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Project #3: Proposal
ENC 3241 Fall 2024 Section 4
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Project Title: Empowering Education: Advancing Skill Acquisition Through Augmented Reality in Vocational Training

Project Objective or Aim:

This research investigates how augmented reality (AR) can transform vocational education by enhancing student engagement, technical proficiency, and self-efficacy. Specifically, it will address the question: *How can AR applications improve skill acquisition and confidence in a risk-free simulated environment?* By integrating AR into vocational training, the study aims to develop innovative methods for teaching hands-on skills, enabling students to practice complex tasks with real-time feedback. This project will focus on creating AR modules for skill refinement and evaluating their impact on learning outcomes, ultimately contributing to the development of more effective and accessible educational tools.

Project Background and Significance

Augmented reality (AR) has emerged as a powerful educational tool that bridges the gap between theoretical knowledge and hands-on practice. In vocational training, where skill acquisition often requires immersive and experiential learning, AR can simulate real-world scenarios in a controlled, risk-free environment. This capability is especially valuable in fields where errors during training could have costly or dangerous consequences, such as healthcare, aviation, and technical trades. By integrating AR into vocational education, institutions can provide students with opportunities to practice complex tasks, develop confidence, and refine technical skills without facing real-world risks.

Research underscores AR's transformative potential in education. Kaya and Bicen (2019) found a strong correlation between AR use and improved academic outcomes, demonstrating that AR enhances student engagement and comprehension by making learning experiences more interactive. Similarly, Sirakaya and Kilic Cakmak (2018) highlighted AR's ability to boost self-efficacy, a critical factor for success in vocational settings. This study will build on these findings by focusing on how AR can address common barriers in skill-based training, including the lack of access to equipment and real-world practice opportunities.

The relevance of AR extends beyond general education into specialized fields. Schaffernak et al. (2020) explored the use of AR in pilot education, revealing its ability to improve situational awareness and decision-making in high-stakes scenarios. While this research focused on aviation, the principles of simulated practice and enhanced decision-making are broadly applicable to vocational training in other fields. For example, medical education has also embraced AR, as highlighted by Kuehn (2018), who emphasized how AR enables risk-free simulations of complex procedures. These examples demonstrate AR's versatility in creating interactive, practical learning environments that are both effective and safe.

Vocational education faces unique challenges that AR is well-suited to address. Traditional training methods often require expensive equipment, extensive instructor oversight, and live practice scenarios that may not always be feasible. AR can mitigate these challenges by providing virtual tools that simulate real-world conditions. This approach reduces costs, ensures consistency in training, and allows students to repeat exercises as needed to build competence. Additionally, AR's ability to offer immediate feedback enhances the learning experience by enabling students to identify and correct errors in real time.

The significance of this research lies in its potential to transform vocational training methodologies by incorporating AR to improve student outcomes. The findings of this study will not only contribute to the growing body of knowledge on AR in education but also provide actionable insights for educators and policymakers. For the UCF community, this research represents an opportunity to lead the way in adopting innovative technologies for education. By addressing the challenges of traditional vocational training and exploring AR's full potential, this project will benefit students, educators, and the broader academic community. Moreover, it will contribute to the development of more inclusive, accessible, and effective training tools, aligning with UCF's commitment to fostering innovation and excellence in education.

Research Methods

This research will follow a structured, four-phase approach designed to fully investigate the potential of augmented reality (AR) in vocational training. Each step has been carefully planned to ensure that the objectives are met within the timeframe of the Summer C semester (May-August).

Phase 1: Literature Review (May)

The first phase involves an in-depth review of existing literature on AR applications in education and vocational training. This step will include identifying gaps in current research and analyzing best practices for implementing AR in skill-based learning. Key sources will include peer-reviewed journals, conference proceedings, and case studies. This review will establish the theoretical framework for the project and ensure that the proposed AR modules align with proven methodologies.

Phase 2: Module Development (June)

In the second phase, AR training modules tailored to vocational scenarios will be designed and developed. These modules will focus on replicating practical tasks that students encounter in their fields, emphasizing interactivity and real-time feedback. For example, the modules might simulate assembling machinery, performing technical repairs, or other hands-on tasks that are essential in vocational training programs. The modules will be created using AR development software, such as Unity, and will incorporate elements like 3D models, step-by-step instructions, and interactive problem-solving exercises. This phase will also include usability testing to refine the design before pilot testing.

Phase 3: Pilot Testing (July)

The pilot testing phase will involve a cohort of vocational students who will use the AR modules as part of their training. Before the modules are introduced, participants will complete a pre-assessment to establish baseline data on their technical proficiency and confidence levels. After engaging with the AR modules, they will complete a post-assessment to measure improvements. Additionally, qualitative data will be collected through surveys and interviews to capture students' perceptions of the AR modules, including their usability, effectiveness, and impact on learning. This phase is critical for evaluating the modules' success and identifying areas for further refinement.

Phase 4: Data Analysis and Reporting (August)

In the final phase, both quantitative and qualitative data collected during pilot testing will be analyzed. Statistics will be used to assess changes in technical proficiency and confidence, while thematic analysis will be applied to qualitative feedback. The results will be synthesized into a

comprehensive report detailing the modules' effectiveness and potential applications. Findings will be prepared for distribution through a poster presentation at UCF's undergraduate research conference and a scholarly article submitted to an educational technology journal.

