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# Leading Edges of Innovation in our Schools

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## ABSTRACT

The George Lucas Educational Foundation documents and disseminates the most exciting classrooms where new digital multimedia and telecommunications not only can improve students learning, but also support educators in their challenging endeavor. I will explore some of these edges to help students and teachers to acquire twenty-first-century skills in our innovation and CIT society. We are heading to a *technology edge* full of virtual opportunities as we can see in the redesign of the curriculum and learning in the last years in the K-12 grade level and beyond. Educational simulations, such as *simSchool*, are going to be the next big revolution in e-learning changing education once and forever.

## Keywords

Education, technology, research on educational innovation, simulation, e-learning

## 1. INTRODUCTION

We all know the responsibility of school success falls not only on the student, but also on the families, teachers, schools, education authorities and society in general. Moreover, the quality of education demands a joint effort; we need to get all sectors of the educational community to collaborate in order to improve education. Teachers (Ron Clark), professors (Milton Chen) and even filmmakers (George Lucas) are eager to know about what works in education. They realize there is a critical need in our society preparing teachers to change our schools.

Most students are bored in class, as one can realize when entering a classroom in most schools and colleges today. Social and emotional learning enhance the education process, and *Edutopia.org* reflects those ‘Success Stories for Learning in the Digital Age’; one can witness this phenomenon in the integration of technology and digital resources in classrooms.

Attempts to use computer technologies to enhance student learning and achievements began with the efforts of pioneers such as Atkinson and Suppes in the 1960s[1]. The presence of technology to support learning has increased drastically since that time; it has a great potential if used appropriately [7].

Technology is our students’ latest diversion. The most powerful element in education, however, is the teacher; “...nothing will compete with that” [3] as George Lucas discussed with Linda darling-Hammond, a distinguished expert on teaching and teacher education. In fact, “we need talented individuals with technical skills, but their abilities to communicate and work with others are

just as valuable” [5]; teacher behavior will change through the integration of innovative schools such as *The Ron Clark Academy* in Atlanta (U.S.A.) or the *IES Galileo Galilei* in Madrid (Spain), and programs, such as *the Maine learning technology initiative* as Milton Chen suggests.

Dr. Milton Chen has worked at The George Lucas Educational Foundation (hereafter GLEF) as executive director. His background includes director of research, Sesame Workshop and his new book *Education Nation: Six Leading Edges of Innovation in Our Schools* is a must in every educators’/book library. Redesigning education, as Milton notes in his book, is a matter of paying attention to innovation at the “six edges of educational change”: the Thinking Edge: Getting Smarter About Learning; the Curriculum Edge: Real Learning and Authentic Assessment; the Technology edge: Putting Modern Tools in Young Hands; the Time/Place Edge: Learning Any Time, Anywhere; the Co-Teaching Edge: Teachers, Experts, and Parents as Coeducators and; the Youth Edge: Digital Learners Carrying Change in Their Pockets.

GLEF has been documenting and telling stories from these edges of school innovation. They always stay positive, as classroom rules, *carrying the change in their pockets*. Many new technologies are interactive and can help students to increasing their understanding by providing them with information, feedback, and motivation.

## 2. THE GEORGE LUCAS EDUCATIONAL FOUNDATION’S EDUTOPIA. SPEAK WITH VERY LOUD MEGAPHONES.

In this *i-world* in which we live, teachers need to *Engage* students in their learning (the 5 E’s instructional model). Students should become mentally *Engaged* in their learning process, and GLEF is focused on document the “edges of educational change” that is going to help teachers in this endeavour.

I wonder as George Lucas “*Why couldn’t we use these new technologies to help improve the educational process?*” The edges of innovation are growing and teachers need to keep up with all the possibilities that modern digital tools offer in order to enhance student’s learning.

GLEF captures what innovation looks like in the classrooms around the world; as Edutopia’s Founder, George Lucas himself, points out in the foreword of *Education Nation: Six Leading Edges of Innovation in Our Schools*:

[1] our job is to produce and disseminate information about the most innovative learning environments, addressing core concepts of project-based learning, cooperative learning,

technology integration, comprehensive assessment, and teacher development for implementing these practices.

