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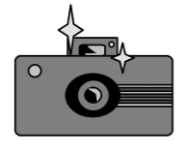
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Diverse Avatars and Inclusive Narratives in Virtual Reality Biology Simulations

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ABSTRACT

Virtual reality lab simulations were reviewed using a process that encouraged the use of diverse avatars and inclusive environments. In a partnership between the School of Life Sciences at Arizona State University, ASU EdPlus, and Labster collaborated on a process for developing online content that was built with a cultural values framework for language, empathy, and diversity and guided the development of new simulations. This resulted in a proactive process for creating content that was more supportive of ASU's diverse and online student population.

Keywords: Diversity, Virtual Worlds | Augmented Reality

INTRODUCTION

Arizona State University's mission includes the statement that "we are measured not by whom we exclude, but rather by whom we include and how they succeed." This mission is infused throughout ASU, and filters into all new initiatives on campus. Inclusive language and equitable teaching practices, although not mandated by the university, have been slowly integrated into classrooms with a number of training opportunities by ASU faculty including Renee Klug, the ASU International Educator, and supported by research by Sara Brownell, PhD, Director of the Research in Inclusive STEM Education (RISE) Center.

ONLINE BIOLOGY DEGREE

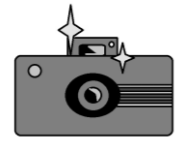
In 2017, Arizona State University (ASU) embarked on creating a fully online biology degree. The challenge was how to develop three lab courses that would meet the degree criteria and offer a quality lab experience for students. In partnership with The ASU School of Life Sciences (SOLS), EdPlus, Labster and Google, ASU incorporated virtual reality into three new courses for the online biology students. The lab courses used virtual reality headsets to immerse students in real world simulations to learn concepts typically taught in traditional lab classes. Headsets were provided for

students that were interested in using them, however, the simulations could also be done in a browser.

Labster developers worked with content designed by ASU faculty to create lab simulations. All the simulations sought to move away from simply replicating the traditional laboratory experience, and instead capitalize on the narrative and presenting life-like cases. Stories were developed that expanded a student's experiences to include the core science concepts, safety protocols, lab technology and analyzing results found in traditional labs. Examples of this included students gathering field samples and traveling back to the lab for experiments, and identifying local challenges through observations and conversations in an environment. One lab even had students exploring a completely new planet to apply knowledge to an unknown environment.

INCLUSIVE CONTENT CONCERNS

During initial testing of simulations, there were overwhelmingly positive responses on the use of narratives, engaging visuals, and clear learning experiences. Students also commented about feeling immersed in the virtual world. They also felt empathy for the avatars and their challenges in the virtual world. For instance, in one simulation, with a patient who is pregnant, students learned about the fetus' and possible



birth defects. Students commented on “feeling sorry for her”, and that the medical professional did not seem to care about the difficult decisions the mother would need to make.

Additionally, some themes regarding diversity and inclusion began to develop that were concerning for the SOLS instructional staff, including stereotypes, microaggressions and insensitivity. Students mentioned that the simulations had older, Caucasian male researchers, and females were often lab assistants and secondary characters. In another example, a researcher went to the field to study indigenous people. Some students commented that they were not treated respectfully, and students felt that these avatars were stereotypes.

A specific example of a microaggression was in the lab safety simulation. Students were introduced to a female student and asked questions about the proper dress code for a lab. The specific question was “What is wrong with this woman?” Wrong answer choices included “She walks weirdly” and “She has terrible taste in fashion.”

DEVELOPMENT OF CULTURAL VALUES GUIDELINES

ASU School of Life Sciences, EdPlus and Labster teams met to begin to develop a plan for developing content that reflected our diverse students, and was inclusive to all communities.

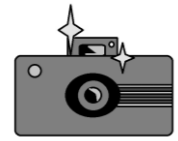
A team was chosen for this project that consisted of ASU students, faculty and staff, as well as team members from Labster. The ASU members were selected based on their interest, research, job positions, or work with related issues in diversity and inclusion. The ASU Committee for Campus Inclusion provided members, as well as the ASU Disability Resource Center. These members had already been through some training and experiences with the issue, and were advocates for the importance of creating inclusive learning environments where different perspectives were valued and everyone was able to actively participate. Every attempt was made to include members from a broad definition of diverse communities including race, gender, religion, sexual orientation, age, physical abilities, and lifestyles.

The Inclusion Team was tasked with developing a specific list of standards to be used to review biology simulations that would assess storylines for inclusive content, and avatars for diversity. They would also create a review process, communication guidelines, and complete reviews on the simulations being developed for two additional courses in the biology degree program.

