A Proposal to Enhance Learning with Augmented Reality & Digital Games

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Background

- The Ocean Discovery Institute (ODI) is a local non-profit organization that seeks to transform young lives through science.
- Various studies on innovative teaching methods have been examined [1,2,3].
- I have selected a study by Lu & Liu [1] that shows that augmented reality (AR) technology & digital games can be used to increase learning in elementary school students.

Lu & Liu: Results

- AR & digital games can lead to significantly increased test scores (Figure 1A) with elementary school students [1].
- This suggests that these innovative methods increased learning achievement.
- The implementation of the new technologies allowed the historically lower achieving students to perform as well as their high achieving peers (Figure 1B).
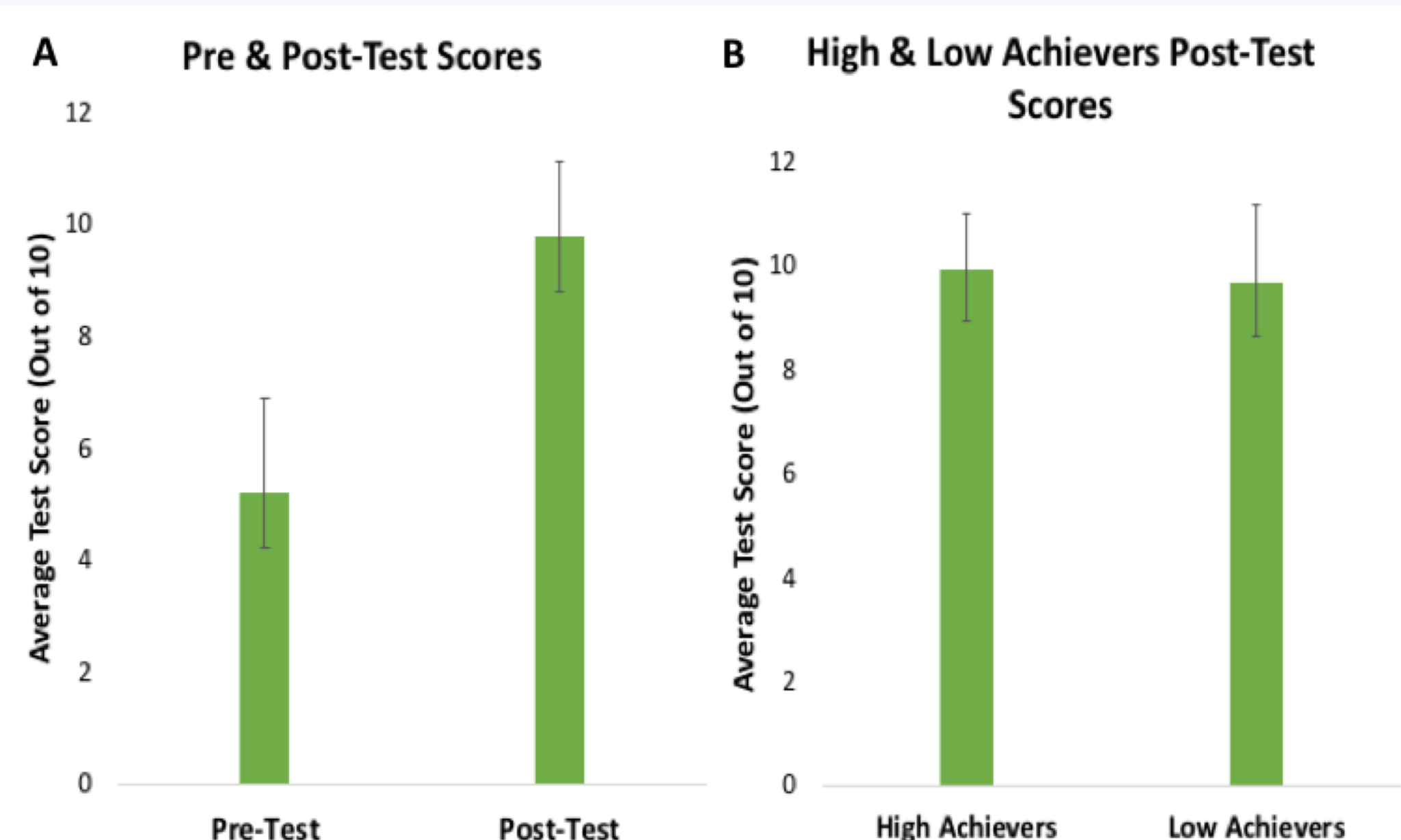- This suggests that lower-achieving students learn better with these method.

