Sample Appendix

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Open-Ended Responses from Educators on Emerging Technology for Student Instruction

Note: Responses have been sorted by topic for your reading convenience. If a response has multiple topics, you will find it repeated in multiple sections.

APPENDIX

Q: "Last, we would ask you to be our futurists and look five years ahead. This is your chance to speak directly to the product development companies in science and STEM/STEAM education. When you think about emerging technology (for example: virtual reality, augmented reality, the Internet of Things, coding, biotechnology, etc.) what do you believe has the most promise for student instruction? Please give specific examples."

Virtual Reality & Augmented Reality

786 respondents included some form of "virtual or augmented reality" in their answer. Verbatim responses are listed below.

- Virtual Reality/Augmented Reality - The ability to explore uninhabitable places without risk to harm and to test prior to production make these fields important."
- Virtual reality - opportunities to see and do things that are not possible in the classroom.
- Virtual reality, because it can make it possible to take field trips without leaving the classroom.
- Augmented reality
- I think coding is imperative and more computer science courses. I like the virtual and augmented reality, but it's difficult for teachers to find time for it in their classrooms. Problem solving needs to be a big push, as well.
- 3D printing and virtual reality experiences.
- I believe augmented reality has the most promise for teaching our students how to handle the problems of the future.
- I believe that providing students the opportunity to experience virtual reality would be most promising; they could visit a research lab and "help out" the scientists that work there--help to conduct the testing, use the high-tech equipment, etc.
- Students must have exposure to current trends, which means we need more direct communications with the real world. Would like for all my high school students to have coding understand the Internet of Things, and exposure to virtual and augmented reality.
- Virtual reality...students learning it from storyboard to programming to finished product; coding and robotics for engineering students
- Virtual reality would be fun to learn to use to bring the advanced science topics to life! For example, 3-D crystallography would be neat to share structures of solid crystal structures of substances.
- VR
- Virtual and augmented reality for all subject areas to help student better learn. Examples: dissecting a heart to view how all chambers function; analyzing how instruments work; becoming involved with math manipulative to discuss area or other features; Meeting "people" from the past

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- Teacher's expertise in using technology as a tool to help deepen student understanding. It is all about good instruction and outcomes. These technology tools just deepen understanding and align with industry standards. It also deeps student engagement. It is a combination of instruction and virtual reality.
- Virtual reality. I think that most students are going to have to interact with a virtual world in their careers and it is important that we are building their skills in this area.
- More access / less expensive options for education so that we can incorporate innovation more easily during the school year. More virtual reality options that is true and realistic. Robotics
- Introduce students to the concept of STEM Design Thinking and learning how to address failure as part of a growth mindset.
- Virtual reality. Urban and very rural districts may not have the resources or ability to expose students to the world beyond their own boundaries. This type of technology, while not an exact substitute, can help narrow the gap.
- Virtual reality - example one of our high schools is using virtual reality to explore the internal human body.
- Virtual reality field trip experiences and mentoring opportunities
- Virtual and augmented reality
- Virtual/augmented reality to bring ideas to classroom.
- Virtual labs that are linked to classroom presentations such as peardeck so teachers can not only show students all types of information, but the computer can collect and process the information, so the majority of time can be spent on analysis.
- Augmented reality
- It seems to me that virtual reality and augmented reality could be an amazing resource in the classroom once it becomes cheaper and mainstream. I love that these technologies allow students to ""experience"" concepts that cannot be experienced in real life. Example: Atomic Structure, Body Systems, Space, Etc. I don't see coding being implemented into my science class any time soon. There isn't enough time to cover the state standards, let alone added projects. :("
- Virtual reality and augmented reality I could imagine would be incredible for science and STEAM instruction. I haven't seen what emerging technology is capable of so this is challenging to answer. I just know that the more engagement that can be achieved, the more learning and skill development in students will consequently also be achieved.
- Using virtual reality with robotics, such as training students how to use systems like the Devinci.
- My students love anything that is hands on. I think virtual and augmented reality would greatly enhance stem curriculum.
- Since I teach Earth Science, I feel that any virtual reality products would greatly benefit student interest and growth. In Earth Science, teachers cannot provide tactile lessons to a great extent. For example, the moon cannot be pulled down and inspected. We must rely on pictures and/or films to enhance our learning and teaching. If there were a way that the students could feel that they were a part of the systems, I think that they would be more eager to learn.
- Coding, virtual reality / design
- Augmented reality: to further expand the sharing of information on a global scale"

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