

White Paper

Creating Classrooms for Everyone

How Interactive Whiteboards Support Universal Design for Learning

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Introduction

Classrooms today are filled with a diverse range of students. Many of them have grown up with computers and the Internet. Some are primarily visual learners, some are auditory learners and some kinesthetic. Some speak English as a second language. Others may be gifted and talented. Still others may struggle with physical, mental, behavioral or emotional challenges. In the 2003–2004 school year alone, the U.S. Department of Education reported 14 percent of U.S. students, or nearly 6 million learners, required Individualized Education Programs (IEPs), 11 percent needed English Language Learner (ELL) assistance, and 36 percent, or 17.5 million, qualified for free or price-reduced lunches (Hoffman and Sable, 2006).

Not surprisingly, teachers find their workloads steadily increasing as they struggle to keep up with the demands of more complex student populations. A Canadian Teachers Federation survey noted an increase from an already heavy 51.8-hour work week in 2001 to an even more demanding 55.6-hour week in 2005 (Price, 2005). In the UK, the National Union of Teachers cites workload as the major cause of stress and the primary reason for teachers leaving the profession (Andalo, 2008).

Given the demanding environment teachers inhabit today, many wonder how a sometimes dizzying array of new classroom technology can truly help manage differentiated learning, engage digital learners and save time. Many technology solutions, including interactive whiteboards, are offered to ease the challenge of teaching in today's classrooms. While few would deny the need for technology-enabled classrooms, how can educators determine which technology solution is right for any given learning environment? With myriad products to consider, budgets to balance and ever-changing trends to watch, evaluating technology can seem daunting.

A useful approach may be found in Universal Design for Learning (UDL). UDL has its roots in architecture's universal design movement, which advocates designing structures and products that can be used equally well by everyone, whether or not they have disabilities. Borrowing from the principles of universal design, UDL can provide a framework for evaluating which products have the potential to work best for all learning environments. This paper examines UDL standards and how they can help guide the evaluation and use of interactive whiteboards in today's classrooms.

History: Universal design for learning

In the U.S., the movement toward barrier-free design began to gain momentum in the 1950s. At that time, wheelchair ramps, audio systems, automatic doors and other adaptations helped reduce barriers for people with physical limitations (Center for Universal Design, n.d.). As policies and legislation set new standards for accessibility in subsequent decades, new ideas began to emerge. People envisioned products and structures that could be used by everyone, without expensive or unsightly adaptations, setting the stage for universal design (Center for Universal Design, n.d.).

Universal design differed from barrier-free design as the latter solution was geared more toward retrofitting or adapting existing structures and environments than considering the needs of all people during the design process itself. Ron Mace, the founder of universal design, described his philosophy as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (Center for Universal Design, n.d.). For example, where accessibility might previously have meant adding a wheelchair ramp to an external set of stairs leading into a building, the universal design approach would be to design access to a building at street level or via a mild slope, which accommodates everyone with the same nonstigmatizing solution.

From the 1960s to the turn of the 21st century, significant legislation was passed to protect the rights of people with disabilities. These laws influenced the adoption of universal design as architects realized the aesthetic, financial and humanitarian benefits of building designs that worked for everyone. In 1997, the Center for Universal Design at North Carolina State University published seven principles of universal design:

1. Equitable use – the design is useful and marketable to people with diverse abilities
2. Flexibility in use – the design accommodates a wide range of individual preferences and abilities
3. Simple and intuitive use – use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level
4. Perceptible information – the design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities

5. Tolerance for error -- the design minimizes hazards and the adverse consequences of accidental or unintended actions

6. Low physical effort – the design can be used efficiently and comfortably and with a minimum of fatigue

7. Size and space for approach and use – appropriate size and space is provided for approach, reach, manipulation and use regardless of the user's body size, posture or mobility

(Center for Universal Design, n.d.)

From architecture and product design, the ideas behind universal design spread to other disciplines, including education. There, through differentiated instruction and IEPs, the challenge is not only to reduce barriers for students with special needs, but also to improve the learning environment for all by helping to individualize instruction.

In 1984, a group of education researchers and clinicians founded the Center for Applied Special Technology (CAST), “to explore ways of using computer technologies to improve education for all children, especially those with disabilities” (CAST, n.d.). Influenced by universal design guidelines, CAST researchers explored how education could be individualized through a flexible approach to teaching methods and materials, which they called universal design for learning, or UDL. Their work led them to develop alternatives that would not only reduce barriers for individuals with special needs, but would also enhance learning for all students. According to CAST, “addressing the divergent needs of special populations increases usability for everyone” (Rose and Meyer, 2002, section 4.2).

