craft, 2013) and complexities. Doing so will best support current and future art education learners to dialogue about and make sense of (Biesta, 2017) in a post-humanistic way (Chapell, 2018) their contemporary and forthcoming worlds. The following sections will discuss ideas to envision art education in the metaverse whilst considering its infrastructure and applicability.

2.1. A Metaverse Campus

On 28 July 2022, The Hong Kong University of Science and Technology (HKUST) announced it would establish the world's first physical-digital campus in the meta-universe. The intention was to enhance teaching and learning experiences for its Hong Kong and Guangzhou campuses. Opening in September, the "world's first physical-digital campus" project, formerly known as "MetaHKUST", will become an XR campus. The virtual campus will provide an immersive learning experience and platform for HKUST stakeholders (students, staff, alumni, etc.) to engage in cross-campus interactive activities. This venture is relevant to art education because it shows extensive creative possibilities for the subject. In a metaverse campus, people can create personal creative content, including avatars and non-fungible tokens (NFTs) (e.g. virtual artworks). Blockchain technology, for example, could store learning progressions, qualifications, and event information, affect the structure and governance of supply chains and help manage creative copyright concerns (Wang et al. 2019). Art exhibitions, artist residencies, and seminars could also all occur in virtual campus habitats. Stakeholders (like educators and learners) from multiple locations and disciplines could simultaneously interact and participate in virtual classes, events or experiences.

A metaverse campus foregrounds the potential for global art learners to unite. Time, space and generation boundaries can be reduced or omitted for learners. Cooperation and communication can occur regardless of distance. Such open and shared learning environments may also benefit art learners by enhancing their intellectual and emotional dispositions (Dewey, 1997; National Research Council, 2012; Grenfell, 2013) positioning them competitively alongside learners in other subjects.

2.2. Pedagogic Possibilities

When we think about art learning in the metaverse, Lindstrom's (2012) work concerning convergent and divergent learning about, with, in, and through art could be considered. Convergent learning means aiming to achieve something preconceived, and divergent means joining knowledge for new purposes. In the Metaverse, for example, convergent learning in art education could involve engaging with a pre-designed or ready-produced gallery environment, or artwork, to learn about art. It could also involve engaging with works of art, perhaps like NFT artworks in the virtual space, to produce or curate a virtual exhibition. Divergent art learning in the metaverse may involve creating a graffiti art, or a sculpture, in VR software (like Tilt Brush on Oculus Quest 2) to learn about or explore the possibilities in a specific art medium or context. Another example of divergent metaverse learning could involve learners collaborating virtually, using VR (VRChat), to create dialogue as a piece of sound art, whilst learning through art creation about each other's voices, perspectives, and geographic or cultural environments. There are numerous possibilities for how Lindstrom's (2012) art learning model could be enacted in the metaverse. What is demonstrated here is that existing art education learning models, like the Studio Habits of Mind (Hetland et al. 2007, 2015), and pedagogies, like artist-teacher pedagogy (Hoekstra, 2015; Heaton, in press), that are used in art education can also fit art education learning in the metaverse. Whilst new educational learning models and pedagogies can and will be developed for art education in the metaverse, those that are established as successful can also be used. Amendments may be needed, like they would in physical learning environments, to align with context and learner needs. But learning models and pedagogies do not necessarily need reinvention.

The metaverse provides a new space for envisioning subject-orientated, context-specific, interdisciplinary and diverse learning models and pedagogies. The United Nations Scientific and Cultural Organisation (UNESCO), in their 2018 *A Lifeline to Learning Report*, reminds people that only comprehensive training and subject knowledge on technological integration will equip educators with effective skills to design and support quality virtual and mobile learning. Whilst we agree with this statement to some extent, if art education waits for such training to occur, then our subject may already be positioned in the metaverse in a deficit position. Art education, therefore, needs educators to embrace metaverse engagements and take pedagogic risks. But with criticality and willingness to report on and develop such practices to aid the professional development of others and collegiality in the discipline. Being open and flexible, the metaverse and metaverse campus can serve as a practical and effective environment for art education learners to create art, pedagogy, and research. Unlike traditional physical learning environments, the metaverse and metaverse campuses can be edited and modified by programmers to keep up with changing times (Braud, Fernández & Hui, 2022) whilst maintaining relevance.

