

## Reaching Learners: Immersive Education through Interactive Multimedia

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*Growing evidence supports immersive approach to education, utilizing multimedia technologies, over traditional classroom environments.*

Interactive large screen displays support the collaboration of two or more people, and are ideal for visualization, multimedia, and presentation applications. These displays, in the form of walls, windows, touch screen displays, interactive whiteboards, and touch-tables, can be found in workplaces, educational institutions, museums, and other public spaces. New display systems allow for co-located communication between groups of people, and also allow for collaboration with individuals and groups in remote locations. In the classroom setting, these new systems technologies support new ways of communication and knowledge-sharing, increasing collaboration, motivation, and engaged learning among young people.

Touch is one of the simplest, most instinctive, and universal human actions while a touch screen may be the simplest, most direct way for a person to interact with a computer. With the recent drop in price of large flat panel displays, many school districts are opting for an alternative to their projection displays and are retrofitting their classrooms and training facilities with LCDs and Plasmas. Pairing a large display with a touch screen combines the benefits of multimedia with an intuitive interface, creating an opportunity to completely re-design the ways in which we teach, collaborate and communicate.

**"Communicating visually is becoming the norm rather than the exception in technological societies... This renaissance in graphics is coupled with the emerging re-thinking of the role of visualization in basic human intelligence."**

*- Gary Bertoline, University of Indiana*

Evidence supports the use of instructional practices that address the unique and varied ways that people learn. Young people thrive in environments that provide multiple means of accessing information and knowledge, supported by content that is presented in multiple formats. Advances in multimedia technology provide students with opportunities to use digital media to gain and share knowledge and work collaboratively on projects with their peers. These experiences are rich, social, and often more meaningful than word-dominant lessons.

### The Case for Visual and Multimedia Learning

*"Say it with words and you're lucky if they hear it or bother to read it. Tell your story with imagery, and it grabs attention, evokes emotion, and is more instantly processed. Sixty thousand times faster, say some researchers."*

*-Michael Lambert and Margaret Carpenter, [Visual Learning: Using Images to Focus Attention, Evoke Emotions, and Enrich Learning](#)*

*"As any 10-year-old can tell you, it's not just about the book anymore... For educators, this means recognizing all forms of literacy, embracing them as relevant, and, finally, creating meaningful classroom experiences that integrate printed, visual, and technological literacies within disciplines and subjects."*

*-Johanna Riddle, Media Specialist*

*"If educators want to have relevance in this century, it is crucial that we find ways to engage students in school. Because common sense tells us that we will never have enough truly great teachers to engage these students in the old ways—through compelling lectures from those rare, charismatic teachers, for example—we must engage them in the 21st century way: electronically. Not through expensive graphics or multimedia, but through what the kids call 'gameplay.'*

*"We need to incorporate into our classrooms the same combination of desirable goals, interesting choices, immediate and useful feedback, and opportunities to "level up" (that is, to see yourself improve) that engage kids in their favorite complex computer games. One elementary school in Colorado, for example, takes its students on a virtual journey to a distant planet in a spaceship powered by knowledge. If the students don't have enough knowledge to move the ship, they need to find it—in one another."*

*-Mark Prensky, founder and CEO of **Games2train**,*

*Author of **Digital Game-Based Learning***

According to Richard Mayer, an educational psychologist, "Multimedia learning is defined as learning from words (e.g., spoken or printed text) and picture (e.g., illustrations, photos, maps, graphs, animation, or video)... Multimedia environments include on-line instructional presentations, interactive lessons, e-courses, simulation games, virtual reality, and computer-supported in-class presentations."

A variety of fields, including science and math, increasingly rely on multimedia technology for scientific visualization, data visualization, and three-dimensional modeling. These technologies can be incorporated into interactive multimedia activities for students, often improving the academic engagement of students. Learning activities that integrate multimedia also support and enhance learning in non-scientific fields, such as literature, writing, music, history, and art.