In the course of their research, CAST developed three enduring principles of UDL:

1. Provide multiple means of representation – give learners various ways to acquire information and knowledge

2. Provide multiple means of action and expression – give learners alternatives for demonstrating what they know

3. Provide multiple means of engagement – tap into learners' interests, offer appropriate challenges and increase motivation (Rose and Meyer, 2002, section 4.3)

UDL principles provide insight into how noninclusive curricula and reliance on traditional media, such as printed texts, lead to a one-size-fits-all approach, which misses the mark for many learners, regardless of whether or not they have special needs. In such contexts, the onus to adapt is placed on students, as noted by Thomas Hehir in “Eliminating Ableism in Education”: “We often attempt to retrofit the child with inappropriate interventions after they have failed in school, rather than design the instructional program from the beginning to allow for access and success” (Hehir, 2002, p.20). When educational technologies and curricula embed UDL principles, they ensure students can access, use and engage with learning materials in multiple ways. This flexibility more effectively supports the needs of all learners (Rose and Meyer, 2006).

UDL principles and interactive whiteboards

Interactive whiteboards are designed to engage a wide variety of students in the learning process. They evolved from constructivist pedagogy and support each of the three principles of universal design for learning. The product provides teachers with multiple ways to represent information using interactive text, images, sound and video files, and thus engage a broad range of learners. Students can use the same features of the product to demonstrate their understanding of a topic. Touch-sensitive boards in particular give multiple options for interacting with displayed information, including by finger, pen tool or other object. Finally, interactive whiteboards captivate learners of the digital age, increasing student engagement with instant, tactile access to digital resources. The following sections review these principles in greater detail.

Multiple means of representation

Interactive whiteboards and differentiated learning

One of the key strengths of interactive whiteboards are their ability to simplify and speed the process of sharing information using a variety of media formats, either as planned or spontaneous elements of a lesson. Teachers can, for example, embed multimedia into existing lessons, launch a WebQuest on a topic as it arises, listen to a symphony, view the Pyramids via Google Earth™ and likewise enable students to actively demonstrate their knowledge to the class through whatever media they desire. Using multiple media enables a “more diversified, flexible palette for communication,” and allows teachers to select the best medium for a particular purpose and audience (Rose and Meyer, 2006, p.19).

This flexibility not only expands the scope of learning in the classroom, but also succeeds in engaging learners of the digital age. In a 2007 report entitled *Evaluation of the Primary Schools Whiteboard Expansion Project Report to the Department for Children, Schools and Families*, researchers from the British Education and Communications Technology Agency (Becta) noted

that “pupils are universally enthusiastic about interactive whiteboards, because of their clear visibility (‘We can see!’), the easy access they give to ICT through touch, and the added variety they bring to lessons” (Somekh, et al., 2007, p. 4).

Because interactive whiteboards speak to the multiple senses of sight, sound and touch, they help reinforce topics and create a compelling focal point in the classroom. Teachers can use the boards to build in informational redundancies, for example, by bringing up images or diagrams during a lesson that provide additional reference material, thereby benefiting all students, and in particular those with learning and behavioral challenges. These strategies also help ESL students by providing additional context for discussions and lessons.

Many teachers today effectively use interactive whiteboards to appeal to multiple senses and learning styles within the same lesson. They can turn anatomy lessons, grammar activities, geography – even dissections – into engaging virtual, yet tactile and interactive, experiences for every student, which has tremendous potential for differentiated learning.

The interactive whiteboard acts as a multimodal portal, giving teachers the potential to use still images, moving images and sound, and when used in this way, it can address the needs of learners who find text difficult as the only mode of communication (Somekh, et al., 2007, p. 6).

Some interactive whiteboards also allow teachers to capture lessons as audio and video files for distance education, future use, or for students who are absent or who cannot attend class because of illness or injury.

Multiple means of expression

Accommodating learners with special needs

A key benefit of using interactive whiteboards to accommodate diverse student populations is the fact that students do not need to be able to use all the features of the interactive whiteboard to unlock its educational potential. The technology enables multiple means of expression, benefiting students of all ages and abilities.

Fine motor delay

Younger students and those with fine-motor challenges can operate interactive whiteboards by using special pens, a finger or fist, or any object, such as a tennis ball, depending on the type of board used. Those who cannot type or write can still benefit from lessons and participate in activities using drag-and-drop techniques on the board. Even students with severely limited

movement who are able to use switch systems to control their computers can use the same systems to operate interactive whiteboards.