Figure 1: Pre & post-test results (1A). The comparable post-test scores of the high & low- achievers are also displayed (1B).

AR System Model

- A webcam captures the image of a teaching instructor wearing a vest equipped with an AR marker. This marker corresponds to a specific invertebrate or vertebrate species. The system then projects both an image of the teachers and a 3D rendering of the species onto a projector.
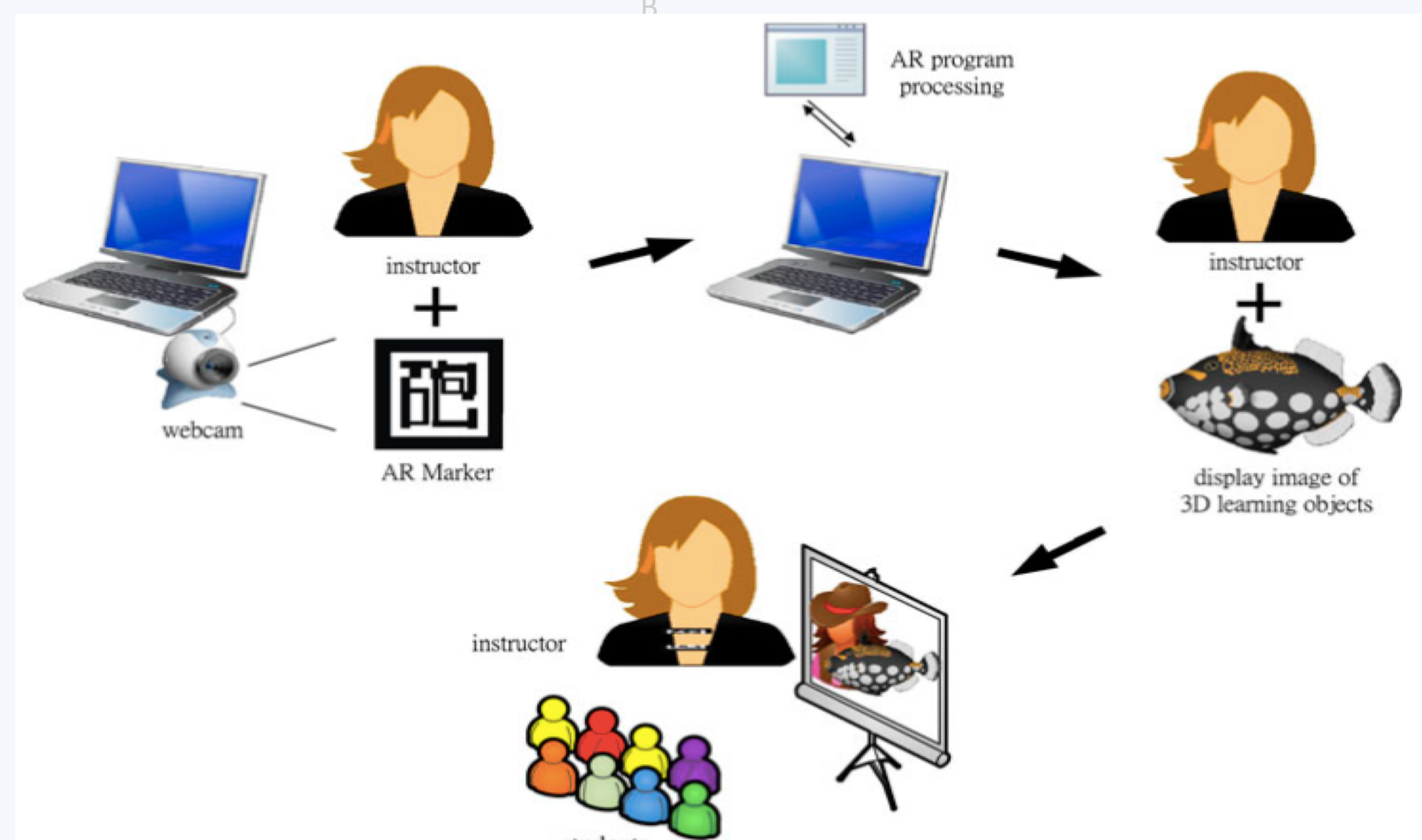

Figure 2: The proposed AR system for ODI's 3rd grade class.

