

Please find the locations of the revisions in response to the reviewer and editor comments in the text below. Responses and locations of revisions are provided in green. Please don't hesitate to let me know if anything else is helpful. Thanks so much!

Editorial Review

The article makes a significant contribution to the ongoing discussion about using Virtual Reality (VR) in archaeology courses. It introduces an innovative pilot study designed to make international study abroad experiences accessible via 360-video VR, addressing inclusivity and accessibility issues for economically disadvantaged students. The detailed explanation of how the VR tour was created could serve as a valuable guide for other researchers and educators looking to implement similar projects. Reviewers concurred that this paper is well-written, includes a robust literature review, and is generally relevant to the fields of higher education and cultural heritage. However, several points raised by the reviewers need addressing to enhance the paper's clarity and structure:

- **Reviewers 1 and 2 stress the need for more explicit details regarding the learning objectives and their evaluation, especially since the course has not yet been implemented.**
 - *A thorough discussion of the course's learning outcomes and examples of student activities to achieve those learning outcomes has been added in the "Methodology" section (lines 133-183).*
- **Reviewer 2 suggests that the abstract should clearly state that the evaluation has not yet been conducted.**
 - *This has been clarified in the "Abstract" (lines 25-30).*
- **Clarifying at a minimum the specifications of the VR headsets, such as eye-tracking technology, visible field of view (FoV), and prices, will be crucial.**
 - *This has been added in a substantial paragraph in the "Methodology" section (lines 250-266).*
- **A few minor corrections related to figure captions and citations are necessary.**
 - *A call to Figure 1 is added in line 192.*
 - *A rewording of the figure caption to clarify the relationship between numbers and filming locations has been added in lines 194-195.*
 - *A call to Figure 2 has been added in lines 211-212.*
 - *A clarification of the site depicted has been added to the caption of Figure 2 in lines 215-216.*
 - *The DOI for the Nobles et al. bibliographic entry has been hyperlinked in line 449.*

Authors should address the reviewers' concerns by clarifying the implementation plans. Additionally, some structural improvements and minor corrections to figures and references will further strengthen the paper.

Reviewer 1

This article presents an overview of a pilot study that will provide an opportunity to test the relative merit of implementing VR immersive experiences in college classrooms. The authors plan to use 360-video, rather than synthetic experiences built in VR, to simulate experiences in international study abroad settings, thus combatting problems of accessibility for economically differentiated students and non-traditional learners with financial obligations that do not facilitate enrollment in expensive study abroad programs. The article is well written and conceived.

Additionally, the authors touch upon several important benefits and limitations of implementing VR in the college classroom, positing that the experience outlined in the article will be nearly if not equally as engaging in terms of content and delivery, despite absence of tactility.

Some points that warrant further consideration and clarification are as follows:

1. The authors delve into the pedagogical rationale behind VR implementation in the college classroom, but the course has not yet been implemented. Will headsets be provided to online users taking the course remotely? Will they be made available only in a university setting?
 - a. *Logistics for students viewing the 360-degree videos (including, VR specs, cost, and options), are discussed in a paragraph added in the "Methodology" section (lines 250-266).*
2. How will the program be made a learning tool? Are their learning objectives associated with the experience so that it can be deployed in other university classrooms? Will learning be assessed in a way that parallels classroom instruction? How will leaders and/or instructors address questions from students? These characteristics of the study abroad program should be clarified in the text, particularly when one of the contemporary critiques of VR implementation in in-person classrooms is how such technologies can be transformed into substantive learning tools. This could be included in the form of a table.
 - a. *The intended learning outcomes and examples of student activities to achieve those outcomes have been added in the "Methodology" section (lines 133-183).*
3. How many students will benefit from the experience? Although high-enrollment courses are mentioned in the introductory section, it is unclear if the experience will be deployed in high-enrollment classes or if this is only the pool from which data will be drawn. This should be clarified early in the text
 - a. *Enrollment expectations have been added in the "Methodology" section (lines 133-142).*
4. Given that one of the aims of this project is to make the study abroad program more accessible, it is important to recognize that students who cannot normally afford traditional study abroad experiences may have financial challenges like limited or poor internet connectivity and inability to purchase personal headsets. How will the authors address problems of bandwidth and equipment when deploying the experience? This should be clarified.