2.3. Industry

Due to the 2019 pandemic, online art education has gained global popularity (Alsuwaida, 2022). Some companies, like HIART (https://hiart.com.

sg) and Coursera (https://www.coursera.org/learn/artinquiry), have attempted to create online art education platforms. The Lithuanian metaverse education platform "Learnoverse" (https://www.bitdegree.org/courses/learnoverse), like the online courses mentioned, also provides an early example of an art education metaverse-orientated business. It attempts to gamify learning content and experiences by creating virtual worlds specifically for Web3 users. In these online spaces, learners, educators, and industry brands interact and transfer knowledge. The platform uses the "Learn & Earn" concept to reward learning whilst offering motivation for course completion. The concept is intended to benefit learners and course organisers because learners gain knowledge and organisers gain participants and funds through increased and incentivised participation. The Learn & Earn system could be applied in the metaverse, to establish a position for art education. Art education systems in the metaverse need maintenance and revenue to ensure hardware and content upgrades, and art educators need compensation to work as metaverse educators.

On the Learnoverse website, a focus on crypto and blockchain education for educators and learners is declared, alongside a plan to build a crypto learning meta-universe in conjunction with the Learn & Earn system. According to the website, the company identify four prevalent identities in metaverse art education:

1. Art learners: Users who are looking for knowledge about art theory and practice.
2. Art teachers: People with knowledge of specific topics in an art subject that can teach and earn money.
3. Crypto project developers: Individuals who can create art courses, including learning settings or virtual tools for teaching, and those who can purchase advertising or offer project help for educators and users.
4. Influencers and brands: People or companies generating art portfolios based on metaverse study that can be found, engaged with and followed through social media.

The structure and identities above, show potential for art education in the metaverse business. In such educational platforms, users can connect virtual roles in virtual spaces achieving academic certificates to create and grow their identity and presence in crypto communities. Learners, educators, project owners and brands can interact through such metaverse platforms and display their knowledge status and social identity on-chain. For art education, there is great cooperative potential. For example, art and design courses can be conducted using a theme connected to a business's brand culture and craftsmanship. For instance, the Victoria & Albert Museum used to cooperate with brands like Mulberry and Verizon, to organise art events. Events like exhibitions and workshops help gain public attention and sponsorship (Whidding, 2021). With educational business systems developing in the metaverse, being a metaverse art educator could provide a career. However, based on the four identities shared above there may need to be regulation, training or quality auditing that occurs to ensure that roles are undertaken in a legitimate way, like one's qualifications or experience being shared with users. Not to discourage free participation in art education, but to make sure that users are informed about the services and experiences being offered to them. Four identities also seem quite limited for art education

provision, when many roles in art education exist and have been researched in the real world such as curators, historians, art community educators and artist-teachers (Freedman, 2003; Parker, 2009; Manathunga et al., 2017) etc. It appears there is more potential for the development, use and research of art education roles and personas in art education metaverse provision. This paper is only touching the surface.

2.4. An Immersive Learning Environment

With applied VR and AR technology, art education learning environments in the metaverse should be immersive and engaging (Tlili et al., 2022). Narin (2021) posits that educational pedagogies like cooperative learning, blended learning, student-centred learning, inquiry-based learning, and mobile learning also have applications in the metaverse and these could be used to help deliver an immersive art education experience. Inspired by the *Neuromancer* novels, Jeremy Bailenson, a professor at Stanford University, launched the first course in Stanford's history to be entirely set in virtual reality (Recode Staff, 2018). The programme shows potential for using fully immersive technology in teaching. It allows learners who take the course to wear VR headsets from anywhere in the world. They can break space barriers and appear in the same "classroom". The teaching takes place entirely in VR, in a museum, a laboratory, under the sea, or even in a volcanic crater. These experiences could certainly inspire art education learners, like those interested in interdisciplinary art experiences, or those that can not get easy access to diverse locations (Suraco, 2006). During the programme, learners are immersed in virtual and interactive environments where they can experience things that previously only occurred in their imagination. Through AI and AR/VR technology, textbook content can be transferred into interactive and realistic scenes. These scenes can be explored from sensorial perspectives that play virtually with sight, sound and touch, strengthening learning cognition (Batat & Hammedi, 2023). The benefits of such experiences for art education are vast. For example, learners could use AR to see how a painting might have looked when it was first created, or they can use VR to explore a sculpture from different angles. They can also use AI-powered tools to experiment with different colour schemes or brush strokes and get real-time feedback on their work.

Delacruz (2009) has stated that technology use in art education is a teaching and learning necessity that should be used to enhance learner creativity. He recognised in 2009 that the electronic revolution has left school-orientated education far behind student needs and abilities. This concern is still prevalent in art education to date (Pavlou, 2020). Art education experiences need designing to meet learner needs (Knutson et al., 2011), and potentially this could occur in metaverse settings (Ayiter, 2010). The "open-ended" possibilities for metaverse education and a three-dimensional learning environment could enable learners to create and interpret artistic ideas and artwork more freely. These entities are beneficial because such settings can provide postdigital artists with an intermediary environment for creation. They can combine diverse knowledge, thought, social models, and solutions based on cooperation, communication and interaction (Alexenberg, 2011). Therefore, art education in

the metaverse can be beneficial for art learners to engage in the art-making process in a three-dimensional environment, and let them explore art with a new viewpoint.