## 2.1 The Technology Edge: Putting Modern Tools in Young Hands

Most kindergarten teachers to college professors, and students themselves share the passion for redefining when, where, and how learning happens. Teaching and learning should be exciting, contemporary, and hip; our students need to experience the true joy that comes with learning. *Sesame Street* and *The Electric Company* made learning enjoyable, focusing on both cognitive and social skills. [2]

Who could imagine that a TV show could change the future of media in education. Similarly, *Flocabulary's* founders, Alex Rappaport and Blake Harrison, believe in both rigorous and Engaging academic programs by creating hip-hop music and curricular materials to teach in grades k-12, fostering a love of learning.

The potential of technology is vast, and the culture of technology-based education is undermining every educational setting. In this war on illiteracy, we need to educate a modern workforce of student teachers in the *field* of educational technology.

In fact, classroom innovation grows out of passion by educators with an entrepreneurial bent, like David Gibson, *simSchool* [8] Founder, or Dr. Christopher Dede, *River City* [9] creator.

## 2.2 Simulation-Based E-Learning

Clark Aldrich, author of *Simulations and the Learning Revolution* strongly believes that “educational simulations will be in widespread use by leading instructors within 5 years and will eventually change education as much as textbooks and motion pictures.” [6] In fact, education is a field devoted to improving the teaching and learning of students. Teachers need to motivate love of learning and improvement in students.

However, the Confucius proverb notes “I see and I forget, I hear and I remember, I do and I understand”. There is a need for hands-on learning, and *simSchool* is going to provide that tool to future teachers. The U.S. educationist Edgar Dale (1969) illustrated this with research when he developed the *Cone of Learning* (see Figure 1) - a ‘visual metaphor’ stating that *learning-by-doing*, an immediate application of learning is vital in the 21<sup>st</sup> century.



Figure 1. Cone of Learning (Edgar Dale)

Although the original model of the cone does not include any percentages, it depicts types of learning, from the concrete to the abstract. Time should be spent at higher percentages of the cone since students are going to retain the greatest percentage of information when they *do the real thing, simulating the real experience*. The focus is not just on knowledge, but also on applying that knowledge, and this is when *simSchool* comes into play – one simulation that may benefit all learners by “transforming tomorrow’s classrooms by improving future teacher effectiveness today.”

While the field of simulation-based e-learning is still evolving, researchers have shown that significant increases in learning can be accomplished through the informed use of *multimodal learning*. In fact, results from across multiple studies [4] show students generally do learn best when they are *enjoying the learning experience* that incorporates *multimodal designs* (Figure 2), outperforming students who learn using the single-mode traditional learning approach.

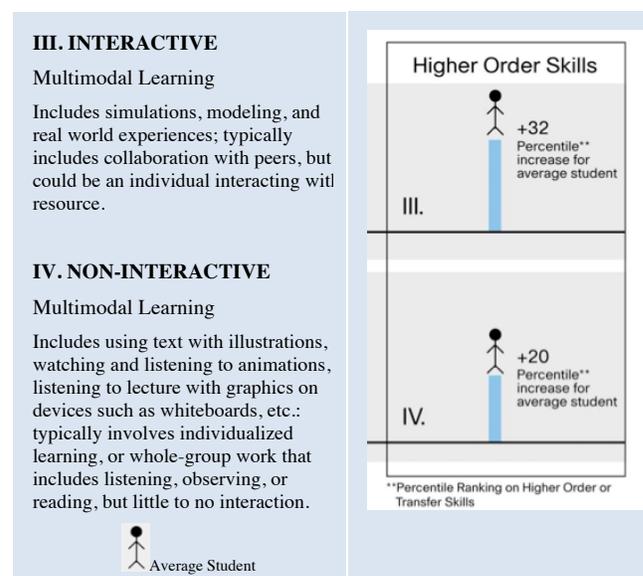


Figure 2. The Impact of Multimodal Learning

### 2.2.1 Simulation vs. Computer Gaming

Games and simulations have been one of the most exciting areas in the redesign of learning, an example of innovation happening on the vast majority of schools [2]. Simulation and computer games have similar approaches and a lot in common except for the main objective: *entertainment versus skill building*.