Initially, the team met, were introduced to the current examples of concern. They went through training on understanding challenges for international students, recent research on inclusion in science classrooms, and were introduced to Bennet’s Model of cultural competency, often used in medical training, to show the process by which people learn to value and respond respectfully to people of all cultures. Examples of avatar interactions were shown, and the team determined the avatars level of competency based on the model. The second part of the training consisted of a dialogue about ASU demographics of online students and how all these concepts could be applied to online simulations, and student/avatar interactions.

The team then developed a “Cultural Values” document to be used for designing simulations by both Labster and ASU employees. It focused on creating a framework that would allow flexibility, but could also be used as a guideline for reviewing content. It included the following five themes, with examples to show how each could be implemented into simulations:

1. Language: Text, voice, and discussions should focus on description over judgement. Descriptions are observable, literal facts, as opposed to a judgement statement that is an interpretation or evaluation of what the viewer may feel about what they see.
 - a. Example: Developers should consider using “Is this woman dressed appropriately to work in a lab?” instead of “What’s wrong with this woman?”
 - b. Example: Developers should apply empathy from doctor to a patient for the difficult decision involving a possible abortion of a fetus, instead of only following the technical steps needed to show a process
2. Diversity: Simulations should include a broad lens for creating avatars, and avoid cultural assumptions.



- a. Gender example: Developers should consider using women as lead researchers and doctors, and avoid using them in stereotypical roles of administrative assistants, and victims.
3. Race, Culture, Ethnicity example: avoid typical stereotypes and accurately and respectfully show diverse people as community leaders
 - a. Example: Researchers should be shown consulting with indigenous people and their leaders, and respectfully conducting their research in compliance with the community's values.
4. Religion: Include broad examples of world religions respectfully, and include people with diverse beliefs as scientists
 - a. Example: Developers should consider creating avatars wearing religious symbols like a cross, kippot or hijab, having religious items on office desks, and considering religious preferences with patients.
5. Disabilities: Include broad examples of people with disabilities working in the science industry.
 - a. Example: Developers should consider implementing lab equipment with assistive devices for helping researchers with disabilities, like ramps, audio weight scales, screen readers, etc.

IMPLEMENTATION OF CULTURAL VALUES GUIDELINES

After the Inclusion Team agreed on these values, a new process was developed for reviewing all simulations. First, Labster posted the guidelines within their offices, and encouraged their developers to be mindful of implementing avatars that met these standards when working on simulations for ASU. They encouraged dialogue and internal reviews of designs based on the guidelines.

Second, the Inclusion Team acted as a review team for current simulations being developed. A form was set up that would allow individual members to input comments during the review that could be shared directly with Labster developers. Along with specific details about a possible problem, members included specific details about where it could be found in the

simulation, and possible suggestions for changes that would make it better. After forms were filled out, the team met informally to review comments and prioritize potential changes. Once Labster had implemented changes, the team reviewed the final simulation to approve the changes.

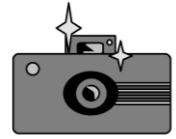
As expected, the review process was initially awkward, however, the resulting dialogue afterwards supported team members' comments and gave them confidence in their feedback. Labster team members encouraged the comments, and listened openly, and reacted quickly to fix concerns. By the third round of simulations, team members commented on seeing examples of Labster's proactive development of diverse characters, including the creation of non-gendered avatars, and respectful interactions between avatars.

ONGOING EFFORTS

Beyond the initial three lab courses, developed with Labster, the cultural values document has influenced a variety of other situations including:

1. Labster incorporated questions into their standard beta testing and focus groups, that would prompt users to comment on the diversity of avatars, resulting in more feedback before implementing simulations
2. Instructors began questioning diversity and inclusion used in simulations outside of Labster, including 3D anatomy apps and publisher content in textbooks.
3. SOLS developed a review process for all online courses, and included reviewing content covered in the cultural values document. Specific standards in the review looked at whether content was global and inclusive, supporting diversity and valuing different perspectives

In conclusion, each step we've taken, pushed our lens out a little further, and reflected our values for portraying a more diverse population, and a more inclusive laboratory for our students. This is a top-down approach to creating content and therefore has limitations. Future studies might include surveying users in order to better understand their values, and modify the cultural values document to be more inclusive of their needs. However, every effort was made to create a team that reflected diverse perspectives and beta testing with



students allowed users to freely comment on all aspects of their experience. Although not formally assessed, comments regarding stereotypes from students were significantly lower in the latest set of simulations. Admittedly, our work continues, and as new research in this area appears, the Inclusion Team continually works to improve the training and review process, confirming that our biology content reflects our cultural values at ASU.

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