

Research Question 2: Missing Topics

What key technologies are missing from our list? What would you list among the established technologies being used in STEM+ education today that arguably ALL institutions should using broadly to support or enhance teaching, learning, research, or information management?

What technologies that have a solid user base in consumer, entertainment, or other industries should STEM+ education be actively looking for ways to apply?

What are the key emerging technologies you see developing to the point that STEM+ education should begin to take notice during the next 4 to 5 years?

Added as New Topics to RQ1:

- **Multi-tech Learning Environments.** It is related with the integration of technologies to create new learning environments. That means integrate cloud services with natural human interface, RA, PLE and so on. In this way the students can interact with the learning environment in a natural way. This new environments involve new design of curricula where the technology has his own role. Also let us to personalize the learning adapting to the student needs. Not only the interface, but also the learning processes.
- **Wearable Technology.** With ubiquitous computing, wearable technology better integrates technology into the user's everyday life.

Combined with Existing Topics in RQ1 or Moved to Trends/Challenges Section:

- **Assessment.** The massive growth in big data on education and the growing technologies to support assessment are a major part of the current education world, and I don't think they're really addressed at all here. I absolutely agree! BrainPOP is currently developing a new Quiz Mixer tool that will enable teachers to create their own quizzes to support assessment, as the shift in assessment the past few years has been so significant. We need to avoid using multiple choice assessments tools... we need to develop new and creative ways to solve assessment challenges in a distance education model, but I'm still not able to envision a system to solve this problem, specially the need for certification of the identity of the student. *[Editor: Added to Learning Analytics]*

- **Augmented Virtuality.** The reverse of augmented reality, where virtual environments are augmented by data/phenomena from the real world. *[Editor: Combined with Augmented Reality]*
- **Educational Games - with an Emphasis on PLAY.** I see educational games as different than gamification of learning. It's the use of games in the classroom to teach, engage, and assess student learning. The emphasis is on games that were designed with education and learning in mind, rather than modifying games that were created for entertainment to fit into a learning module. Some are single player, while others bleed into multi-player and even multi-modal experiences. With the changes to common core, which emphasize an application of knowledge, rather than just a regurgitation of facts, education games offer unique potential to change how we also assess learning. The emphasis here is on PLAY as different from game creation by students. *[Editor: Added to Gamification]*
- **Educational Games- with an Emphasis on Game Creation.** There *is much activity* around empowering students to create games that teach educational concepts. Students are then encouraged to share those games to help their peers make connections to core content. It encourages students to demonstrate understanding not only through game play, but through a higher thinking skill of creation and innovation. *[Editor: Added to Gamification]*
- **Interactive Textbooks.** Interactive Textbooks: While probably wrapped in electronic publishing, I really think this should be a separate category. The ability to integrate video, simulations, remote laboratory interaction, social media / crowd sourcing data, etc. into textbooks makes this old learning methodology new again! I'd like to see it listed with the adjective "interactive" rather than the more boring "electronic publishing". *[Editor: Combined with Electronic Publishing]*
- **The tools for creating technology itself are being put in students' hands.** Coding for all: In building on the point above, I think there can be a distinction in the new focus on providing the knowledge and tools for new coders to program their own tools. From OLPC's early focus on providing an activity that would teach child users basic program commands to the recent announcement of the Khan Academy [<http://www.khanacademy.org/cs>] announcing a big push to teach computer science, the tools for creating technology itself are being put in students' hands. I might perhaps add to this the maker movement. Can't agree more, but not only at child level.

Programming is a great strategy to analyze problems and synthesize solutions. Which means understanding! App development can be a fun way to study some physical process and produce a model, perhaps running in a mobile.

[Editor: moved to Trends]

- **There is evidence that students in school face problems in understanding and applying math concepts.** ICT-based approaches can support to learn and train math competences as well as can help to apply it in different context. Support should include symbolicas well as numeric support. Some advanced systems already can assess students' calculation, even stepwise and provide feedback and support. *[Editor's note: Moved to the Challenges section of the wiki.]*