Virtual Reality as Mediator in Teaching Landscape Architecture History

Ramzi Hassan[1], Annegreth Dietze-Schirdewahn[2]

[1]Norwegian University of Life Sciences (NMBU)/Norway · ramzi.hassan@nmbu.no
[2]Norwegian University of Life Sciences (NMBU)/Norway

Abstract: This paper introduces an innovative teaching method merging landscape architecture history and digital media technologies. The approach, born from a collaboration initiative between History of Landscape Architecture and Advanced Visualization Technologies courses, aims to engage students with historical studies using digital tools. It shares insights, lessons learned, and an implementation plan including activities and assessments. Emphasizing the need for solid pedagogical theories, the article showcases enhanced comprehension and practical application when students merge historical studies with digital skills. While promising, integrating these technologies requires meticulous planning, budget considerations, collaboration with research centers, and specialized training. Thoughtful assessment strategies are crucial for maximizing their potential impact.

Keywords: Teaching landscape architecture history, digital media integration, collaborative learning approach, pedagogical innovation, virtual reality (VR)

1 Introduction

Teaching the history of garden art and landscape architecture is an essential aspect of any landscape architecture education. It's a critical component of the landscape architecture curriculum because it gives students a profound comprehension of the past, which informs their design decisions in the present. However, it poses several challenges for landscape architecture schools when it comes to organizing and teaching it to students. Traditional methods of teaching the history of the landscape can be complex, dry, and unengaging, leaving students feeling disconnected from the subject matter (DIETZE-SCHIRDEWAHN & HASSAN 2021). This lack of engagement makes it challenging for teachers to maintain student interest, which is essential for effective learning. Another challenge is organizing excursions and study tours that are difficult to justify from a climate perspective and hard to find funding for. As a result of these challenges, it becomes difficult to get students interested in the management and conservation of cultural heritage, as well as in advanced courses that deal with the history of landscape architecture that extends beyond the basic mandatory courses. To address these challenges, there is a need to find new ways to teach the history of landscape and present the subject in a manner that is accessible, engaging, and relevant to students. Additionally, there might be a necessity to modify the curriculum to adapt to different learning styles and interests to elevate students' engagement and make the topic more interesting.

Latest developments in digital media technologies, including 3D visualizations, 3D capture, digital twins, 3D reconstruction, and virtual reality (VR) technologies have emerged as promising tools that can play a transformative role, acting as a mediator between the past and present by enabling students to engage with the history of garden art and landscape architecture in new and innovative ways. Moreover, in today's digital age, young generations of students are growing up in a world flooded with digital technologies, and they are highly adept at using these technologies for a variety of purposes, including learning and entertainment.

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By integrating the latest technological development solutions into teaching history, we can leverage students' existing skills and interests to engage them in the subject matter in new and innovative ways.

Through this paper we present an approach for teaching garden art and landscape architecture history by integrating advanced digital media technology. The concept is to introduce a new method of teaching the history of landscape architecture by encouraging students to work with historical studies related to this field. The primary objective is to merge historical data with contemporary digital media to create innovative methods for students to explore the history of landscape architecture. Additionally, we will reflect on how this approach can be implemented based on the experience gained from the collaboration experiments, supported by relevant pedagogical theories.

The collaboration initiative involves the LAD302 course on Advanced Visualization Technologies and the LAA321 course on the History of Landscape Architecture at the School of Landscape Architecture, the Norwegian University of Life Sciences (NMBU). The two courses are offered simultaneously during the autumn parallel semester as a combined proposal from both responsible teachers with support from the LA program board. Through this collaboration, students are introduced to the use of the latest advancements in digital media and learn how to apply this technology in the context of landscape architecture history. By integrating historical studies and digital media, students are expected to gain in-depth comprehension of the past and its relevance to the present and are better equipped to make informed design decisions in their future careers.

The paper will start by debating the pedagogical implications of incorporating digital media to teaching the history of landscape architecture, and its potential to enhance student learning. It will then discuss the benefits, challenges, and limitations of using digital media and 3D visualization technology for teaching landscape architecture history. Then, it will discuss approaches to implement and assessment methods that align with pedagogical theory to evaluate student learning outcomes. Lastly, the paper will provide a reflective discussion, highlighting the key takeaways, lessons learned, and recommendations for the future implementation of this educational initiative.

2 Pedagogical Framework

Digital media is becoming an essential aspect of our modern education systems. In recent years, it has offered various benefits to students, teachers, and educational institutions. The integration and use of digital media in education have contributed significantly to personalized learning, improved student engagement, and enhanced communication between students and teachers (FAIZI et al. 2013). However, incorporating these technologies into teaching without a pedagogical framework risk the reducing of their potential impact on student learning. It's therefore essential to connect the integrations of digital media into teaching to a solid pedagogical theory that should guide teachers to enhance their effectiveness and facilitate purposeful and meaningful learning experiences for their students.

