Emerging Technologies and Learning: Augmented Reality in K-12 Learning

EME 6055 Final Essay Paper December 2019

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Vision of the Future Classroom/Training

"People around the world are taking their education out of school into homes, libraries, Internet cafes, and workplaces, where they can decide what they want to learn, when they want to learn, and how they want to learn." So say Collins and Halverson in their 2009 publication *Rethinking Education in the Age of Technology: The Digital Revolution and the Schools* (p. 1), and this is a key part of my vision for the classroom of the future. I derive some inspiration from Ivan Illich's renowned work *Deschooling Society* (1971); not that I am advocating "a society which has disestablished school" (Illich, p. 52) but one in which there is more freedom to choose a child's style of education, one in which the state works hand-in-hand with families and the community. Some degree of freedom already exists, with options for home schooling and, in many U.S. states, for online schools in the K-12 system. My vision, though, approaches K-12 education by involving the family and community to a much greater extent.

Collins and Halverson describe the way in which responsibility for education is moving back to parents (for younger children) and individuals (for teenagers and adults): "In the current era people interested in getting ahead are taking back responsibility from the state." (Collins & Halverson, 2019, p. 6) In my vision of the future, children may still be educated at a "school" location but there will be greater state and local support for those who want to home school their child or arrange private tutoring for them, or enroll them in an online or virtual high school. As envisioned by Collins and Halverson, learning centers will also be more robustly supported as a strong alternative for children to pursue high school and possibly the full range of K-12 education, with technology on hand that they might not have access to at home.

My vision puts a great emphasis on situating children in their community. Local businesses, the local library, museums, and city government offices are all involved. For every age group, children are taken or sent out of school into the community for educational activities. These activities are open, too, to children who are being home schooled or who attend online or alternative schools. All parents/guardians will be strongly encouraged to participate and to involve their children.

These in-the-community educational activities will begin at an early age, with parent/guardian and/or teacher involvement in taking young children out. In higher grades, children will be able to venture out on their own or in groups. Year by year, the child gains more confidence and self-individualization and will identify and move toward a career or higher education. Specific details of activities and assessment are provided in the next section, "Vision of One Particular Type of Emerging Technology."

Examples of potential activities are:

- Visit to the Mayor's office
- Attend city council meetings
- Museum tour
- Project at the local library
- Visit a local business e.g. lawyer, hardware store, animal hospital, doctor's office, newspaper/local publication, architect, farm

Examples of learning/projects:

- Local history
- Citizenship
- Local politics/town government

- Running a business
- Customer service
- Medical front/back office
- Animal husbandry

Some of these learning examples point in the direction of apprenticeships as a potential course for children to pursue after graduating high school. These are available already in the United States ("Apprenticeship.gov") but not emphasized as much as, for instance, in the United Kingdom where a child can complete their high school education at age 16 and move into a paid apprenticeship. (National Apprenticeship Service, 2019) Apprenticeships form part of my vision for the future as a very acceptable alternative to college or university. The sort of community-based educational activities I am recommending can feed into apprenticeships if that is the route the child wants to go.

This vision uses the constructivist learning theory that situates the child in real-life environments. It will include problem-based learning (Jonassen, 2011), where a teacher or community member or business owner creates a hypothetical scenario. The parent/guardian and child may be given a choice of learning scenarios that interest them. For older children, the learning activity may be moving toward an apprenticeship. For younger children, it will be more of an interest/discovery activity.

Children will be able to work collaboratively on projects, if they choose. Home-schooled, alternative-school and online school students may be included in groups for this purpose. Students will be motivated in an ARCS-style model: Attention will be aroused and maintained by the child's involvement in choice of activity as they will be pursuing something that interests them; the activity will be Relevant to the child's interests and short- and long-term educational

goals, planned out between child, teacher, parent/guardian and whichever other figures are involved in the child's education; the child will grow in Confidence year-on-year as they increasingly participate in such activities and become a valued member of their community (and any shy students will have been prepared and getting to know the people and environment ahead of time and very involved in choosing it); Satisfaction will be high, again due to the child's participation in the decision-making and planning process and the level of engagement in fun, varied activities that get them out of the classroom (whether school, home or online) into the "real world" and community, also due to feedback from community members as well as educators; Volition will be maintained because students will have clear goals for each activity and will also increasingly be making longer-term goals for their education and career.

