3D Digital Reconstructions as an Educational Resource for Teaching Classical Disciplines: The Case of Strabo and Alexandria in Egypt

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In recent years, digital technologies have profoundly transformed education, thanks to the many free online resources that are often, unfortunately, overlooked by teachers and not properly organized. Even subjects like the humanities, which have traditionally followed a more classical teaching style, have had to rethink how knowledge is shared. The traditional teaching approach to classical subjects is mainly text-based, focusing on the direct study of original texts through well-established practices such as translation, grammatical and syntactical analysis, as well as philological and literary commentary.

However, while this approach is essential for ensuring philological rigor and critical understanding of literary material, it can be limited when it comes to conveying complex spatial and visual dimensions, such as the representation of ancient cities or historical-topographical contexts, which written text alone cannot always fully capture. From this perspective, recent research in museum education and transformative learning practices highlights how immersive technologies, such as virtual reality and 3D environments, can support multisensory and deeply engaging learning experiences that combine cognitive understanding with experiential involvement.

The integration of 3D models into teaching is closely linked to Howard Gardner's theory of multiple intelligence, as it engages a variety of cognitive channels and learning styles. Moreover, to the linguistic and logical-analytical skills traditionally linked to philological study, the visual-spatial, kinesthetic, and experiential dimensions are actively engaged, along with interpersonal skills that emerge through collaborative work. The approach taken in this study is grounded in this theoretical framework, focusing on an educational model that blends content delivery with students actively constructing knowledge in context. This approach helps make learning more inclusive by valuing diverse cognitive profiles and encouraging greater engagement and motivation.

3D digital technologies open up new possibilities beyond traditional text-based study, combining philological analysis with immersive experiences and moving past the limits of just reading texts. This study aims to critically explore the educational potential of integrating digital technologies, with a focus on 3D reconstructions of ancient cities. Furthermore, it highlights the example of ancient Alexandria in Egypt, the core of this work for reasons that will soon be explained, within the teaching of classical subjects. The goal is to investigate whether and how 3D virtual environments can promote deeper, more mindful, and critical learning, especially in cases where ancient texts describe spatial realities that no longer exist or are only partially preserved. Descriptions of cities, temples, landscapes, and urban structures that were once familiar in the ancient world now require not just mental, but also visual reconstruction to be fully understood. In this regard, 3D reconstructions of an ancient city now covered by other urban layers, or reduced to ruins, grounded in scientific and archaeological criteria, offer a powerful tool to reimagine what has been lost, allowing students to immerse themselves in highly realistic environments.

The choice of Alexandria, Egypt, as a case study was deliberate and strategic: an ancient description of the city was available, along with a highly accurate study by an archaeology professor on the urban structure, streets, gates and monuments of a specific era, and a 3D reconstruction of the same period, all available free of charge online (this allows students to enjoy a classical high school experience without any financial burden on the school). Moreover, the city served as a key cultural crossroads in the ancient world, acting as a meeting point for diverse cultures due to its central location. In his description, Strabo goes beyond a simple topographical account, guiding the reader through a dynamic and detailed picture of the city that reflects its complex cultural, political, and symbolic dynamics.

The experimental project described was carried out with final-year students at the IIS ‘De Filippis Galdi’ in Cava de’ Tirreni, a classical high school. It takes the form of an exploratory case study aimed at investigating new ways of teaching classical subjects through the integration of innovative digital tools, particularly 3D environments, comparing the translation of an ancient text by Strabo, watching a long video lecture by an archaeologist, Theodoros Mavrogiannis, Professor of Ancient History at the University of Cyprus, and a 3D environment that is available and viewable free of charge.

The core of the teaching activity focused on the study of a selected passage from Strabo's Geography, which describes the topography of Alexandria, Egypt. The project's educational goals included both strengthening linguistic and interpretative skills typical of classical studies and developing transversal abilities such as critical thinking, comparative source analysis, and media literacy.

The project unfolded through a four-stage process, with each phase contributing specifically to creating a rich and interdisciplinary learning experience. Initially, the students focused on the philological and content analysis of Strabo's text, working directly with the passage in its original language. This activity concentrated on grammatical, lexical, and cultural aspects, following the core principles of traditional classical teaching. Through translation, grammatical and syntactical analysis, and philological commentary, the students went beyond a literal understanding of the text and sought to interpret its deeper meaning. For example, they reflected on the image of Alexandria that emerges from the author's words, how Strabo constructs the city's representation, and which elements he describes in detail versus those he omits or simplifies. This phase helped develop linguistic, interpretative, and metacognitive skills, highlighting the central role of the ancient text in the learning process. Next, the focus shifted to historical and topographical contextualization, made possible by the video lecture of Mavrogiannis that is in Italian. Working in small groups, students pieced together what Alexandria's cityscape looked like in Strabo's era by examining different historical sources. This hands-on, collaborative method helped them develop research skills, learn how to sift through information, and draw conclusions supported by solid reasoning. It was a crucial shift from just reading the text to understanding its place within a real historical and geographical setting.

The multimodal core of the project came in the third phase, which focused on exploring 3D reconstructions of Alexandria and engaging in critical reflection. Students watched videos of the 3D models, selected key scenes, and wrote reflections on each one. In this way, Strabo's phrases begin to take on a physicality, albeit a virtual one, in the course proposed by the teacher.

The task required students to link the visual representations with Strabo's textual description. The aim was not merely to observe but to engage in

critical analysis. Students learned to compare the original ancient text with digital reconstructions, identifying discrepancies and reflecting on how images can shape or enhance our understanding of the past. This activity proved highly effective in fostering critical thinking and encouraging an active approach to source material. Finally, the project concluded with the design and administration of an evaluative questionnaire, intended to gather data on the overall effectiveness of the learning experience.

The questionnaire examined two key areas: on one hand, students' personal perceptions regarding the course, the relevance of its content, their level of engagement, and motivation; on the other, their actual grasp of the material, with particular focus on their ability to connect literary sources, historical facts, and digital representations. The results will provide a solid foundation for assessing the project and, crucially, for reflecting on the positive impact that integrating digital technologies, especially 3D reconstructions, can have on learning. This approach encourages students to participate more consciously and actively in classical studies.

Each phase of the project was designed to promote active student involvement, develop transversal skills, and foster a critical attitude towards knowledge.

Overall, the project offers an innovative educational approach to teaching classical subjects, blending rigorous philological methods with 3D digital technology. In this context, digital technologies did not replace traditional teaching but enhanced its effectiveness, providing new ways to access, engage with, and reinterpret content. The city itself became a dynamic learning environment, where textual and visual dimensions combine to stimulate students' critical thinking.

The integration of digital technologies, particularly 3D reconstructions, responds to a growing need for digital teaching in classical studies: to equip students with innovative interpretative tools suited to the complexity of ancient texts. 3D reconstructions, grounded in historical, archaeological, and educational criteria, allow learners to visualize and virtually 'inhabit' worlds that have partially disappeared, transforming reading into a deeper, more immersive, and aware experience.

This approach is distinctive for its ability to combine traditional classical methodologies with innovative technologies, paving the way for future educational experiments where technology acts as an active tool for interpretation and critical engagement with cultural heritage. From this perspective, excluding such tools from humanities teaching would mean denying education one of its core functions: guiding students towards an informed interpretation of the world's cultural heritage, deeply connected to classical languages and civilizations.

Keywords: Interdisciplinary education; Cultural heritage education ; 3D environments

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A conceptual framework for the integration of educational robotics in school

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