Art and XR: Experiences With 3D Scanning and Nfts in Web 3.0 Education

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Abstract

This article presents the experience of a multidisciplinary Scientific Initiation project that explored the use of NFTs and XR technologies in Web 3.0 education. Developed within the MAI/DAI Program of CNPq, the project involved students from Design, Pedagogy, and Computer Science in the creation, digitization, and minting of NFTs, promoting a hands-on approach to understanding digital authorship, tokenization, and ownership. Despite the educational potential of these technologies, several barriers were identified, such as hardware limitations, accessibility challenges, and the predominance of English in available tools. The findings highlight the need for more inclusive and accessible solutions to ensure broader adoption and meaningful engagement with Web 3.0 technologies.

Keywords

NFTs, Web 3.0, digital accessibility, technology education.

1 Introduction

This article describes the experience of creating NFTs [1] within the context of a multidisciplinary Scientific Initiation project, which brought together the fields of Design, Pedagogy, and Computer Science. The project is part of the MAI/DAI Program of CNPq, which funded the authors of this study: Manuella (master's student and supervisor), along with students Artur, Milena, and Vitória. Artur participated voluntarily in the project and played a fundamental role throughout the entire process, actively contributing to the activities described here. Unfortunately, he passed away in December 2024, leaving behind a legacy of dedication and enthusiasm for research. This article is also a way to honor his participation and impact on the development of this work. The main objective of the

[1]Unique digital assets that works as certificates of ownership registered on a blockchain network, which cannot be replaced by another, representing diverse digital assets.

Figure 1: Paper sculpture digitized for experimentation with 3D scanning and NFTs.

project was to explore accessible ways of teaching about Web 3.0 and NFTs, integrating XR technologies into the artistic creation process. During the research, the students developed and tested educational materials aimed at beginners and co-authored an article on anonymity in crypto art. From March to August 2024, the team gathered to carry out the proposed project activities, which included theoretical classes, the creation of artworks, and the final process of minting the NFTs. As part of the practical activities, the students used a 3D scanner app on their phones to digitize a paper sculpture (fig. 1), experimenting with the conversion of physical art into digital format. This experience allowed the participants to understand, in practice, the challenges and possibilities of digital authorship, tokenization, and ownership in Web 3.0. More details on the adopted procedures will be presented in the Methodology section.

2 Methodology

The methodology adopted in this experience combined theoretical and practical approaches to introduce students to the world of NFTs, Web 3.0, and Extended Reality (XR). Initially, participants had access to online educational materials developed by the supervisor as part of her master's research, validating the content through four classes—both in-person and virtual—held (fig. 2) from March to July 2024. These classes covered topics such as the history of blockchain, its structure and security, NFTs, and digital communities.

After the theoretical phase, in August, the students participated in a hands-on workshop at CIn, where they created and digitized their artworks using 3D scanning and image digitization tools. The main experiment involved using the free version of the Polycam[6]

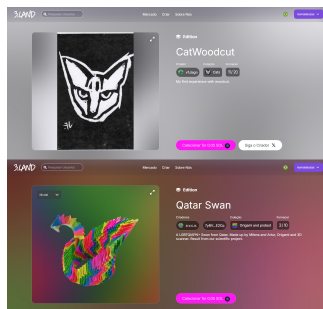**Figure 2: Photographs of some of the meetings.**

Figure 3: NFT pages created for the project on the 3.land platform.

app to convert a paper sculpture into a GLB file through photographs. In addition, students scanned physical drawings (fig. 4), converting them into JPG files.

With the digital files ready, the next step involved the minting process of the NFTs, which was carried out remotely on August 30, 2024, through a Google Meet call. The activity was conducted remotely, with the students being guided by their advisor in using the 3.land [1] platform (fig. 3) on the Solana blockchain. The platform, available in Portuguese, Spanish, Chinese, and English, offers an open-source tool for creating cNFTs (compressed NFTs), a unique type of token that allows multiple assets to be grouped within a single account, significantly reducing minting costs.

The minting process followed a specific sequence within the platform. First, on the "Create" page, it was necessary to generate the collection that would house the NFT, ensuring that it was also registered on-chain. At this stage, students uploaded the avatar and cover files for the collection and defined its name and description. Since no collections had been previously created, a new collection was generated for each NFT.

With the collection properly set up, the next step was to create the NFT itself. Students uploaded the corresponding digital file and added its name and description. Additionally, they used the "traits" feature, which allows NFTs to be categorized with custom labels. For the digital sculpture being worked on, information such

as technique, medium, year, city, and country was included, later displayed in the metadata to provide better contextualization within the network.

Both the creation of the collection and the NFT required cryptocurrency transactions to be registered on the blockchain. The funds used for this experience came from the sale of artworks by the project advisor, specifically allocated to finance the scientific initiation activities. After the minting process was completed, the NFTs were shared on the social network X (formerly Twitter), this process transformed theoretical content into practical experience.

3 Results and Discussion

The results of this experience highlighted both the benefits and challenges of using XR and NFTs in teaching about Web 3.0. The students gained a deeper understanding of digital authorship, tokenization, and ownership by directly experiencing the process of creating, digitizing, and minting NFTs.

During the sculpture digitization process, some technological barriers were identified that impact the accessibility of this type of tool. The chosen application for the experiment was Polycam, used in its free version, which imposes certain limitations, such as restricting users to only five captures with a maximum of 100 images per scan. Although sufficient for the experiment, these restrictions can hinder more extensive use. Furthermore, the app is available only in English, which represents a barrier for many users in Brazil, a country ranked 70th out of 113 in the EF English Proficiency Index [?]. Another key factor influencing the final quality of the 3D model is the hardware of the device used. Older smartphone models may struggle with capturing details, compromising the accuracy of the digitized object.