- a. *This is a great point. We've added a paragraph in the "Discussion" section to address this (lines 340-348).*

In general, I find the article a strong contribution to our work as archaeologists to bring the past to life in new and exciting ways.

Reviewer 2

An interesting paper that addresses a gap in the literature on the longevity of benefits resulting from VR displays, and justifies the project on the basis of diversity and opportunity. The literature review does an excellent job covering the existing research, identifying key ideas and themes in the use of VR in cultural heritage and education. A good amount of detail is provided on the nature of the VR tour and how it was created, which will be helpful for readers to contextualise how similar projects can be developed.

As the paper discusses a project that is still in progress and has yet to be fully implemented and evaluated, there is little in the way of tangible data analysis or hypotheses. This isn't necessarily a problem, but I think the paper would be much improved through a clearer discussion of the intended hypotheses for the eventual evaluation studies, and how they relate to the research questions. Several frameworks and metrics are discussed in the literature review and discussion, which will be the focus of the authors' evaluation study for this project? The only clearly defined planned metric is 'the degree to which students opt for the full-immersion headset version of the course', which I think could be influenced by a number of external factors and is not, by itself, a clear indicator of student engagement.

We've worked to clarify the general areas of future inquiry in the "Next Steps" section (lines 350-356, 366, and 371-372). While we don't have the complete list of specific questions at this time, this should help provide a sense for the type of data we'd like to obtain from the studies.

Learning outcomes are mentioned several times, but I'm uncertain how these are planned to be evaluated and would like to know - even accepting that this plan may change as the evaluation draws nearer. It would also help to acknowledge in the abstract that the tour implementation and evaluation is only planned, and has yet to be undertaken.

We've clarified that the goal of this is indeed to present a methodology that may be useful to other instructors rather than focus on the evaluation of the methodology (which will be for a future presentation/paper). We've done this in the "Abstract" (lines 25-30), "Introduction" (lines 49-56), and "Next Steps" (lines 350-356).

Alternatively, if the focus for this article is on the VR tour itself, rather than the future evaluation and its impacts on student learning and engagement, then it would help to have additional details available. How, specifically, is the tour supporting intended learning outcomes? More examples of

the viewpoints, or perhaps some snippets from the narration, or examples of interactive elements could help.

We've added an extended section on learning outcomes and examples of activities that lead to those learning outcomes in the "Methodology" section (lines 143-183).

The article is clear and well-written, but there are a few structural changes I think could help. The discussion of diversity seems to be an important part of the project, but is not mentioned in either the introduction or abstract, and so feels out of place. I think signposting early that this is a significant motivation of the project will help the paper feel more cohesive.

We've added a discussion of accessibility, inclusivity, and diversity to both the "Abstract" (lines 19-21) and the "Introduction" (lines 39-44).

The title of the paper makes it seem as though this will be a broad discussion of a variety of 'immersive' approaches to archaeological education, but really the paper seems exclusively focused on VR, which is a bit misleading. Something like 'Virtual Reality Tours as an Immersive Approach to Archaeology in Higher Education' (although a bit wordy) would I think be more representative of the content

We've changed the title of the paper to the title suggested here (lines 1-3).

Reviewer 3

Review by anonymous reviewer 3, 17 Sep 2024 11:37

This is a robust, up-to-date, well-written and pleasantly short paper on integration of immersive technologies, specifically Virtual Reality (VR), in higher education archaeology courses. I only spotted few points that can be improved:

1. Add call of figures (Fig. 1, Fig. 2).
 - a. *Call to Figure 1 added in line 192.*
 - b. *Call to Figure 2 added in lines 211-12.*
2. In the Fig. 1 caption, mention explicitly that the sequence of numbers (1, 2, 3, etc.) refers to the location, or stations, of the mini-lectures
 - a. *Clarification of meaning of numbers added in caption description (lines 194-195).*
3. In the Fig. 2, mention where the photo comes from (Athens Agora?, station 1?)
 - a. *Location of photo added (lines 215-216).*
4. The DOI of the "Nobles, G., Çakırlar, C., Svetachov.." reference is not properly written. Identically, the Nobles et al. (2019) statement on VR and AR as "pretty pictures" could be discussed a little bit further.
 - a. *Nobles et al. DOI hyperlinked in line 449.*
 - b. *Short clarification added in lines 116-117.*