*SimCity* and *Oregon Trail* are two educational classic games, but they much differ from *River City* or *simSchool*, both of them educational simulators. Simulators have the look and feel of a videogame, making learning a more engaging and enjoyable experience. Furthermore, they are revolutionizing how students learn in their communities.

It is vital to advocate for a student-centered learning and start individualizing education in every responsible way possible. Every student is entitled to a quality of education; we cannot make of our education setting a boring and dreary place, but an exciting and challenging playfield. If students have a choice in

how they learn they will work harder at it; as many a personal trainer has said, “No pain, no gain.”

David Gibson, founder and director of the *simSchool* (see 2.2.2.), believes games may be the key to “stealth education.” In fact, some schools use *games* and *simulations* for learning and assessment; they are natural learning tools for our video game players generation. For example, the River City project from the Harvard Graduate School of Education provide students with a multi-user virtual environment for learning content developed from science education and national educational technology standards, and 21<sup>st</sup> century skills. Its curriculum support middles grades science students.

Innovation, however, happens not only at the k-12 grade level, but also at higher education levels. “The death of the lecture as we know it” is lingering the classroom, and the age of serious games is already here: *simSchool*, a classroom simulator for educators is an example of these efforts to train future teachers for the classroom.

### 2.2.2 What is *simSchool*?

*simSchool* began in 2003 with researchers asking a simple question: *Can you learn to teach with a game or simulation, to be specific, one that offers the advantages of virtual training systems such as flight simulators?*

The answer is “yes,” and that is exactly what *simSchool* does. It offers that opportunity; *simSchool* can do a lot of things that traditional teaching cannot. A classroom simulator to train future teachers in the classroom, providing them with a realistic classroom mix (e.g. different student performance, personality, racial makeup, and social characteristics) where they can see how well students respond to their lesson plans before subjecting an entire classroom to them.

The *simSchool* application is a Web-based flight simulator for teachers in training, providing them the necessary game-like tools to design their own simulations, “constructing” students and tasks that can be embedded in a virtual classroom (see Figure 3) with individualized personalities, attitudes, and behaviors; or they can also search through created simulations in the Open Library.

*simSchool* is a virtual dynamic environment for enhancing educator preparation by allowing them to explore instructional strategies, examine classroom management techniques, and practice building relationships with students that will translate into increased learning.



**Figure 3. A *simSchool* learning setting**

*simSchool* is driven by an artificial intelligence engine; and by using interactive features teacher candidates can explore two important questions in effective instruction:

1. How do you learn to be a teacher?
2. How do educators plan, think about, and see what students are like before they enter the classroom by reading records, understanding some about their personalities, their capabilities and their learning styles?

Since the goal of *simSchool* is to improve teaching, this simulation takes into account the four areas of learning theory outlined in the National Research Council Report on “How People Learn” (HPL) Framework [1]: the characteristics of the *learner*; the nature of *knowledge*; the role of a *community* in shaping expertise, and; the role of *feedback/assessment* in shaping performance.



**Figure 4. Perspectives on Learning Environments.**

Each of these four facets is connected to all remaining, provided a framework when designing a learning environment such as *simSchool*; supporting this accumulation of teachers’ experience in analyzing student differences, adapting instruction to learners needs, gathering data about the impacts of instruction, and seeing the results of their teaching.

When “playing” the user acts as the classroom teacher practicing his/her knowledge and skills: talking to individual students, assigning learning tasks, and observing their behavior. In addition, *virtual classroom teachers* can access different informational tools to inform instructional and management strategies and communication styles.