*"Extensive research shows that visual imagery can play a powerful role in accelerating learning. Complicated concepts and processes can often be conveyed much more simply in a visual format, and evidence suggests that use of visual media can enhance problem-solving, motivation, understanding and the expression of ideas."*

*-Roger Murphy, [Visual Learning Lab](#), University of Nottingham*

**In a nutshell, when people interact with visually-oriented multimedia, the process is more closely matched to the workings of the brain than when they interact through words and text.**

Multimedia learning involves active learning, both behavioral as well as cognitive. Learning is constructive, and information learned is remembered at a deeper level. The use of multimedia promotes meaningful learning that can be transferred or generalized to other situations.

***The following are some of the unique applications in which interactive displays are now being used:***

### **Interactive Displays and Multimedia**

The mistaken view about interactive displays is that they function as electronic chalkboards, or giant PowerPoint screens, providing a few multimedia bells and whistles to attract attention to

key points for a moment or two, while the teacher continues to lecture. Interactive large screen displays support multiple learning and interactive styles and preferences, and are flexible in the ways they can be used. Larger displays decrease cognitive load, as there is enough space to visually organize, represent, and display content.

Researchers at Microsoft have discovered that the use of large-screen displays minimizes the differences between men and women when working on 3-D spatial tasks, which suggests that the use of these displays should be explored for teaching geometry and related math classes. Touch-enabled screens allow for active, "hands-on" manipulation of content, and also provide a means for students to share what they've learned through project-based learning experiences. Interactive displays also enable students to take a more active role in the lesson, and teachers to take account of different learning styles. With the ability to easily tailor lessons according to the needs of different pupils, interactive displays create opportunities for collaborative learning all the while creating a more personalized learning approach for each student.

### **Virtual Field Trips**

Research in the use of virtual reality in education and training suggests that the use of simulations and virtual worlds promotes deeper understanding among learners, as the learning experiences aim to simulate or augment reality and provide a sense of presence, or "being there." Over the years, school districts have cut back on field trips, limiting exposure to learning environments outside of the school door. To counter this trend, Psychologist Alicia Sanchez and [Janis Cannon-Bowers](#) were members of a team at the University of Central Florida that developed [virtual reality field trips](#), using interactive large-screen displays, to provide students with opportunities to explore environments, with the goal of supporting reading and vocabulary development.

According to an [article](#) written by Tracy Voger, posted on the [Edutopia](#) website, high school students in the Environmental and Spatial Technologies (EAST) program, in Mansfield, Arkansas, provided elementary school students with a virtual tour of the Blanchard Springs caverns after they learned that the students' field trip to the caverns had been cancelled, due to high gas prices. During the summer, the EAST program students used global-positioning devices to map the caves, video-taped the kids, and interviewed a seasoned cave-explorer. They included an animated cartoon guide in the virtual tour.

Expensive head-tracking gear and data gloves are not necessary for educators to create immersive learning environments for their students. In many schools, interactive displays, or whiteboards, provide students with a window to websites that contain rich visual and multimedia content. Microsoft's [PhotoSynth](#) is an on-line project that gathers photographs from around the world to construct 3D environments that can be explored through a web browser, providing students with views of places they might never have a chance to explore in the real world. PhotoSynth can be integrated into Microsoft's [Virtual Earth](#).

Several websites offer access to high-quality interactive panoramas of important geological formations and points of cultural interests around the world. For example, the Chicago Traveler website offers [motion panoramas](#) of city attractions. [Google Earth](#) is another application that can be used for building virtual field trips. Points of interest on the globe can be linked to related video clips, photos, panoramas, and websites. Students can contribute to designing virtual field trips by uploading photographs and video from family vacations and outings.

Virtual field trips aren't limited to the outdoors and cultural points of interest. The [Visible Human Project](#), developed at the University of Michigan, offers a [browser](#) that allows students to view and manipulate a human body in 3D space. Students can observe an entire body, or closely inspect smaller regions, from the inside out. There is also a [guided tour](#) of the human body, which includes [interactive annotated images](#) that correspond to various body parts and structures.

## Games and Learning

As a whole generation has been brought up on instant messaging, video on demand, and iPods, the attention span of most students continues to shrink. Clearly we will need a new way of reaching these children to keep them engaged and motivated. Researchers in education, training, and distance learning have broadened their interests and have studied the effects of 3D immersive games for training, education, health, and even social change. Games and game engines are affordable, and more schools have invested in large-screen displays and projection systems, making it easier for modifying games for classroom use.