The sense of accomplishment and mastery for students with physical challenges boosts self-esteem while increasing their engagement in the lesson. Becta noted, for example, that “young children who have not yet acquired writing skills, and older pupils with special educational needs, are highly motivated by being able to demonstrate their skills and knowledge with the tapping and dragging facilities of the interactive whiteboard” (Somekh, et al., 2007, p. 7).

Visually challenged

Educators can use interactive whiteboards to adapt material for students with visual challenges in a variety of ways. For example, they can resize text and graphics, and adjust brightness or contrast controls as needed. Students with limited vision can often write on the surface of the board because the brightness and scale is greater than that of a pen and paper or traditional chalkboard. Educators can also play videos, enlarging the image so their students can view detail they wouldn't be able to see on a smaller computer screen. This enables students to not only view information that would be otherwise inaccessible, but also to interact with objects on-screen and participate more fully in the lesson.

Deaf students

Interactive whiteboards are also a boon for teachers of deaf students. Interactive whiteboards with finger-touch capabilities enable educators to keep their hands free of pen tools, which can interfere with signing. At Ireland's St. Mary's School for Deaf Girls in Cabra, Dublin, educators found that the technology helped keep the entire class on track, particularly during lessons that involved reading text:

In practical terms, the IWB allows one to hold the attention of all students at the same time. When textbooks or worksheets are used in teaching deaf students, they have to look down to read the text and it is very time consuming to get the attention of the students again. The IWB greatly reduces this problem. We can read information from the board and sign at the same time. This increases the opportunities for communication between teachers and students (McLafferty, 2007).

Mental and behavioral challenges

For students with autism, Asperger's syndrome, attention-deficit disorder and other mental or behavioral challenges, maintaining focus can be a significant issue. Interactive whiteboards, which provide a stimulating focal point for lessons, can therefore be a tremendous asset. In

addition to capturing student interest, interactive whiteboards give ongoing visual reinforcement to complement instruction, offering students another sensory channel to help them process information. Educators then have the option to appeal to one or more senses when presenting information, which helps keep students engaged and on task. And for many students, the intrinsic reward of being able to use the interactive whiteboard when answering a question or playing a game provides a compelling reason to stay focused (K. Kautz, personal communication, January 17, 2007).

Many students with mental and behavioral challenges may also struggle with expressive communication, so being able to manipulate information on an interactive whiteboard to answer questions gives them new avenues for sharing knowledge. Some educators use the interactive whiteboard to view videos that depict social situations. This provides students with the opportunity to view and analyze social interactions in order to learn and practice appropriate responses (K. Kautz, personal communication, January 17, 2007).

Interactive whiteboards and IEPs

Educators who use interactive whiteboards find that not only is the technology a helpful teaching tool, but it can also maximize collaboration and facilitate clear communication in meetings with the special education team (C. Swanson, personal communication, January 14, 2007). Special-needs educators work within a team of educators, administrators, parents and specialists to create an Individualized Education Plan (IEP). The team meets to chart achievement goals and discuss progress. Using an interactive whiteboard to view and add input to the IEP enables individuals to examine the plan in tandem, discuss key points and record notes during the meeting. Being able to do this in a group setting helps keep everyone up to date and ensures the correct information is captured to the IEP. Once it is saved and agreed upon, the meeting organizer can e-mail the information to the team for future reference (C. Swanson, personal communication, January 14, 2007).

Interactive whiteboards in the field

Interactive whiteboards are a key classroom element for students in exclusively special-needs schools. For example, Stephen Hawking School in Neckargemünd, Germany, a private school primarily for students with physical disabilities, installed the first of many SMART Board™ interactive whiteboards in its classrooms in 2002. Across the Atlantic, the Florida School for the Deaf and Blind, the largest school of its kind in the United States, standardized on SMART Board interactive whiteboards in 2005.

Flexibility is a major feature for some classrooms in particular. The Bridge Academy in London, England, teaches students with profound and multiple learning disabilities (PMLD), autistic spectrum disorders (ASD) and severe learning disabilities (SLD). Needing an interactive whiteboard that could be operated by all students, including those who weren't able to hold a pen, administrators chose to install SMART Board interactive whiteboards in each classroom.

Multiple means of engagement

Providing digital tools for digital natives

As Marc Prensky noted in *Digital Natives, Digital Immigrants*, “our students have changed radically. Today’s students are no longer the people our educational system was designed to teach” (Prensky, 2001). Prensky asserts that students today are qualitatively different from the generations that did not grow up with the Internet, MP3 players, video games and cell phones. Their thought processes are less linear, they demand instant access to information, and they are fluent in digital media their teachers are still learning about (Prensky, 2001).