- Teaching instructors act out the characters in the story for the students.
- Students journey through the intertidal, interact with its inhabitants, and learn about adaptations.

Digital Game Model

- The game tests students' knowledge on the material covered in the AR storytelling activity.
- Students stand in front of the projector and are asked true or false questions on species and their adaptations (Figure 3).
- Students answer using somatosensory inputs, specific gestures to indicate correct or incorrect statements.
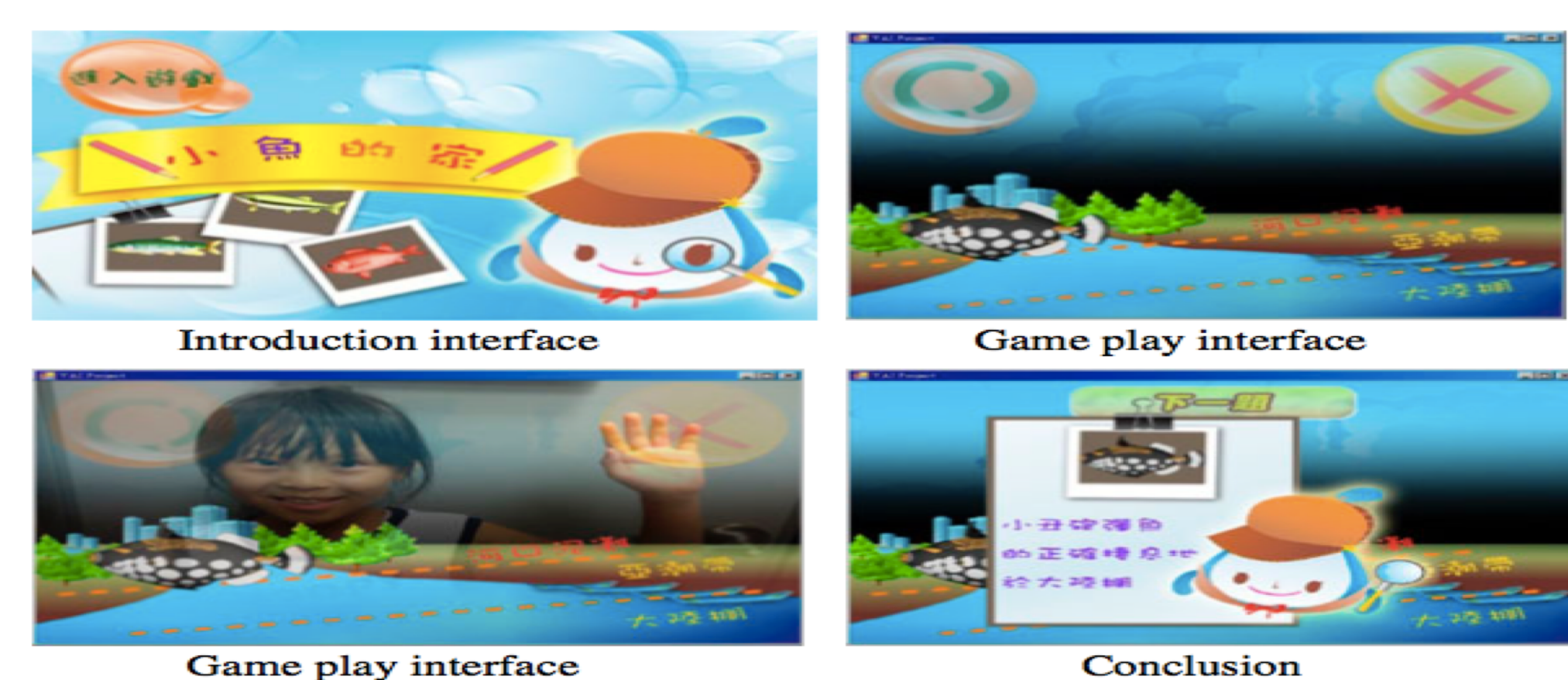- Inputs are registered & the screen displays the correct response.

Figure 3: The interface used by Lu & Liu. A similar game will be designed for the ODI study.