3. Art Education Concerns in the Metaverse

The Metaverse does have limitations for educational use like time, money and privacy (Kye et al., 2021; Nalbant & Uyanik, 2021; Anshari et al., 2022). This section will discuss these limitations from an art education perspective to begin to identify possible alternatives or solutions to support change in provision.

3.1. Time and Money

To some extent, the metaverse has been deemed to offer low-cost learning (Reis & Ashmore, 2022). Building physical infrastructure, like art studios, can be expensive and requires extensive space and maintenance. Virtual spaces solve such problems, but they come with hidden costs. Metaverse systems require extensive time, money and expertise to build (Nalbant & Uyanik, 2021). Metaverse operations also require significant resourcing to keep them running, such as database maintenance, power, water cooling and staffing etc. These entities question the metaverse's sustainability due to carbon footprint concerns (Guo & Liu, 2023). Hardware costs to engage in the metaverse are also high. For instance, an Oculus Quest 2 was priced at 499.99 Singapore Dollars this year. Users and educational institutes then still have maintenance costs after initial expenditure. It can also take time for device users to understand their capabilities, so professional development may be needed. Many people also have concerns about extensive digital exposure, like eye strain etc. (Akulwar-Tajane et al., 2020) and so these general issues need addressing before metaverse experiences become common in education, let alone art education.

The design of metaverse software is often expensive (Petrigna & Musumeci, 2022). Tools and environments are largely three-dimensional and are intended to be dynamic. Educators embracing metaverse systems may need to redesign their educational spaces and materials, but many educators may feel daunted by this or not have the capacity or skills to do so. It is therefore important that support is offered from art education and industry stakeholders.

3.2. Privacy

Privacy issues in the metaverse, that concern data and personal information, are complex (Anshari et al., 2022). Companies developing metaverse technology, like internet software developers, rely on user personal data (George, Fernando, George, Baskar & Pandey, 2021). For example, users of Meta's Oculus Quest 2 immersive VR headset are required to have a linked Facebook account. The headset can collect the users' private data, such as real-time location, physical characteristics, movements, and voice. If the metaverse system does not keep this data confidential or enables advertiser access to it, user privacy becomes violated. Privacy is therefore problematic for metaverse art education. Art education stakeholders need to develop policies related to the safe and sustainable control of such concerns before educators and learners are put at risk in this largely unknown environment.

Sensors in VR devices that allow eye contact and tracking, or facial expression monitoring can provide data that help people (like advertisers) measure user attention. This opens a space for pushing personalised content (like adverts) in response to behaviour. It also opens a space for metaverse-orientated research in art education that uses technology to consider learner engagement, cognition and understanding as examples, which may help develop metaverse art education infrastructure. However, educators and learners may not participate freely in metaverse systems if they know institutions and businesses are monitoring them. The ethical and disclosure-orientated policy, therefore, needs to be put in place.

3.3. Limited Infrastructure

Several challenges need addressing before the metaverse can be fully realised for art education. One big challenge is limited infrastructure. The metaverse needs exuberant computational power, bandwidth, and storage capacity to function properly (Arkenberg & Arbana, 2023). Another challenge concerns haptic feedback, for example using touch to communicate and feel objects in the virtual world (Cheng et al., 2022). In the metaverse, computers and their programmers run physical world simulations, they render scenes and develop interaction between humans and characters. These endeavours use complex computing processes that learners, including those in art education, need to begin to develop skills in to stay abreast of digital development.

With the demand for high-level computing skills, comes high energy consumption. For example, metaverse applications, like 3D video, have high-speed network demands (Chang et al., 2022). This cost is then passed to users and the environment (Morariu & Stiller, 2008; Garraghan et al., 2014) presenting further barriers to metaverse entry. Metaverse infrastructure can also disadvantage certain communities. People living or being educated in rural or low economic contexts, for example, may not be able to access high-speed networks or position metaverse engagement as a priority. In art education, we should teach learners to understand these circumstances and barriers to the metaverse to understand it and make more equitable decisions regarding its use. The metaverse can offer more possibilities for art education, but it can also bring barriers. It is therefore important that art education learners are aware of the different ways they can engage with and understand metaverse developments even if they can not access them directly. As the metaverse develops there should be infrastructure to explore and preserve local and global heritage from diverse and disadvantaged communities (Wang & Lau, 2023; Grincheva, 2023) and this includes art education pursuits.