There are numerous pedagogical theories that have been established to guide and help the integration process of digital media into the classroom. A study by OTCHIE & PEDASTE (2020), found that constructivism is the most commonly used pedagogical theory for the integration of digital media in teaching. Constructivism is the learning theory that underlines

the importance of active engagement and the construction of knowledge by students (JONASSEN 1991). In addition, constructivism offers the benefit in that it highlights the significance of social interaction and cooperation during learning (VYGOTSKY 1978). Research is also showing evidence that the constructivism theory is an effective pedagogical approach in the context of digital and networked learning environments which can lead to improved learning outcomes by promoting active engagement, collaboration, and the development of critical thinking skills (KOLB 2014). In the context of adopting a teaching concept for this initiative, constructivism can therefore provide a solid pedagogical framework for the integration of digital media and 3D visualization technologies into the teaching of the history of landscape. This approach promotes active engagement, collaboration, and critical thinking skills, and should allow students to construct their own meanings and interpretations of the historical and cultural significance of the landscape based on their experiences.

3 VR for Teaching the History of Landscape Architecture

In recent years, the progress made in VR technology has resulted in the creation of increasingly sophisticated and affordable VR tools and devices. These tools are centered around the defining features of VR, namely immersion, interaction, and imagination, as noted by WANG (2020). These features have empowered developers to construct more authentic virtual environments, primarily intended for entertainment purposes. Nonetheless, the educational community has recognized the potential of VR technology to revolutionize the communication of knowledge in ways previously unattainable through traditional teaching methods. The following will discuss the benefits and challenges of the utilization of VR technology and 3D visualizations for the teaching of the history of landscape architecture drawing upon evidence from the collaborative experiment between the technology course and the history course.

3.1 Potentials and Benefits

Numerous researchers have explored the potential of VR technology for educational purposes. PIRKER & DENGEL'S (2021) recent study review highlights that VR technology can provide an immersive, interactive, and engaging virtual environment for students, enabling them to develop a thorough understanding of the subjects being taught. Additionally, VR technology can create a safe and controlled environment for learners to explore and discover new concepts. The study further highlights that instructors can monitor and assess the learning progress of their students effortlessly and offer support and feedback when required.

With relevance to the teaching of the history of landscape architecture, as it was observed from the collaboration experiment between the technology course and history course, one of the significant benefits of using VR technology for teaching landscape history of landscape architecture is the immersive, interactive, and engaging learning experience it offers. Students were able to explore and interact dynamically with historical parks or gardens which no longer exist or have only partially survived in ways that would not be possible with traditional teaching methods. VR technology facilitates an interactive and dynamic viewing offering a new perspective on the historical development of the site that is otherwise only presented in written media and through technical illustrations. This method enabled students to re-trace past design concepts and see how they have developed since. Historical, two-dimensional plans, photographs, illustrations, and other archival material in addition to the site itself

provided the basis for the development of a digital twin model that represents a 3D interpretation of a site. The digital twin model of the landscape scenario created in this way is then "visited" using a VR headset. The immersive and dynamic viewing was highly suitable for enhancing students' spatial reasoning skills which is essential for comprehending and interpreting landscape history. For example, students were able to use VR technology to explore historical gardens or park evolution over time, see how landscape features were constructed, and understand how they relate to each other spatially. It is a method that allowed students to develop a whole new perspective on time and space, arousing interest in the historical dimension. Another aspect that was observed is the high level of engagement by students when using VR technology. Students are usually highly engaged with computers, smartphones, video games, and television screens. The "entertainment capacity" of VR technology promoted user interaction and engagement in a virtual environment since a user in VR becomes part of the narrative and becomes emotionally involved. Another positive benefit that was observed is that VR technology and 3D visualizations made learning more accessible and inclusive by being able to take the whole classroom to various sites virtually. For example, students were able to do study site visits "virtually" to historical sites and gardens that are relevant to the course project study case without the need to organize physical study tours.