The *simSchool* project was selected from a field of more than 600 pre-proposals, funded by EDUCAUSE and its partners, including the Bill & Melinda Gates Foundation, and the William and Flora Hewlett Foundation, providing a new apprenticeship appropriate to our technological age. George Leonard foresaw the dawn of age of learning in his 1968 book entitled *Education and Ecstasy*, and *simSchool* is an example that education is ecstatic providing the tool to create twenty-first-century schools.

#### 2.2.2.1 Education Simulations

There are different types of simulation-based training. *simSchool* takes the form of role playing. A scenario is presented, student teachers are assigned roles, and they have to act out their roles to solve a problem, reconcile a relationship issue or learn about a process.

Research of teacher education simulations is just beginning. *simSchool* enables transformational experiences for over 9000 users from 100 higher education institutions that are now looking at it, using it, and many are starting to organize research. International interest is also accelerating, with nations as diverse

as United States of America, India, Portugal, Kenya, Cameroon, Singapore, Canada, Netherlands, Thailand, Romania, Tasmania, Mauritania, Cyprus, Ankara, Australia, and Spain. The past years have shown impressive growth due to the need of becoming an effective educator in the classroom and learning community.

simSchool puts the student teacher into the context of a scenario which allow him/her to experience training in a realistic teaching-like situation. They get to experience teaching by learning and doing, providing them with the tools and training necessary: contextualizing and target their own learning and improve their self-efficacy as current college students and future educators.

The students and classrooms are *virtual*, but the research-validated outcomes of this learning experience are very *real*, *authentic*, measurable, and include an increased confidence in teaching, knowledge of instructional strategies and classroom management techniques besides technology self-efficacy and retention in education courses.

This online dynamic simulator for enhancing teacher preparation has shown not only relevant benefits strongly connected to mastery of deeper learning capacities that comprise the readiness to teach, but also it can help educators to become more effective in their classrooms by improving their teaching skills, their confidence in using technology and their performance in teacher preparation courses and attitudes toward inclusion of special needs students.

In addition, learning analytics in simSchool follow the moment-to-moment decision-making actions of the user. The simulated teaching tools provide teacher candidates insight into their virtual students' educational profiles (i.e. grades, observations, personalities, etc.), as well as their emotional state and academic progress at any given moment *in direct response to the choices that the players make*.

Following completion of a simSession, players are provided extensive reports, detailing the progress of their virtual students and their choices and tendencies as virtual teachers, providing a great opportunity for self-reflection.

### 3. CONCLUSIONS

Using a simulator to teach student teachers? The idea challenges conventional thinking, but if our students are Engaged, we can teach them anything. Students, in simulation courses, can be enhanced by giving learners control of their interactions with media and prompting learner reflection. Somebody has succeeded in making a blockbuster hit for educators: simSchool, and we need to enhance the simSchool platform in order to address the needs of pre-service and in-service teachers. The *simSchool* platform can help tomorrow's teachers not only to learn faster and enjoy learning, but also to create an innovative culture on high quality schooling and therefore teaching.

As a community, we are required to help our teachers to change schools, and the simSchool project provide a creative learning setting for creating twenty-first-century teachers. I strongly believe as George Lucas does that education is the single most

important job of the human race. We need to start individualizing education in every responsible way, where students can connect school life to real life. The game, however, is not over yet; as Ralph Waldo Emerson would say "Do not go where the path may lead; go instead where there is no path and leave a trail."

We, however, can state that we have found the Holy Grail of technology in educating student teachers, by providing them with this powerful software that supports a personalized instruction in a meaningful way. We can provide our future teachers with significant amounts of practice and the opportunity to develop their teaching skills. simSchool provides the new future teacher's entering the classroom with this specific ability to model diverse types of learners, and support of a low-stakes environment that allows them to play, experiment, evaluate, and try again and again in an Engaging way without fear of 'breaking' a *real* student. The classroom simulator for educators includes advantages such as a reduction in administrative requirements of *live training*, increased scalability and delivery appropriate for and conducive to diverse needs student populations.

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