3.4. Legal Issues

Crime and discrimination can occur in the metaverse. Such problems can also be amplified because it is not known whether prejudices and criminals operating in this domain can be regulated by law. Crimes from virtual domains can help illustrate potential risks. In June 2022, a female psychotherapist on Meta's Horizon Worlds platform experienced a sexual assault (British Broadcasting Company News, 2022). After 60 seconds in the VR environment, the woman was verbally, and virtually, sexually harassed and

abused by a group of players with male voices. These players also documented the event photographically. The victim was said to be so scared she did not have time to use a virtual safety barrier. Such virtual space infringement can cause serious harm to users' mental health. Whilst this example may appear to be a general metaverse protection issue, and possibly subject to media bias it has relevance to art education not only in terms of educator and learner safety but also in relation to the multi-sensory and visual cultural worlds (Wilson, 2020; Heaton, 2014) participants are exposed to and its filtration in art education experiences and provision.

Violence in educational settings is also a global social problem (Ferrara et al., 2019). Virtual violence focusing on learners and teachers may happen in the metaverse. Due to the pandemic situation, many schools conducted courses online in 2022 (Zarcone & Saverino, 2022). On the 28th of October, a history teacher in Henan province in China died of a heart attack after being maliciously attacked by hackers hired by her learners during an online session (Wan, 2022). The same situation may happen in metaverse classrooms. It is thus essential to have relevant legislation in place for metaverse engagements, especially in the educational field.

3.5. Wellbeing

Because metaverse users will be immersed in virtual settings, they might experience some mental well-being concerns from uncontrolled artificial intelligence (AI) or social connections. According to Jeon et al. (2022), AI is essential in managing and storing data in the digital age. Amos (2022) also argues that AI supports metaverse functions, from a business perspective due to its inclusivity and accessibility. AI systems are built around machine learning technologies, which involve deep learning and neural networks (Gupta et al., 2021). An algorithm is presented with loads of training data that can make automated decisions based on vast quantities of data fed to it. The decisions are generalisations based on previous examples and definitions already supplied by humans during system training processes. However, there is a potential danger of AI production in the art field, as when AI produces its products, the result is often out of human control. According to Coldewey (2022), an AI system can automatically create a terrifying image, like repetitions and reoccurrences of a frightening woman in this case, for its viewers. Based on the transparency of complex AI technology (Adadi & Berrada, 2018), the images produced by metaverse AI systems can be uncontrollable and perhaps potentially harmful to one's mental health or well-being. However, through XAI (explainable AI) augmentation techniques, people can trace internal logic or predictions transparently (Slack et al., 2020). Thus, it is necessary for art educators to be aware of the AI system used in teaching systems and go through the keywords and images before conducting AI-based practical courses or learning components.

Although the metaverse can provide social connections for learners, interactions between people virtually are often weaker than in the real world (Kye et al., 2021). If learners immerse themselves in such environments, their social skills could be harmed. Prolonged exposure to virtual environments could also lead to a decrease in social skills and a reduced ability to communicate well face-to-face (Palmer, 1995). As with any te-

chnology, it is important to use the metaverse in moderation and with consideration of one's social and emotional well-being.

3.6. Educator Skills

Metaverse teaching requires educators to be familiar with virtual environments and tools. This could challenge educators from older generations, who may be less confident with developing technologies (MacCallum & Parsons, 2019). To be prepared for the metaverse era, art educators need support and training to use digital tools whilst inquiring into effective ways to facilitate art education teaching and learning in metaverse systems. The earlier educators prepare, the smoother the transition will be to using virtual teaching environments to support art education in the metaverse.

3.7. Artistic Needs

In art education, hand-made processes are significant (Jacucci & Wagner, 2007). Virtual tools can sometimes imitate hand-made processes, but they cannot replace learners' hands-on creations. By physically touching different materials, learners generate a better understanding of art making (Joy & Sherry, 2003). Although the metaverse can be used as a new teaching platform for art educators, learners could be asked to prepare or explore media, materials or ideas for art-making before the virtual session to ensure a hybrid engagement. Whilst virtual art-making may be a valuable supplement to traditional art education, it cannot replicate the tactile and sensory experience of creating art with physical materials (Treadaway, 2009). Learners interested in pursuing art as a career or hobby will likely need to develop physical art-making skills alongside digital ones.