NFTs enable new ways of creating and monetizing digital art, as well as interesting applications in the educational field, as pointed out by Wu and Liu [2], who highlight that educators can register certificates, academic records and learning records through NFTs, in addition to granting them as scholarships, allowing students to use them to access courses on different platforms.

However, the adoption of these technologies still faces significant barriers, especially in relation to accessibility in Brazil. As observed in the use of the Polycam application, the social environment of Web 3.0 is predominantly in English, lacks accessible educational materials and faces challenges related to connectivity and internet access, which limits its adoption in different contexts. In this context, initiatives such as Web3EduBrasil [3] emerge as an essential alternative in the face of these barriers, by providing access to education on Web 3.0 technologies in Brazil, offering educational initiatives in Portuguese and promoting a collaborative environment for innovation.

In Kranzberg's [5] view, technological changes alone do not generate revolutionary sociocultural transformations, and a set of social, economic and political factors are necessary for a technology to be fully integrated into society. Furthermore, as the author argues, a single technological advance does not constitute a complete transformation, which applies to Web 3.0, which, despite its potential and the existence of onboarding projects, still faces structural challenges that prevent its widespread adoption and accessibility.

Figure 4: Digitized woodcut for experimentation with NFTs.

Braga and Vovio [4] raise a crucial question about digital literacies by asking whether the lack of mastery of certain cultural tools, as well as the absence of specific skills and knowledge, would prevent certain individuals from participating in this context. This reflection is essential for understanding the role of technology in society and the social barriers that limit access to it. The mere existence of digital tools does not guarantee inclusion, as the adoption of these technologies depends not only on resource availability, but also on individuals' ability to use them meaningfully. In the context of Web 3.0 and NFTs, this issue becomes even more evident, as inequalities in access to information and digital infrastructure can exclude certain groups from the emerging technology landscape. Therefore, it is crucial to discuss not only the technological innovation itself, but also the social and educational challenges that influence its adoption.

Another major challenge in this field is the creation of legislation that protects users, especially minors. Regulations that ensure credibility and institutional adoption of emerging technologies are fundamental for the consolidation of blockchain in education. Swanepoel [7] highlights that the implementation of these tools also requires regulatory adjustments to ensure that digital credentials are widely accepted and reliably validated. Furthermore, these regulations are essential to counter the limited and predominantly negative perception of blockchain propagated by traditional media, which often focuses solely on fraud and speculation. In fact, blockchain technology has been widely used for speculative activities, reinforcing the neoliberal structure — something evident in the recent political moves of leaders aligned with this ideology who are now investing in cryptocurrencies.

This scenario, far from strengthening the ecosystem in a sustainable way, may instead expose its vulnerabilities. Therefore, the viability of blockchain in education requires not only a solid regulatory framework but also empirical testing and quantitative studies that assess both the technical components of integrated systems — such as software and infrastructure — and the sociological impacts of these tools. The response of students and educators to these emerging technologies must also be considered, as their acceptance and effectiveness will determine the success of initiatives aimed at democratizing access to digital education and reducing inequalities in technological literacy.

Despite these challenges, the project demonstrated the potential of Web 3.0 as a space for new forms of artistic expression and educational engagement, encouraging reflections on the need for more accessible and inclusive solutions for the adoption of these technologies.

4 Conclusion and Future Work

The experience described in this article demonstrated both the educational potential of Web 3.0 and NFTs and the structural and social challenges that still limit their adoption. By integrating XR tools and digital tokenization, students were able to experience, in practice, concepts such as authorship, ownership, and technological accessibility, reinforcing the importance of interdisciplinary approaches in teaching emerging technologies. However, difficulties in accessing adequate devices, language barriers, and the lack of accessible educational materials highlighted that digital inclusion goes beyond the mere availability of tools, requiring educational policies and accessibility strategies. As pointed out by Kranzberg and Braga and Vovio, technology alone does not promote radical social transformations; its adoption depends on a social and educational context that enables its appropriation. Thus, this study reinforces the need for initiatives that make Web 3.0 education with XR more accessible and democratic, ensuring that more people can explore and benefit from these new digital possibilities, as raised by Wu and Liu and how Web3EduBrasil provides.

During the scientific initiation activities, the team also organized an in-person and free training session at UFPE, sharing the research findings with a group of nine students, reinforcing the commitment to democratizing knowledge about Web 3.0 and NFTs. Complementing these actions, the team collaborated in the WEB3PE event, promoted by the Web3EduBrasil initiative and sponsored by Stellar, held at the CIn amphitheater, aiming to expand access to information on the topic.

As a development of this project, the material created for student training will be adapted for a broader audience and is currently being prepared for application in the Computer Science course at UFSJ, in partnership with Professor Darlinton Carvalho, within the Digital Entrepreneurship extension program. Additionally, the accumulated experience will result in offering the course "Design and Web 3.0: Art, Design, and Emerging Technologies" in the Design program at UFPE, at the invitation of Professor Leonardo Castillo.

Other avenues to explore include expanding research to develop more effective teaching strategies about NFTs and blockchain in various educational contexts. Future studies may focus on creating interactive and accessible educational materials, using immersive environments to teach emerging technologies, and analyzing the impact of these tools on students' academic development. Furthermore, according to Swanepoel, it is essential to investigate solutions to mitigate entry barriers for new users, considering aspects such as digital literacy, inclusion policies and the regulation of blockchain technologies for educational purposes.

In this way, this study not only contributes to the debate on the integration of NFTs and Web 3.0 in education but also paves the

way for future research and initiatives aimed at making this technology more accessible, inclusive, and effective within academia and beyond.

Acknowledgments

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