The educational activities will use augmented reality technology as described below and may be designed using the Successive Approximation Model of instructional design (SAM) as a more flexible model for this emerging technology.

Collins and Halverson discuss some incompatibilities between schooling and technology. (Collins & Halverson, 2009, pp. 2-3) These are all addressed by my vision of:

- community-based educational activities that are highly customized;
- provision of diverse, community-based knowledge sources;
- specialized assessments dictated by the activity (also, each student will be creating their own report and choosing the method of creation and mode of delivery);
- learning how to mobilize resources in the real world to accomplish a task (students will be working with on-site experts and possibly also in collaboration with other students and friends/family members/community members);

- student will learn how to learn and how to find the resources they need, with the help of information literacy and technology literacy training; as part of that, learners will not be left to figure out new technologies and social networks on their own as tends to happen today with social media/networking, but teachers, parents/guardians and local community resources will be involved in all-rounded education and life skills support (to the extent that the child and parent/guardian is willing. Parents/guardians are community members/resources, too, so as much as possible they are involved in all these efforts);
- students will be learning by doing.

Vision of One Particular Type of Emerging Technology

Augmented reality is the emerging technology that I see playing a major role in education of the future, and it is the one that I have chosen to support this particular vision.

"The alternative to dependence on schools is not the use of public resources for some new device which 'makes' people learn; rather it is the creation of a new style of educational relationship between man and his environment." (Illich, 1971, p. 52) I would argue that augmented reality goes a long way to facilitating this sort of new relationship between people and their environment.

The educational projects and activities called for by my vision will be facilitated and mediated by geo-located augmented reality. This technology will be used in scavenger hunt type activities designed in collaboration with locations such as City Hall, the local police department, local businesses, museums, libraries, and so on. Children will be provided with tablet devices if they do not already have their own, and will use an augmented reality app (similar to MIT's "TaleBlazer") to follow the trail at the activity location. Trigger images may also be provided at

various points. The activity will also involve one or more real-life people that the child is directed to visit by the learning activity.

Trigger images related to these activities will also be situated in the classroom (whether school-based, home-based, or learning center-based).

A future may be envisioned where, with the collaboration of the local community, the augmented reality app will be carried on children's mobile devices and will be activated in many locations around town. Thus, real-life learning will be engaging and ongoing, and "school" will not be a chore to "go to" but will be a stimulating part of everyday life.

Use of augmented reality for these educational activities is supported by constructivist learning theory and situated learning theory (Dunlevy & Dede, 2014, pp. 58-59)

As a concrete example of integrating augmented reality activities into my vision of the future of education, all students (whatever the education mode) will take part in a City Hall project as a lesson on citizenship.

- Students will visit their local City Hall, bringing a tablet device and headphones or ear buds (unless in a group).
- An augmented reality app on the tablet (similar to MIT's TaleBlazer) will initiate a geo-located scavenger hunt.
- The app will direct students to key locations in City Hall, providing aural and graphical information on history, artwork, and functions of key staff and offices.
- At least one of the geo-located points will be an area or office where a member of staff will be present, and the student will ask questions and gather information.
    - There will be built-in questions (required and optional) but the student will be encouraged to ask their own questions too.

    - The staff member will be prepared to provide specific information but will also be knowledgeable enough to deal with any questions the student has, or will have the authority to arrange for a follow-up visit or for the student to talk with someone else as needed.
    - If there is no staff member constantly available during office hours, it will be necessary to arrange set days/hours for children to come in and do the activity.
    - Having a real-life person involved will help ensure the activity is more engaging and moves the student's attention away from the screen.
- Assessment of the educational activity will be carried out by:
    - The student writes, or video records, a report on the activity that includes their answers to any questions they have asked along the way, for example when meeting the City Hall staff member.
    - The report can, in full or in part, be recorded during the activity via a built-in function in the app.
    - The report may be brought in to "school" or submitted in the "cloud".
    - The report may be a collaboration with other students, or with family, or with the community members/people at the location visited.