4. Art Education in the Metaverse: A Conclusion

In art education, the use of digital and immersive tools is likely to be an ongoing future trend (González-Zamar et al., 2020). It is therefore important that art educators and learners prepare well for this. The metaverse is growing (Kapp & O'Driscoll, 2010), and art educators and learners will have access to new systems, tools and resources that can enrich learning contexts and experiences enabling art education to occur in new and innovative ways. Diverse metaverse environments, including virtual campuses and classrooms (HKUST, 2022), will provide art educators and learners with cooperative educational settings regardless of physical distance. Art educators will need to stay up-to-date with developments in digital technology, adapting teaching approaches and experiences to accommodate these new tools. Metaverse platform developers, as well as art education stakeholders (including policymakers), should develop an international discourse about and vision or manifesto for art education in the metaverse. For example, they should raise stakeholders' awareness of the needs, possibilities and challenges of metaverse art education. Stakeholders should make sure that metaverse laws and regulations are established and continually updated, as needed, to protect user privacy and safety (Anshari et al, 2022).

Whilst the metaverse can be valuable for art educators, as an innovative learning tool and context, it should not isolate the use of traditional art-making methods or engagement with local or

global heritage (Huggett, 2020; Grincheva, 2023). With combined virtual and physical art education experiences possible in the metaverse, learners should be offered a rounded learning experience that affords opportunities to understand and pursue creative passions. By working together and embracing metaverse opportunities, art education stakeholders can ensure that they are well-prepared and positioned for the future of art education in metaverse systems.

Bibliographic References

Adadi, A. & Berrada, M. (2018). "Peeking inside the black-box: A survey on Explainable Artificial Intelligence (XAI)" in *IEEE Access*, 6, 52138-52160.

Akulwar-Tajane, I., Parmar, K. K., Naik, P. H., & Shah, A. V. (2020). "Rethinking screen time during COVID-19: impact on psychological well-being in physiotherapy students" in *International Journal of Clinical and Experimental Medicine Research*, 4(4), 201-216.

Alexenberg, M. (2011). *The future of art in a postdigital age: from Hellenistic to Hebraic consciousness* (2nd ed.). Bristol: Intellect.

Alsuwaida, N. (2022). "Online courses in art and design during the coronavirus (COVID-19) pandemic: Teaching reflections from a first-time online instructor" in *Sage Open*, 12(1), doi.org/10.1177/21582440221079827.

Amos, Z (2022). How AI Is Bringing the Metaverse to Life" in *Unite.AI*. https://www.unite.ai/how-ai-is-bringing-the-metaverse-to-life/.

Anshari, M., Syafrudin, M., Fitriyani, N. L., & Razzaq, A. (2022). "Ethical Responsibility and Sustainability (ERS) Development in a Metaverse Business Model" in *Sustainability*, 14(23), 15805.

Arkenberg, C. & Arbana, J. (2023). "What does it take to run a metaverse?" in *Deloitte Insights.* https://www2.deloitte.com/xe/en/insights/industry/technology/metaverse-infrastructure.html.

Ayiter, E. (2010). "Embodied in a metaverse: Anatomia and body parts" in *Technoetic Arts,* 8(2), 181-188.

Barritt, L. (2021) "(Re)Considering pedagogy – Entangled ontology in a complex age: Abstraction pedagogy and the critical pedagogical importance of art education for other discipline areas" *International Journal of Art and Design Education*, 40(4), 784-793.

Barrera, K. G., & Shah, D. (2023). "Marketing in the Metaverse: Conceptual understanding, framework, and research agenda" in *Journal of Business Research*, 155, 113420.

Batat, W., & Hammedi, W. (2023). "The extended reality technology (ERT) framework for designing customer and service experiences in phygital settings: a service research agenda" in *Journal of Service Management*, 34(1), 10-33.

British Broadcasting Company News (2022, May 25). "Female avatar sexually assaulted in Meta VR platform, campaigners say" https://www.bbc.co.uk/news/technology-61573661

Biesta, G. (2017) *Letting art teach: Art education beyond Joseph Beuys*. Arnhem: ArtEZ Press.

Braud, T., Fernández, C. B., & Hui, P. (2022, March). "Scaling-up AR: University campus as a physical-digital metaverse" in *2022 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW)* (pp. 169-175). Christchurch: IEEE.

Broome, J. L., Bobick, B., Ruggiero, A., & Jesup, C. (2019). "Responding to the challenge to care: Suggestions for art education curricula" in *Art Education*, 72(2), 36-41.

Chang, L., Zhang, Z., Li, P., Xi, S., Guo, W., Shen, Y., Xiong, Z., Kang, J., Niyato, D., Qiao X. & Wu, Y. (2022). "6G-enabled edge AI for Metaverse: Challenges, methods, and future research directions" in *Journal of Communications and Information Networks*, 7(2), 107-121.

Chappell, K. (2018). "From Wise Humanising Creativity to (Posthumanising) Creativity" in K. Snepvangers, P. Thomson, A. Harris (eds) *Creativity Policy, Partnerships and Practice in Education. Creativity, Education and the Arts*. Cham: Palgrave Macmillan. DOI: 10.1007/978-3-319-96725-7_13.