3.2 Challenges and Limitations

Despite the great potential benefits of VR technologies in education, there are several challenges and limitations that need to be addressed for the successful implementation and adoption of VR technology in the teaching of the history of landscape architecture. One of the challenges is the cost of implementing VR technology. While the cost of VR hardware and software has decreased in recent years, it still represents a significant investment for educational institutions that need to be studied carefully. During the preparation of the collaborative experiment with the two courses, there was a need to make sure that the equipment and technology to use in the course were in place. To overcome this challenge of additional costs, a collaboration with the Virtual Reality Laboratory (VR-Lab) at NMBU was made to secure access to VR technology during the course period. Another challenge is the need for specialized skills and training to effectively use VR technology. While VR has the potential to enhance teaching and learning, it also requires a different approach to teaching a new set of skills for students which can be a time-consuming process. This time investment has been observed as one of the main factors for securing the successful implementation of VR technology in the course settings. Students need not only to learn how to use VR technology but also to learn how to create content and navigate their own projects in a VR environment and then to be trained on how to interact with VR environments. Another primary concern that was observed is the potential for some students to become disengaged or distracted in VR environments. While immersive VR experiences can be captivating, they can also be overwhelming and disorienting for some students. It is therefore essential to balance the benefits of immersive learning with the potential risks of sensory overload or motion sickness. Another observed aspect is equipment accessibility for students. Technology was used in class for experiments but unavailable afterward. A proposed solution was made in partnership with VR-Lab, offering students VR headsets to borrow beyond class hours. Another potential limitation of VR technology that was observed is that it may not be as effective for teaching certain aspects of the history of landscape architecture, such as social and cultural contexts.

While VR can simulate physical environments, it may not be as effective for simulating or conveying more abstract concepts or cultural values.

4 Approaches and Assessment Methods Used

The following discusses approaches, learning activities and assessment methods that are used to teach landscape architecture history with digital media, VR technology, and 3D visualizations as it was implemented through the collaboration initiative between the two courses which aligns with the constructivism pedagogical learning theory discussed earlier:

Interactive VR environments: This learning activity aims to build new skills that allow students to use VR technology to learn to create content, learn interaction techniques, and explore landscape scenarios in an immersive way. This is achieved by using 3D modeling digital tools such as SketchUp, Lumion3D, PolyCam, and Sketchfab. This enabled students to understand the workflows and master the techniques to use in a landscape project case study. The outcome of this design task demonstrates students' ability to understand the added value that VR technology can provide through an engaging learning experience, as they are able to explore landscape scenarios and examples in a virtual environment. An assessment method that is used for this approach to evaluate student learning is performance-based assessments. Performance-based assessments assess students' ability to apply their knowledge and skills through learning new tools (WIGGINS & MCTIGHE 2005). The assessment is based on a set of criteria that evaluates the design principles and elements incorporated in the environment, the level of interactivity, the degree of accuracy, and the level of engagement and immersion provided for the users.

Collaborative online learning activities: One way to encourage students' collaboration is by incorporating online learning activities. The online collaborative platform "Miro" is used to allow students to work together in real-time, sharing ideas and refining their concepts collaboratively. By working together, students were able to develop a common understanding of project task through a social process. An assessment method that is used with this activity is self-assessment method. Self-assessment is a way to encourage students to reflect on their progress and assess their own learning (BOUD 1995). A set of reflection criteria is used to guide students in identifying strengths and weaknesses and setting future goals for their collaborative learning experience through a digital collaborative platform.

Group assignments: Another approach that promoted collaboration among students was to organize project tasks through group assignments. Through students working on a project task in groups formation, they were able to learn to develop their own reflections, share their work with their peers, and receive feedback. This helped create a collaborative learning environment where students learn from each other's perspectives and can direct their effort towards producing a joint answer for a project problem task. An assessment method that is used with this approach is presentation assessment. Groups were tasked with presenting their reflections to the class. The presentations are evaluated based on a set of measures that assesses the quality and depth of research, the creativity and originality of ideas, the dynamics of collaboration among group members, and the effectiveness of presentation skills.

Gamification techniques: The use of gamification techniques with VR technology can increase interactivity and engagement in learning (SAVERY & DUFFY 1995). This is possible

to achieve by utilizing VR technologies to enable students to take part in game-like activities such as a challenge to resolve a task within a VR environment where they can earn points upon completing a task. This approach can aid in encouraging problem-based learning and the development of critical thinking abilities because students are required to use their knowledge to find answers. Even though this approach was planned to be executed as part of this collaborative initiative, it was cancelled due to course-time restrictions, and was decided to include it in the upcoming future course.

Digital Storytelling: Digital storytelling is used in the course as a creative and collaborative activity that encouraged students to work together to produce multimedia projects that showcase their understanding of the subject. By combining text, images, audio, video, 3D illustrations, VR visuals, timelines, and interactive elements, students were able to bring the history to life which encouraged curiosity and interest among students. This approach promotes enhanced insight into the history of students through the ability to clarify and communicate complex ideas and concepts. An assessment method that was used with this approach is peer-assessment. Peer-assessment is an effective way to encourage students to take responsibility for their learning and develop critical thinking skills (NICOL & MACFARLANE-DICK 2006). Students were tasked with sharing their narratives with their peers and receiving feedback on their work. Peers provided feedback based on a set of evaluation criteria that assess the quality of the work, the coherence and logic of the story, and the effectiveness of the storytelling techniques used.