In the past, most educational software programs were designed for the small screen, to be used individually by one student, on a personal computer. Newer educational games, some modified from off-the-shelf games, allow for "multi-player" interaction and some require players to work in teams, and allow players to communicate with one-another on line. Although most games are not designed for touch-screen interaction, some multi-player games can be controlled from PCs and displayed on the large screen in front of the class. One example is [Dimenxian](#), a 3D game designed to teach Algebra that is impressive to watch on a large screen display.

There are a variety of free websites that provide educational games and other activities that require "drag and drop" or painting interaction that are fun for students to play on large-screen displays. Examples of sites that provide a variety of interactive games and activities include [PBS Kids](#), [BBC Kids](#), [Discovery Kids](#), [National Geographic Kids](#), [NASA for Kids](#), and the National Gallery of Art. For middle and high school students, the [NoblePrize.org](#) website offers a variety of [multimedia games](#) that correspond to each Nobel Prize category. For those interested in crime scene forensic science, the [CSI: The Experience WebAdventure](#), an on-line companion to a traveling museum exhibit, offers fun and engaging activities and games.

## Interactive Multimedia for Social Skills and Coping Strategies

["It's My Life"](#) is an interactive website on [PBSKids.org](#), designed for middle-school students. It offers video clips, games and related activities on topics such as bullying, dealing with emotions, dealing with crushes, gossip and rumors, divorce, death, time management, test stress, fighting, and more. Streaming video clips on a range of topics are available on this site. Resources are provided on-line for teachers and parents. The activities on this website are appropriate for classroom guidance, small group counseling/intervention, and for "homework." The website also includes several interactive games. The activities are engaging when presented via an interactive whiteboard.

Non-violent games, such as the [Cloud Game](#) and [Tranquility](#), provide a relaxing experience when played on a PC or on the large screen, and can help anxious or stressed-out students relax. [RippleEffects](#) provides a variety of interactive multimedia applications designed for helping children and teens develop a variety of positive coping skills. Although the applications were designed for use on a PC, they work well on large interactive displays and can be useful for small group activities or presenting character education topics during whole-classroom activities.

## Interactive Multimedia for Literacy Development

### Collaboration and Communication

"Two widely accepted principles about knowledge and learning—learners construct their own knowledge and learning is an inherently social phenomenon—support the use of group learning. Working in a small group provides learners with opportunities to articulate ideas and understandings, uncover assumptions and misconceptions, and negotiate with others in the process of creating a product or reaching consensus. Group activities enable students to discover deeper meaning in the course material and improve creative thinking skills."

"The most effective use of group work is that which engages students with higher-level content that is thought-provoking, difficult to understand, or has multiple interpretations."

- Cheelan Bo-Linn, [Center for Teaching Excellence](#), University of Illinois, Urbana-Champaign

On-line virtual world applications such as Second Life are now used for education and training purposes, and are impressive when viewed on a large screen. The advantage of 3-D worlds is that they facilitate interaction, communication, and collaboration between users, and for students, this can provide an effective means of maintaining their interest.

One example of a 3D world is EduSim, a free, open source educational software. EduSim was designed for use on large interactive touch-screen displays to build collaborative, networked environments, allowing students in different classrooms to work together. EduSim has been used to create machinima, models and simulations, and multimedia art. A student can quickly draw an animal or object with a finger, and it automatically turns into a three-dimensional figure, easily placed into a 3-D world. [EduSim's](#) website provides software downloads and teacher resource packets. EduSim was built on [Croquet](#) an open-source software development environment. It supports a large number of users and a variety of platforms and devices.

The knowledge about our world continues to grow exponentially and educators are tasked with imparting this information to a diverse group of learners. It was not long ago that a high school education was sufficient, and then it was a Bachelor's degree. Now a Masters is considered adequate preparation, while a Doctorate is considered a requirement in some fields. Specialization is the only practical way in which to impart a portion of the vast amounts information that we continue to compile. So it is also an educator's responsibility to provide the tools in which to continue to learn throughout life.

Instead of widening the digital divide, technology can be used to bridge the gap -- bringing together students from various backgrounds and skills to share, collaborate and to learn from one another. Through the use of technology in conjunction with creative software, we can provide educators with a more efficient means to convey information.