Chappell, K., & Craft, A. (2011). "Creative learning conversations: producing living dialogic spaces" in *Educational Research*, 53(3), 363-385.

Cheng, Wu, N., Chen, S., & Han, B. (2022). "Will Metaverse Be NextG Internet? Vision, Hype, and Reality" in *IEEE Network: the Magazine of Computer Communications*, 36(5), 197-204. DOI: 10.1109/MNET.117.2200055

Coldewye, (2022). A terrifying AI-generated woman is lurking in the abyss of latent space. TechCrunch, 13 September. Available at: https://tcrn.ch/3BgYXDk (Accessed: 22/7/2023)

Craft, A. (2013). "Childhood, possibility thinking and wise, humanising educational futures" in *International Journal of Educational Research*, 61, 126-134, DOI: 10.1016/j.ijer.2013.02.005.

Delacruz, E. (2009). "Old World Teaching Meets the New Digital Cultural Creatives" in *The International Journal of Art & Design Education*, 28(3), 261-268. DOI; 10.1111/j.1476-8070.2009.01620.x

Dewey. (1997). Experience and Education, New York: Free Press.

Facer, K., & Selwyn, N. (2021). "Digital Technology and the Futures of Education: Towards "Non-Stupid" Optimism" in *UNESCO*. https://unesdoc.unesco.org/ark:/48223/pf0000377071.

Ferrara, P., Franceschini, G., Villani, A., & Corsello, G. (2019). "Physical, psychological and social impact of school violence on children" in *Italian Journal of Pediatrics*, 45(1), 1-4.

Freedman, K. (2003). *Teaching visual culture: Curriculum, aesthetics, and the social life of art*. New York: Teachers College Press.

Garraghan, P., Moreno, I. S., Townend, P., & Xu, J. (2014). "An analysis of failure-related energy waste in a large-scale cloud environment" in *IEEE Transactions on Emerging Topics in Computing*, 2(2), 166-180.

Ge, J. (2022). "Multiple influences of intelligent technology on network behavior of college students in the metaverse age" in *Journal of Environmental and Public Health*, 2022, 2750712. DOI: 10.1155/2022/2750712.

George, A. H., Fernando, M., George, A. S., Baskar, T., & Pandey, D. (2021). "Metaverse: The next stage of human culture and the internet" in *International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)*, 8(12), 1-10.

González-Zamar, M.-D., Abad-Segura, E., Luque de la Rosa, A., & López-Meneses, E. (2020). "Digital education and artistic-visual learning in flexible university environments: Research analysis" in *Education Sciences*, 10(11), 294. DOI: 10.3390/educsci10110294.

Grenfell, J. (2013). "Immersive interfaces for art education teaching and learning in virtual and real world learning environments" in *Procedia-Social and Behavioral Sciences*, 93, 1198-1211.

Grincheva, N. (2023). ""Contact zones" of heritage diplomacy: transformations of museums in the (post) pandemic reality" in *International Journal of Cultural Policy*, 29(1), 76-93.

Guo, L., & Liu, J. (2023, June 26). "The carbon footprint of the metaverse can be reduced?" in *UNESCO*. https://courier.unesco.org/en/articles/liu-jianya-and-guo-liang-carbon-footprint-metaverse-can-be-reduced#:~:text=Idea-,Liu%20Jianya%20and%20Guo%20Liang%3A%20%E2%80%9CThe%20carbon%20footprint%20of%20the,to%20reduce%20its%20environmental%20impact.

Gupta, R., Srivastava, D., Sahu, M., Tiwari, S., Ambasta, R. K., & Kumar, P. (2021). "Artificial intelligence to deep learning: machine intelligence approach for drug discovery" in *Molecular Diversity*, 25, 1315-1360.

Heaton, R. (2014). "Moving mindsets: Re-conceptualising the place of visual culture as multi-sensory culture in primary art education" in *Canadian Review of Art Education*, 41.1, 77-96.

Heaton, R. (in press). "Crafting and cultivating an international repertoire of artist teacher pedagogies" in R. Payne (ed.) (in press). *Artist Teachers, UK Perspectives*. Open University Press.

Heaton, R., Burnard, P., & Nikolova, A. (2020). "Artography as creative pedagogy: A living inquiry with professional doctoral students" in *Australian Art Education*, 41(1), 53-74.

Heaton, R., Chan, S. (2023). "Managing cognitive dissonance in art education" in *Cambridge Journal of Education*, 53(4), 473-494. DOI: 10.1080/0305764X.2023.2175789.

Hetland, L., Winner, E., Veenema, S. & Sheridan, K. (2007) *Studio thinking: the real benefits of visual arts education*, New York: Teachers College Press.

