Names: Benjamin Nathan, Harshil Agarwal, Daniel Kim, Lani Akinwale, Alex Campbell, Nickey Zhang, Markell Morris
Team: VISTA
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Identifying Stakeholders and Equity Impact

Team VISTA's project aims to develop virtual learning software accessible to individuals who cannot perform in physical labs while emphasizing interest in science and demonstrating mistakes and realism in the lab. This topic falls deeply into accessibility, and some concerns about equity in virtual labs include a lack of internet access, students with disabilities, and school funding/resources.

Equity Concerns:

In the current research field that Team VISTA is in, one issue that students who have to perform virtual labs face is a need for internet access. Approximately 7% of children in the US had no access to the internet at home, and another 4% relied on their smartphones for internet access ("Children's Internet Access at Home", 2023). Without internet access at home, one of the main benefits of virtual labs, their accessibility of not requiring physical presence, is lost. Having to rely on a smartphone for internet access could also have the same effect, as smartphones may not support programs to do virtual labs.

Another issue that may be present in virtual labs is a lack of accessibility for students with disabilities. Many virtual labs do not include accessibility options for students with disabilities. In "Review Of Virtual Labs As The Emerging Technologies For Teaching Stem Subjects" (Lynch & Ghergulescu, 2017), it was found that four out of 18 virtual labs used in mainstream education in Europe had options for students with disabilities. Not even a quarter of these labs have options for disabilities, and even then, not all of these accessibility options are

available in these labs. For example, some labs focus on language and learning disabilities, whereas others focus on hearing and viewing disabilities (Lynch & Ghergulescu, 2017). Additionally, as students have disabilities of all kinds, it is essential to consider their opinions and needs because it is Team VISTA's goal to support students who cannot perform in physical labs. The main individuals who would primarily be unable to participate in physical labs would be students with disabilities.

Finally, school funding and resources are other equity factors to consider when creating virtual labs. Schools in poorer areas of the country receive less funding from their state than more wealthy areas. According to the research article "Funding Gaps: An Analysis of School Funding Equity Across the U.S. and Within Each State" (Morgan & Amerikaner, 2018), across the country, the areas with higher poverty receive about $1,000, or 7 percent, less per pupil in state and local funding than the districts with lower poverty. This disparity in funding negatively impacts the educational quality of lower-income communities, preventing them from creating certain programs and having access to technological resources. More specifically, poorer districts' lack of school funding can limit their access to amenities such as virtual labs.

Equity Considerations:

Research Question Design: Ensuring equity in the research question design enables Team VISTA's research to include equity. Including words such as "affordable" or "accessible" keeps these goals at the forefront of the research agenda so that these factors are included in the final product.

Methodology: Including equity in methodology is also important, and Team VISTA plans on doing that by making sure that any data gathering (such as surveys or using existing databases) will put into consideration from whom data is being gathered in aspects such as

income level, education level, disabilities, etc. Considering the factors that may have influenced how a person thinks and acts will allow our research to be more open-minded and thoughtful.

Sources: Sources could fail to reflect equity if our team only gets information from one or a few perspectives. If we use sources from different fields and studies, our research will hopefully incorporate more viewpoints, including those from less represented viewpoints. Proper crediting and citation could also go a long way.

Team Composition: To consider equity in our team composition, we will create an inclusive and supportive environment where everyone's opinions are valued and heard. We should foster open communication and encourage active participation among our team members, regardless of background or experience. Open communication will allow for diverse perspectives, and these viewpoints will enhance our discussions and decision-making processes, resulting in more innovative and effective solutions. We can incorporate regular check-ins to allow team members to voice their opinions and address any issues that may arise. Our ultimate goal in terms of equity in our team is to provide an environment that values equity, respect, and cooperation so that every team member can contribute to our success as a whole.

Dissemination of Research: Ensuring stakeholders are aware of our research is an integral part of equity, so our team will make an extra effort to ensure that some groups that typically would not hear about our research do. For example, students are not likely to learn about our work and are among the most affected groups, so using strategies to ensure our research is disseminated to students could be a good idea. We can also prioritize the accessibility of our research by disseminating our findings through various channels, such as open-access publications, online platforms, and even community presentations. We can also ensure that our materials are available in various formats.

Significant Stakeholders:

Students, educators, and school administration/government are the individuals most significant to Team VISTA's research.