Potential Benefits and Concerns

The main benefit for integrating augmented reality technology into these learning activities is that students will be "learning through active engagement and meaningful activity" according to constructivist learning theory. (Reiser & Dempsey, 2018, p. 62)

Issues related to safety when children are going out into the community on school-sanctioned activities will be addressed by involving all parties, including city officials/police, in the decision-making and planning processes.

One concern is availability (or non-availability) of individual smart devices. Ideally, students in my vision will each have a tablet device, bigger than a smart phone for more ideal use, but still portable. With the involvement of the whole community, including business owners/leaders, chamber of commerce, etc., it will be possible to arrange sponsorship if needed to assist in supplying smart devices to those who do not have them.

Brent Wilson (in Reiser & Dempsey, 2018, p. 63) raised some potential concerns to be considered when using a constructivist approach. I address each concern as follows:

- Are the learners prepared to take on the work as it will be to some extent self-directed?
    - The activities will be teacher- or parent/guardian-led for younger children, with a gradual, year-by-year progression of increasing responsibility for the learner. Buy-in and support will be needed from the parent/guardian and, of course, from the local community. Such support will likely not be in question when dealing with museums, libraries, and local government offices. Businesses may need incentives, but these activities will: (a) be good for business, advertising, and community goodwill; (b) may yield future apprenticeships and employees; (c) may yield feedback and ideas from the participants.
- Are learners motivated and emotionally mature enough to work independently and look after each other's interests?

    - Older children will have been prepared for this activity through prep sessions in earlier years, and more intensely during the current school year. In fact, a project might last for the whole school year or at least for the final term. Learners will have been introduced to the persons/people in the local situation and will be getting to know them already.
    - Younger children will be more teacher- and/or parent/guardian-directed and supervised. Their activity will default to a teacher-led group, unless the student/parent/guardian arranges something more unique and individual (they will have that right).
    - Any shy children will have been prepared and getting to know the people and environment ahead of time, and very involved in choosing the activity.
- Do learners have the prior knowledge they need to handle complex, authentic environments?
    - Yes, as mentioned above, the learner will have been prepared in prior terms/years.
- Do learners have adequate access to needed information?
    - Again, these activities will have been prepared and built up to ahead of time. The teacher and/or parent/guardian will have been working with the local community institution or organization or business to prepare whatever types of information and access methods are needed.

My Recommendations

Educational technologists should evaluate and refine geo-location augmented reality apps that have been developed or are already being worked on, such as MIT's "TaleBlazer" app.

Instructional design models such as the Successive Approximation Model (SAM) should be examined and refined for working more closely with augmented reality activities. SAM is a flexible model with many iterations and testing opportunities. Some designers are talking about models and strategies specifically geared toward augmented reality (e.g., Debbie Richards, "Designing for Augmented Reality").

Overall Critique and Potential Concerns

This vision is quite utopian! It will take a great deal of thought, consultation, planning, and working out.

A concern over home schooling: Collins and Halverson say that home schooling "means that children will not be learning common content and values." (Collins & Halverson, 2009, p. 3) This issue can be addressed by requiring home schoolers to teach a common module of content that has been developed at state and/or city/community level. However, any such requirement will need to be brought in through close consultation with all parties involved, especially when considering parents/guardians who choose to home school their child specifically to avoid some state mandated content that they are in disagreement with.

Collins and Halverson cite Jefferson's & Horace Mann's concerns over preparing people to be good citizens and developing social cohesion. (2009, p. 7) My vision certainly attempts to do this, especially to develop social cohesion, but the element of it that allows for much freedom and parent/guardian responsibility for their child's education would indeed allow the possibility for extreme interest groups to isolate their children and undermine these citizenship and social

cohesion goals. That would be addressed, at least in part, by the way my vision calls for a core of content and values that would be recommended for all learners, no matter what their mode of learning. The way that my vision connects school and learning with the local community, too, would make it more likely that outlying groups/individuals would be brought in and connected. Churches and religious and similar groups would be included in the local community efforts and planning.

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