Hetland, L., Winner, E., Veenema, S. & Sheridan, K. (2015) *Studio thinking 2: The real benefits of visual arts*

education, New York: Teachers College Press.

Hoekstra, M. (2015). "The problematic nature of the artist teacher concept and implications for pedagogical practice" in *The International Journal of Art & Design Education*, 34, 349-357.

Huggett, J. (2020). "Virtually real or really virtual: Towards a heritage metaverse" in *Studies in Digital Heritage*, 4(1), 1-15.

International Society for Education through Art (INSEA) (2023). "The INSEA Manifesto" in *INSEA*. https://www.insea.org/our-manifesto/.

Jacucci, G., & Wagner, I. (2007). "Performative roles of materiality for collective creativity." *In Proceedings of the 6th ACM SIGCHI conference on Creativity & Cognition (C&C '07). Association for Computing Machinery, New York, NY, USA, 73–82. https://doi.org/10.1145/1254960.1254971*

Jagatheesaperumal, S. K., Ahmad, K., Al-Fuqaha, A., & Qadir, J. (2022). "Advancing Education Through Extended Reality and Internet of Everything Enabled Metaverses: Applications, Challenges, and Open Issues" in *arXiv preprint arXiv:2207.01512*. DOI: 10.48550/arXiv.2207.01512.

Jeon, H., Youn, H., Ko, S., & Kim, T. (2022). "Blockchain and AI Meet in the Metaverse" in T. M. Fernández-Caramés & P. Fraga-Lamas (ed). *Advances in the Convergence of Blockchain and Artificial Intelligence*. London: IntechOpen. DOI: 10.5772/intechopen.99114.

Joy, A., & Sherry, J. F., Jr. (2003). "Speaking of art as embodied imagination: A multisensory approach to understanding aesthetic experience" in *Journal of Consumer Research*, 30(2), 259-282.

Kapp, K. M., & O'Driscoll, T. (2010). *Learning in 3D: Adding a new dimension to enterprise learning and collaboration*. San Francisco: Pfeiffer & Company.

Knutson, K., Crowley, K., Lin-russell, J., & Annsteiner, M. (2011). "Approaching art education as an ecology: exploring the role of museums" in *Studies in Art Education*, 52(4), 310-322.

Kozinets, R. V. (2023). "Immersive netnography: a novel method for service experience research in virtual reality, augmented reality and metaverse contexts" in *Journal of Service Management*, 34(1), 100-125.

Kun, Y. U. E. (2022). "The Metaverse in the Psychoanalytic Perspective: The Unleashed Human Id in the Metaverse" in *Psychology*, 12(1), 6-10.

Kye, B., Han, N., Kim, E., Park, Y., & Jo, S. (2021). "Educational applications of metaverse: possibilities and limitations" in *Journal of Educational Evaluation for Health Professions*, *18* (32).

Leonard, N. (2020) "Entanglement Art Education: Factoring ARTificial Intelligence and Nonhumans Into Future Art Curricula" in *Art* Education, 73(4), 22-28.

Lindstrom, L. (2012). "Aesthetic learning about, in, with and through the arts: a curriculum study" in *International Journal of Art and Design Education,* (31)2,166-179.

MacCallum, K., & Parsons, D. (2019). "Teacher perspectives on mobile augmented reality: The potential of metaverse for learning" in *World Conference on Mobile and Contextual Learning* (pp. 21-28). https://www.learntechlib.org/p/210597/.

Manathunga, C., Selkrig, M., Sadler, K., & Keamy, K. (2017). "Rendering the paradoxes and pleasures of academic life: Using images, poetry and drama to speak back to the measured university" in *Higher Education Research & Development*, 36(3), 526-540.

Meccawy, M. (2022). "Creating an Immersive XR Learning Experience: A Roadmap for Educators" in *Electronics*, 11(21), 3547.

Morariu, C., & Stiller, B. (2008). "DiCAP: Distributed Packet Capturing architecture for high-speed network links" in *2008 33rd IEEE Conference on Local Computer Networks (LCN)* (pp.168-175). Montreal.

Mystakidis, S. (2022). Metaverse" in *Encyclopedia*, 2(1), 486-497.

Nalbant, K. G., & Uyanik, Ş. (2021). "Computer vision in the metaverse" in *Journal of Metaverse*, 1(1), 9-12.

Narin, G. (2021). A content analysis of the metaverse articles. Journal of Metaverse 1(1), 17-24.

National Research Council. (2012). *Education for Life and Work: Developing transferable knowledge and skills in the 21st century*. Washington D. C.: National Academies Press.