The main focus is on students because they are the individuals that virtual labs impact the most. Whether the virtual labs are effective or not is up to them, and the project's goal is to ensure that the students can learn and grow from using virtual labs. All opinions must be considered, even opposing opinions. For example, while virtual labs have proven to be an effective educational tool, the study "Exploring Diversity, Equity, and Inclusion in Remote Laboratories" (Paul et al., 2023) revealed that 33% of students identified various distracting elements in virtual labs, including timed sessions, connectivity issues, interface complexity, and the requirement to be online. Team VISTA's goal is not only to add a physical component to virtual labs but to generally improve virtual labs as much as possible. Given this, the research question must include ways to improve virtual labs as a whole. Additionally, with this information in mind, Team VISTA will closely scrutinize the lab interface to mitigate any potential distractions it may pose.

Aside from students, educators, such as teachers, must be considered, as they are the individuals implementing and teaching these labs. More specifically, they are the individuals assigning both virtual and in-person labs. They are one of the best resources in ensuring that our labs, which are an attempt to improve upon current labs, are educationally beneficial. A few educators have shared opinions stating that virtual laboratories fall short of fulfilling the educational standards attained through physical labs. However, Team VISTA is determined to alter this perception, and to achieve our objective, we require the involvement of teachers (Bohr,

2014). Additionally, since teachers would be implementing these labs, Team VISTA must ensure that we create a product that can easily and quickly be set up by teachers.

Finally, school administration and government must be involved in research equity consideration because they choose what labs to use for their schools, influence curriculum, and direct funds for resources such as these. As referred to previously, locations with higher levels of poverty struggle with money and funds. As a result, Team VISTA must consider situations where districts may not be able to afford the virtual lab resources (Morgan & Amerikaner, 2018). In considering the equity of spreading the right to education, they must consider not just how well the virtual labs work but whether they are accessible to be used or applied by school districts.

Stakeholder Table:

Name	Reason for identification	Type	Ways to engage
Students	- Students are the primary users - Results are based on student performance	Individuals	Surveys about previous experiences, problems, and suggestions; interviews to hear about other context and feedback
Students with disabilities	- Aim to make virtual labs more accessible for students with disabilities thus their opinion matters the most, as these labs would directly impact them	Individuals	Similarly, for students without disabilities, surveys to garner opinions and wants in virtual labs would help. There are many different types of disabilities, and making virtual labs accessible to students with the most prevalent disabilities would help with their education, so getting their input through surveys and interviews would help

			expand equity.
Educators	- Actually implement and teach labs - Must also understand labs	Individuals, union	Surveys about what to replicate and how to make it easy to implement, interviews to provide an open platform to hear other ideas, emails to set up meetings and send surveys
Parents	- Care about, support, and scrutinize education systems - PTA's pay for many school resources	Individuals, organization	Surveys to see what parents value in the STEM education of their children, interviews to hear any concerns that students have expressed to their parents that may not have been captured in other engagement methods
Tech Companies	- May support R&D - May buy the project - Could industrially scale the project	Companies	Apply for grants to potentially receive resources or money for research and development, emails to connect with professionals and get feedback and suggestions on the research process and product design
School Districts	- Virtual labs would be implemented into their schools' curriculum/funding	Government bodies	School board meetings to engage with school administration and those setting policy/curriculum to see how to fit into broader education plans, emailing board members to understand political opinion and feasibility of implementation
School Administration	- Help direct curriculum implementation and resource acquisition	Government body	Emails with administrators to determine whether they

			see the project as feasible, beneficial, and relevant to their institutional educational goals, Interviews with specific administrators to hear feedback in more depth
Local Government	- Help allocate funding for labs - Influence on the budget allocated for the school district	Government Organization	Visit local council meetings to possibly receive funding for specific implementation/pilot projects, emails to initially gauge support for this idea
Investors	- Help give funding to lessen the burden on schools	Individuals, companies, non-profits	Investors are vital for Team VISTA to find grants for, as they are the individuals who are able to fund projects for education and may be interested in the actions that Team VISTA is doing. Meet/email them to see how Team VISTA's goals align with theirs and how they can all support one another and help the people around them
National Government	- Help set curriculum - Provide funding - Endorse product to school districts	Government body	Grants from the Department of Education and other government programs that fund such projects, meet/email with officials to see where VISTA can fit into national school curriculum projects and policies
General Public	- Form most of the reception to research	Individuals	Surveys to gauge public support and public

			opinion, interviews with demographics not represented among other stakeholder groups to ensure hearing all relevant feedback and suggestions/ideas

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