This phased approach ensures that each aspect of the research is systematically addressed, from conceptualization to implementation and analysis. By following this plan, the project will provide robust insights into the role of AR in vocational education and deliver actionable outcomes for educators and researchers.

Expected Outcome

This research will result in multiple deliverables, including a fully functional augmented reality (AR) training module, a research article intended for publication in an educational technology journal, and poster presentation for UCF's undergraduate research conference. These outputs will demonstrate the effectiveness of AR in vocational education, providing resources for future applications and setting a foundation for continued exploration of technology-enhanced learning.

The AR training module will serve as a prototype for integrating AR into vocational programs, showcasing how interactive, immersive tools can enhance technical proficiency and confidence. The module will include features such as realistic simulations, step-by-step guidance, and real-time feedback mechanisms. It will also include a built-in assessment system that tracks user progress and identifies areas for improvement. This product will be shared with educators at UCF and potentially integrated into existing training programs to further evaluate its impact.

The research findings will contribute new knowledge to the field of educational technology, particularly regarding the use of AR for skill-based learning. By analyzing both quantitative and qualitative data, the project will provide valuable insights into how AR can improve learning

outcomes, student engagement, and confidence. These results will also address broader questions about the role of immersive technology in education, offering practical recommendations for educators and policymakers.

For the UCF community, this project represents an opportunity to lead in the adoption of innovative teaching methodologies. The findings will highlight how AR can make vocational training more effective, accessible, and engaging, benefiting both students and instructors. Furthermore, the research will foster interdisciplinary collaboration by combining expertise in education, technology, and design.

The expected outcomes go beyond delivering actual products; they aim to inspire further research into AR's potential across various educational contexts. This project will position UCF as a leader in cutting-edge educational research, showcasing how technology can be leveraged to meet the evolving needs of students and educators alike.

Literature Review

1. Huang, T.-K., Shen, Y.-S., Lin, H.-C., & Wang, D.-H. (2018). Augmented reality (AR) and virtual reality (VR) applied in dentistry. *The Kaohsiung Journal of Medical Sciences, 34*(4), 243–248. https://doi.org/10.1016/j.kjms.2018.01.009
    - This study investigates the integration of AR and VR technologies in dental education, focusing on interactive, immersive environments that enhance students' practical skills. It demonstrates how AR can provide hands-on learning experiences, which is relevant to this proposal's focus on skill acquisition in vocational education.

2. Kaya, O. S., & Bicen, H. (2019). Study of augmented reality applications use in education and its effect on academic performance. *International Journal of Distance Education Technologies, 17*(3), 25–36. https://doi.org/10.4018/IJDET.2019070102

    - Kaya and Bicen examine AR's impact on general education, highlighting improved academic performance and engagement. This study provides evidence of AR's broader educational benefits, which supports the potential for AR to enhance learning outcomes in vocational training.

3. Kuehn, B. M. (2018). Virtual and augmented reality put a twist on medical education. *JAMA, 319*(8), 756–758. https://doi.org/10.1001/jama.2017.20800

    - This article discusses how AR and VR are used in medical training to simulate complex procedures safely. Its findings underscore AR's potential for providing risk-free environments for skill development, a concept applicable to vocational training programs.

4. Schaffernak, H., Lechner, M., & Schranzhofer, L. (2020). Potential augmented reality application areas for pilot education: An exploratory study. *Education Sciences, 10*(4), Article 86. https://doi.org/10.3390/educsci10040086

    - Schaffernak and colleagues explore how AR enhances pilot training by improving situational awareness and decision-making. Their work provides insights into AR's potential for high-stakes training, which can inform its application in vocational education.

5. Sirakaya, M., & Kilic Cakmak, E. (2018). Effects of augmented reality on student achievement and self-efficacy in vocational education and training. *International Journal*

for Research in Vocational Education and Training, 5(1), 1–18. https://doi.org/10.13152/IJRVET.5.1.1

- This study highlights AR's ability to boost students' technical skills and self-efficacy, emphasizing its effectiveness in preparing students for real-world tasks. The findings align with the proposed study's objective of enhancing confidence and skill proficiency.

6. Soltani, P., & Morice, A. H. P. (2020). Augmented reality tools for sports education and training. *Computers and Education, 155*, Article 103923. https://doi.org/10.1016/j.compedu.2020.103923

- Soltani and Morice evaluate AR's impact on spatial awareness and strategy comprehension in sports training. While focused on sports, their findings about AR's practical skill enhancement provide a framework applicable to vocational education.

Preliminary Work and Experience

My background in programming coursework provides a basic technical foundation needed to develop augmented reality (AR) modules for this project. Through the coursework, I have gained proficiency in coding and problem-solving, which will be essential for implementing AR tools. However, I lack experience in educational technology and user experience design, so I plan to collaborate with other students who possess complementary skills. Their experience and expertise in design, coding and educational methods will ensure the modules are both user-friendly and pedagogically effective. In addition, with my technical writing skills I will make sure technical documentation is up to date and properly addresses the users. This collaborative

approach will allow me to focus on the technical aspects of the project while leveraging diverse perspectives to achieve its broader educational goals.

IRB/IACUC statement

This project involves human participants for AR module testing and will require IRB approval to ensure that ethical standards are met.

Budget

This project requires $1,500 to cover the following expenses:

- **Software Licenses**: $500
- **AR hardware (e.g., headsets)**: $750
- **Printing and Presentation Materials**: $250

This budget ensures the necessary tools and resources for successful project execution while adhering to funding limits.