Nikas, B. W. (2022). "The "metaverse." The arrival of the future of 3D research, learning, life & commerce" [Paper Presentation] in *30 Years of Economic Reforms in The Republic of Moldova: Economic*

Progress Via Innovation and Competitiveness. DOI: 10.53486/9789975155649.07.

Palmer, M. T. (1995). "Interpersonal communication and virtual reality: Mediating interpersonal relationships" in F. Biocca & M. R. Levy (eds.), *Communication in the Age of Virtual Reality* (pp. 277-299). Hillsdale: Lawrence Erlbaum Associates.

Parker, T. (2009). "Continuing the Journey – the Artist-Teacher MA as a Catalyst for Critical Reflection" in *International Journal of Art & Design Education*, 28(3), 279-286.

Pavlou, V. (2020). "Art technology integration: Digital storytelling as a transformative pedagogy in primary education" in *The International Journal of Art & Design Education*, 39(1), 195-210.

Petrigna, L., & Musumeci, G. (2022). "The metaverse: A new challenge for the healthcare system: A scoping review" in *Journal of Functional Morphology and Kinesiology*, 7(3), 63.

Recode Staff (2018). "Full transcript: VR researcher Jeremy Bailenson on Recode Decode" in *VOX*. https://www.vox.com/2018/2/20/17029344/transcript-vr-virtual-reality-augmented-researcher-jeremy-bailenson-headset-oculus-recode-decode.

Reis, A. B., & Ashmore, M. (2022). "From video streaming to virtual reality worlds: an academic, reflective, and creative study on live theatre and performance in the metaverse" in *International Journal of Performance Arts and Digital Media*, 18(1), 7-28.

Slack, D., Hilgard, S., Jia, E., Singh, S. & Lakkaraju, H. (2020). "Fooling LIME and SHAP: Adversarial attacks on post hoc explanation methods" in *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society* (pp. 180-186). DOI: 10.1145/3375627.3375830.

Suraco, T. L. (2006). *An interdisciplinary approach in the art education curriculum* [Unpublished Master Thesis]. Georgia: Georgia State University. DOI: 10.57709/1062139.

The Art Newspaper (2022). "What is the metaverse and why does it matter to the artworld? Experts weigh in and predict its future impact" in *The Art Newspaper*. https://www.theartnewspaper.com/2022/01/28/what-is-the-metaverse-and-why-does-it-matter-to-the-art-world-experts-weigh-in-and-predict-its-future-impact.

Tlili, A., Huang, R., Shehata, B., Liu, D., Zhao, J., Metwally, A. H. S., ... & Burgos, D. (2022). "Is Metaverse in education a blessing or a curse: a combined content and bibliometric analysis" in *Smart Learning Environments*, 9(1), 24. DOI: 10.1186/s40561-022-00205-x.

Treadaway, C. (2009). "Translating experience" in *Interacting with Computers*, 21(1-2), 88-94.

United Nations Educational, Scientific and Cultural Organization (2018). *A Lifeline to Learning. Leveraging Technology to Support Education for Refugees*. Paris: United Nations Educational, Scientific and Cultural Organization.

Wan, L. (2022, November 7). "Teacher's death focuses on abusive invasions of online classes" in *Shine*. https://www.shine.cn/news/in-focus/2211072446/.

Wang, M., & Lau, N. (2023). "NFT Digital Twins: A Digitalization Strategy to Preserve and Sustain Miao Silver Craftsmanship in the Metaverse Era" in *Heritage*, 6(2), 1921-1941.

Wang, M., Yu, H., Bell, Z., & Chu, X. (2022). "Constructing an Edu-metaverse ecosystem: a new and innovative framework" in *IEEE Transactions on Learning Technologies*, 15(6), 685-696.

Wang, Singgih, M., Wang, J., & Rit, M. (2019). "Making sense of blockchain technology: How will it transform supply chains?" in *International Journal of Production Economics*, 211, 221-236. DOI: 10.1016/j.ijpe.2019.02.002.

Whidding, R. (2021, October 22). "Which Museums Won Over The Brand Collaboration Landscape In 2021?" in *Jing Culture & Crypto*. https://jingculturecrypto.com/brand-and-lifestyle-licensing-awards-2021/.

Wilson, B. (2020). "Art Classrooms, Comic Markets, and the Digital Cosmos: Children's Visual Worlds as Pedagogical Spaces" in R. Hickman, J. Baldacchino, K. Freedman, E. Hall & N. Meager (eds.) *The International Encyclopedia of Art and Design Education*. DOI: 10.1002/9781118978061.ead011.

Zarcone, D., & Saverino, D. (2022). "Online lessons of human anatomy: Experiences during the COVID-19 pandemic" in *Clinical Anatomy*, 35(1), 121-128.