Proposal for ODI

- Design & test the efficiency of an AR system and digital game specifically for ODI's 3rd grade curriculum.
- These teaching methods will be studied with the use of a control group and a test group (Figure 4).
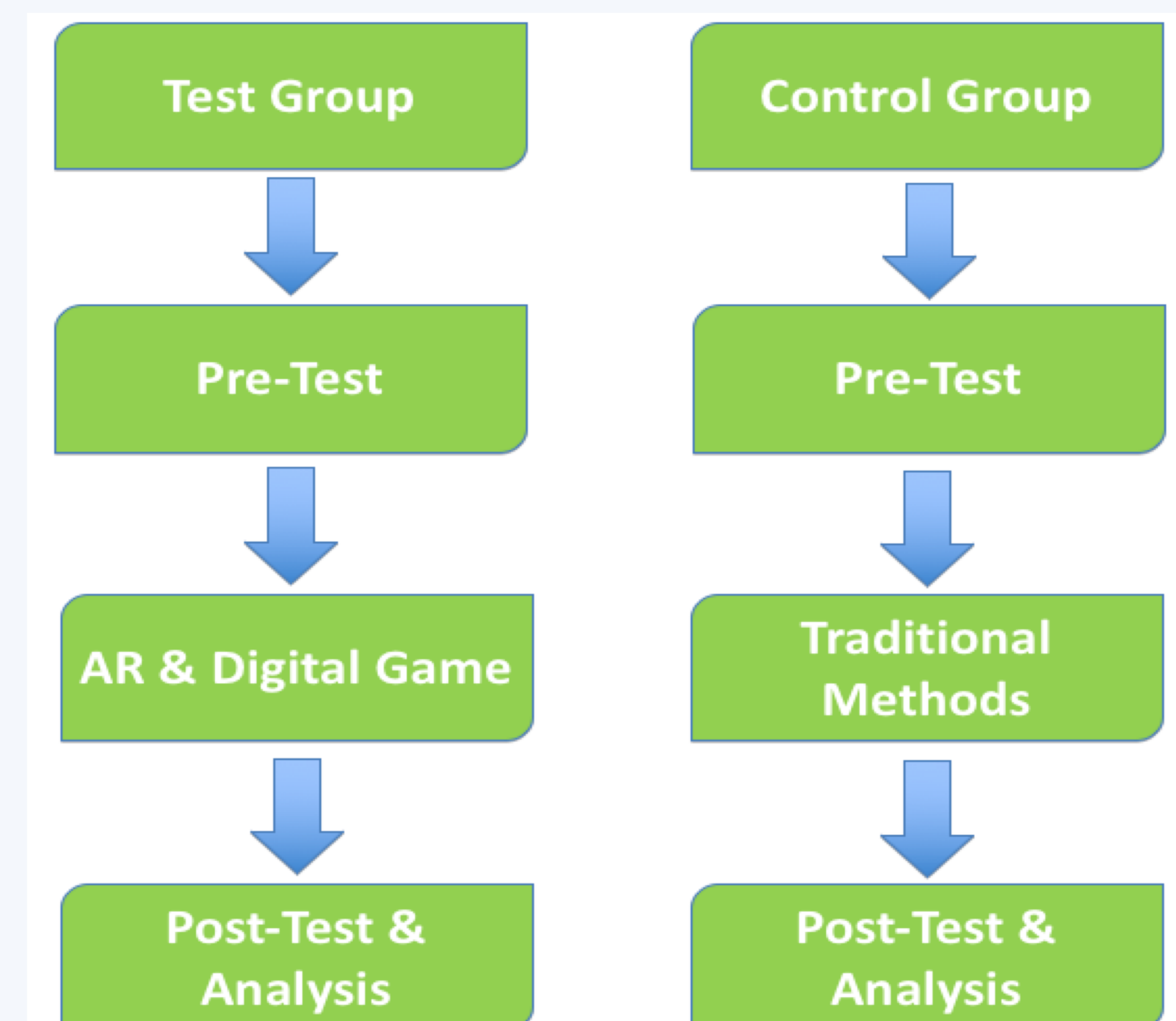

Figure 4: Depicts the proposed experiment model.

Requirements for Implementation

- Engineers to design the program.
- ODI's "The Living Lab" to be equipped with the necessary technology.
- Extensive teacher training on the AR system.
- Classification of students as high or low achievers.
- Three teaching instructors per activity.
- Statistical analysis to determine if the proposed methods increased students' learning achievement.

References

[1] Lu S, Liu Y (2014) Integrating augmented reality technology to enhance children's learning in marine education.
[2] Su T, Cheng M, Lin Shu-Hua (2014) Investigating the effectiveness of an educational card game for learning how human immunology is regulated.
[3[Kerawalla L, Luckin R, Seljeflot S, Woolard A (2006) "Making it real": exploring the potential of augmented reality for teaching primary school science.