Project-based: The approach of project-based learning involves students' capability to apply their acquired knowledge in a project case situation. This approach was important to include for this collaborative initiative, as students were able to connect historical analysis studies produced in the history course with technological skills gained from the technology course and apply it into a case study. The assessment method that was used for this approach is an essay, which evaluated students' comprehension of historical concepts and interpretations. The essay is structured as a reflective piece, which synthesizes their learning and showcases their critical thinking and analytical skills. Additionally, the essay provided an opportunity for students to contemplate their comprehension of the role of digital media in the study of historical landscapes.

5 Discussion

The collaboration between the history and technology courses, and the incorporation of contemporary digital media tools into the teaching of garden art and landscape architecture history, provided an engaging opportunity to explore this field in a dynamic and interactive manner. The history course focused on studying the past, emphasizing the basics for historical studies such as archival studies, literature/document analysis, field surveys, map overlay techniques, and intricate comparisons of diverse sources and historical evidence, while the technology course aimed at equipping students with digital skills specifically tailored to enhance their abilities in studying history. Although the technology course has incorporated several digital media applications, the primary emphasis has been on leveraging cutting-edge 3D visualizations and VR technology. To ensure coherence and complementarity, both courses employed the same case study, and project groups were formed with identical members. An important benefit of this collaboration is the interplay and synergy between histori-

cal dimensions and digital competencies. Through simultaneous engagement with history and digital competencies, students developed a deeper understanding of the subject matter and gained exposure to the practical applications of digital competencies in historical studies. This approach aroused students' interest in the subject of landscape architecture history, which can be considered a main accomplishment of this initiative.

The collaboration of the two courses served as a testing bed for addressing various aspects and challenges associated with incorporating digital media into history teaching. It is important to emphasize that the success of this collaboration was heavily reliant on the instructors' constant coordination and their willingness to think beyond their own competence and knowledge. Without a collaborative effort, aligning the learning objectives of the two courses and maintaining student engagement would have been difficult. Thus, the establishment of effective communication and collaboration channels between the instructors will be critical to the future success of similar collaborations. As a result, this collaboration provided valuable insights into how to overcome challenges and create a framework for future collaboration between these two subjects, as well as facilitate interdisciplinary future collaboration projects.

The proposed pedagogical theory of constructivism provided a strong foundation for this initiative, emphasizing the active role of the student in the learning process and providing a framework to effectively integrate digital media into teaching. By engaging students in interactive VR environments, collaborative online learning activities, group assignments, digital storytelling, and project-based learning, this approach promotes a rich perception of the historical and cultural significance of landscape architecture. In addition, assessing student learning when using digital media that are aligned with constructivism learning theory requires a variety of assessment methods that go beyond traditional ones. The assessment methods are designed to encourage students to apply their knowledge and skills, work collaboratively, reflect on their learning, and think critically. Grounding the work with a solid pedagogical theory serving the learning objectives of both courses is considered another achievement reached by this initiative. As ZHAO & FRANK (2003) noted, “the most effective uses of technology in schools are those that are aligned with pedagogical goals, support student-centered learning, and provide opportunities for collaboration and interaction.”

The final results of student’s work for the project case studies were presented in the form of an online digital platform: RØD HERREGÅRD (2022) and BARONY ROSENDAL (2020). The digital platform is enriched with media content and is geared toward learning and studying the historical parks and revealing their history and qualities. It facilitates story-guided tours that enable students to observe and understand the complications of historical sites interactively and dynamically and provide a comprehensive historical experience of them. The digital platform has the potential to be developed further to act also as a medium for the preservation, documentation, interpretation, and intervention, assisting in research, education, and increased awareness regarding the significant value of historically important landscapes. The platform incorporates all the knowledge that students gained from both courses and shows that the concept of integration of digital media has a positive effect on the learning history of sites through inspiring imagination, creativity, critical thinking, and perspective.

While the students' course evaluation results were positive overall, it is important to note that evaluating the effectiveness of such a new teaching method has been overlooked. While the collaboration experiment between the two courses and the integration of digital media was generally well received by students, future collaborations must include additional evaluations

that measure the effectiveness of the integration of contemporary digital media tools in the teaching of the history of landscape architecture. This will help to ensure that future implementations of the method are well-informed and optimized for the best possible learning outcomes for students.

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