An interactive display is the convergence of technology, price, and application; instead of just being a single purpose display or dedicated whiteboard, an interactive display becomes multi-purpose and therefore a more valuable interactive communication tool.

### **Reaching All Learners**

Multimedia applications that are used on large interactive displays and surfaces meet the needs of a wider range of learners. According to research, the use of digital media, within a *Universal Design for Learning* framework, can support instruction in inclusive classrooms, and meet the needs of a wider range of learners, not limited to those who have disabilities. Universal design for learning was developed by researchers at [CAST](#), the Center for Applied Special Technology, and focuses on the following guidelines:

- *Multiple means of representation*, to give learners various ways of acquiring information and knowledge,
- *Multiple means of expression*, to provide learners alternatives for demonstrating what they know,
- *Multiple means of engagement*, to tap into learners' interests, offer appropriate challenges, and increase motivation.

For educators who would like to effectively incorporate the use of digital media into their classrooms, CAST offers an online interactive book, *Teaching Every Student in the Digital Age: Universal Design for Learning*, as well as an easy-to use lesson-builder.

## **Additional Resources**

Karen Janowski's Site: Free Technology Toolkit for Universal Design for Learning  
RadTeach (Dr. Judy Willis, a neurologist and middle school teacher. Bill MacKenty's Games and Education Pages (Bill Mackenty is an instructional designer)

EduSim 3D

Center for Teaching and Learning in Reusable Learning Objects: Interactive On-line Learning Objects

Merlot: Multimedia Educational Resources for Learning and On-line Teaching

WISC Online Learning Objects

## **Blogs**

Ed Tech Solutions: Teaching Every Student

Resources for All: Interactive Multimedia and Universal Design for Learning

TechPsych

## **ABOUT THE AUTHORS:**

Lynn Marentette and Anthony Uhrick began working together earlier this year when NextWindow donated an interactive touchscreen overlay for use by Marentette's students at Wolfe School, in Monroe, N.C.

"The film maker George Lucas himself was a gifted visual learner who struggled with traditional word-based schooling," Marentette noted. "We believe that digital media and video/multimedia in education is key to our students' success in education and in life."

"One of our goals was to highlight the visual teaching-learning strategies we use for our students that are supported by digital technology, including AV. The NextWindow display has been invaluable to our students' current and future learning. We've used the screen to enable computer/Internet access for students who are in wheelchairs or who cannot operate computer mice or switches well. It's also been used to conduct adapted assessments of students who can't be evaluated through traditional test materials."

Marentette said that the NextWindow interactive display will also assist the school's efforts to receive support for the use of visual and multimedia instructional strategies, which has historically been difficult, due to barriers against using TV or video in education.

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Lynn Marentette is a school psychologist in the Union County Public Schools in North Carolina, and also graduate student taking courses in the College of Computing and Informatics at the University of North Carolina at Charlotte. She is interested in interactive technologies that support collaboration, communication, and learning.

### **Anthony Uhrick**

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Anthony Uhrick is the Vice President of NextWindow. Mr. Uhrick brings more than 20 years experience building sales channels for technology businesses. As Vice President, Mr. Uhrick is responsible for North American operations including sales, marketing, and business development. Mr. Uhrick received his Master's of Science from Loyola Marymount University in Los Angeles.

**ABOUT WOLFE SCHOOL:**

The mission of Wolfe School is to educate and prepare each student to make appropriate choices and to function as independently as possible in school, home and community settings. The school provides services and educational support to meet the challenges of various disabling conditions. Services and programs are available for those who are ages 3 to 21. A new state-of-the-art Wolfe School is scheduled to open in February 2008. The new facility will be located on Brewer Drive in Monroe, N.C.

**ABOUT NEXTWINDOW:**

NextWindow is an international leader in the design and manufacture of optical touch-screen overlays, and OEM touch components, from 12.1" to over 100". NextWindow is a privately held company based out of Auckland, New Zealand, and has its U.S. headquarters in Chicago, IL. For more information call 1-866-870-9733 or visit on the web at [www.nextwindow.com](http://www.nextwindow.com).