Augmented Reality: Educational Resource of the Future

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Augmented Reality: Educational Resource of the Future

**Augmenting Reality**

Reality is the world or state of things as they actually exist. From an educational perspective the world that exists are textbooks, classrooms, models and drawings, instructors, computers, and the information that they can convey to the students. The information is usually presented as a two-dimensional representation with limited information. Due to the limited space and lack of a movable third dimension, explanations have to be carefully worded to show the correct context and placement. All teachers and students are affected by the limitation of the two-dimensional representation. However, augmented reality allows users to enhance the physical world by displaying a three-dimensional virtual object in reality. Which is why augmented reality will replace many of the existing technologies in education.

**The Problems**

In an education environment with limited time frames and rigid course materials instructors must teach full classes of students with various learning styles. There are four learning styles according to the VARK inventory system; visual, aural, verbal, and kinesthetic. Visual is learning while looking at a representation of what is to be learned about. Aural is hearing about the topics. Verbal is reading and writing about the topic. And Kinesthetics relates to touching and moving the object which is the focus of the topic. While only using two dimensional representations instructors must leave out the kinesthetic and part of the visual elements while teaching. This becomes a hinderance to not only the student but to the instructor as well, because there are students whose learning style would benefit from a hands-on approach. As some students are slower to grasp complex concepts instructors tend to slow the course causing more and more delays. Drago and Wagner showed differences in VARK analytics of each participant in the four styles in their paper (Drago and Wagner, 2004.) However, some instructors have found ways to combat those complex systems with the use of models and props (training aids.) Training aids allow instructors to show three-dimensional objects and how they work. The main problem with this is the high cost, when allowing for each student to utilize one, this means very often only the instructor has the model and student interaction with it is limited, due to the potential for damage and availability. As shown by Chang et al. there are many use cases for augmented reality in education in areas like physics, geometry and chemistry (Chang, Morreale, and Medicherla, 2010). These training aids can also become obsolete when newer information is made available requiring a new purchase to update the information for accuracy. One training aid per classroom leads to a secondary problem, viewing a small model from the student’s perspective can be quite difficult due to placement of student versus instructor in the classroom. Students who do not sit directly in front of the instructor will not be able to observe the model one hundred percent effectively. In regard to training aids geographic location can also play a pivotal role in which training aids are available. Instructors who are geographically located to a resource will have an easier time obtaining that resource. For example, an instructor close to the coast will be able to show and teach more in depth about coastal and oceanic habitats, while those who are geographically close to a desert would not have access to the same materials. This presents the problem of how do we get the resources or an equivalency to everyone?

**Complex solution**

Augmented reality is an overlay to the physical world that can show information, virtual objects, and other visual data to a user. Suppose an instructor needed to show a water molecule, in todays environment a small model would be shown to the class, a drawing would be made on a projection device at the front of the class, a textbook page would be given, or a website would be given for the students to look at the molecule in two-dimensions. With augmented reality a student could interact with a virtual three-dimensional model of the molecule and view pertinent details while engaging in class discussion. Furthermore, complex systems can be modeled in layers so when one layer is removed more information can be viewed about how the system works together. Billinghurst and Dunser show that augmented reality’s interactivity helps kinesthetic, visual, and other non-text-based learners learn. (Billinghurst and Dunser, 2012.) For geographic specific topics three-dimensional models can be rendered to give more access to students around the globe. A rendering of a starfish could be utilized in the absence of an actual starfish. Moreover, how something moves, or lives can be accurately represented with an animated three-dimensional model which could be a better tool that a stationary physical one.

**Education**

Augmented reality with the ability to show information in an organic way as well as the ability to show interactive models will allow students with various learning styles to find topics of interest which may not have been identified, due to varied course material presented in an interactive and visual way. Grasset etal. stated, “People liked to discover the system and interact with the various features. They were particularly amazed by the visual effects and the animations (e.g. the morphing of the cow associated with a darkening filter effect)” (Grasset, Dunser, and Billinghurst, 2008). This could provide a more organic way of learning about a given topic which lends itself to this style of learning examples are geography, art, anatomy, and any other subject that could benefit from a three-dimensional model. Vate-U-Lan showed that with a simple pop-up book education in elementary school students showed an increase in enjoyment of learning (Vate-U-Lan , 2011.) Augmented reality is not limited to three-dimensional models either, two-dimensional representations can also be rendered such as text books and webpages. Students may find learning easier or more fun if visual representations that were interactive and alterable are presented.

**The Future**

Augmented reality in the future could provide student with cheaper learning aids that are robust and alterable. Virtual textbooks, models, and on-demand information could lead to a more organic learning environment as well as interest in subject that have long stagnated. The on-demand information that augmented reality could provide instant information such as price, dietary information, and history can help everyone make more informed decisions as well as provide points of interest to someone who would know to ask for the information. Lee predicts that augmented reality tools will be developed as it becomes more available (Lee, 2012.) As with smartphones the societal impacts there are many short-term detractors as was seen in the case of Google Glass; Privacy being the biggest concern. An individual’s right to privacy extends both to the user and to anyone the user observes, and unfortunately augmented reality uses cameras to observe the world around it. However, the scope of this paper is in an educational setting and the use of the devices would be deemed as consent.

**Conclusion**

By allowing teachers to show students interactive three-dimensional representations of physical things, augmented reality could be a cheaper and more interactive way to learn about the physical world. As well as how it works, and its history. From geography to chemistry, and from art to physics enhancing the world around us with more information (which can be toggled on or off) will lead to a better understanding of the subjects that are being taught. A more natural way to learn those subjects. And a better range of subjects which can be covered in-depth. Augmented reality will replace many existing technologies in education.

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