To engage these learners effectively, teachers need technologies that enable their students to speak their “native” tongue (Prensky, 2001). Interactive whiteboards are suitable for presentation and interaction, and they provide access to all types of media and the Internet. For students of the digital age, whose lives outside the classroom are inundated with technology, having an interactive whiteboard in classrooms also provides continuity. Their need for instant answers and desire for stimulating, media-rich environments find satisfaction in the large, colorful displays, touch control and sound capabilities that most boards provide. As a venue for content, the interactive whiteboard gives digital learners the immediacy they desire and the ability to find, create, synthesize, share, organize and play with information in new and exciting ways.

Effect on student achievement

With the ability to engage a broader spectrum of students in multiple ways, educators are quick to appreciate the benefits of interactive whiteboards. Solid evidence exists that interactive whiteboards have a positive effect on student engagement. The Becta study concluded that interactive whiteboards supported whole-class teaching, focused students’ attention and increased engagement (Somekh, et al., 2007).

However, an additional, critical factor in determining the value of interactive whiteboards in diverse student populations is their effect on student achievement, or attainment. Far from being faddish, the value of interactive whiteboards actually increases over time. In the same study, researchers reported a positive correlation between students’ achievement gains and the amount

of experience their teachers had with interactive whiteboards, highlighting the critical role teachers play in using technology to benefit their students (Somekh, et al., 2007).

Seven key features of interactive whiteboards that support UDL principles

As UDL tools, interactive whiteboards provide educators and students with a variety of avenues for creating, presenting and sharing information, including text, images, drawings, websites, charts, sound and video files. Interactive whiteboards engage students by appealing to all learning modalities and providing new opportunities to demonstrate their knowledge. But not all models are the same, so knowing which one is best for any given situation depends on the needs of the learning environment in question. The following points outline several important features for consideration:

1. Is the interactive whiteboard you are considering truly easy to learn and use? Look online for objective reviews and ask educators who use the product to evaluate its ease of use. Test the board yourself to find out how intuitive it really is.
2. Do you need a pen-only board or one that accepts input from fingers, pen tools and other devices? Having the flexibility to shift from pen tools to fingers or other devices can be important in meeting the technology needs of diverse student populations.
3. Can the software license be used in multiple instructional arrangements and environments without additional fees?
4. Is the product designed for accessibility? Does it have toolbars that can be moved around the screen to make them easy to reach? Will you need a wireless slate to interact with the content from anywhere in the classroom? Do you require a height-adjustable stand so you can raise or lower the screen?
5. What kinds of training programs are available and how flexible they are in meeting the needs of your staff? Effective and accessible training is the key to empowering teachers with new technology. Check with others who have taken all or some of the programs to see if they found them helpful.
6. Do professional development programs or user communities exist for the product? Are they virtual and local? These resources help teachers get the most out of the product and

enrich the classroom experience for everyone. Find out how well the programs are used and supported, and if they have been successful in attracting an active community.

7. How well established is the brand? Take advantage of your professional networks and ask around. The more established the brand, the greater the potential for online communities to share information and advice – this is important for educators looking to expand their skills or to collaborate with geographically dispersed peers and their students.

The benefits of choosing SMART

SMART Board interactive whiteboards have flexible, intuitive features that help teachers and students adapt to the challenges of the 21st century classroom while enriching learning for all. The products are also supported by comprehensive training and professional development programs, backed by solid warranties, and chosen more often than all other interactive whiteboard brands combined.

From a usability perspective, SMART's robust hardware and easy-to-use software are perfect for the demands of the classroom. Moveable tool bars, height-adjustable screens, pen-and-finger operation and other options allow even severely physically disabled students an opportunity to participate in lessons. This versatility also gives teachers a broad range of options for accommodating diverse abilities, creating differentiated lessons and appealing to every learning style.

SMART invented the interactive whiteboard in 1987. Today, it continues to drive innovation by supporting a research and development team of more than 200 scientists, engineers and other specialists. It remains focused on providing the best user experience by actively collaborating with teachers and students – each new version of software or hardware incorporates features and suggestions from classrooms around the world. Choosing a SMART Board interactive whiteboard is an investment in industry-leading classroom technology for both teachers and students for many years to come.

Conclusion

Because interactive whiteboards conform to UDL principles, they are adaptable to even the most unique learning environments and student populations. The opportunity to present information in multiple ways, allow flexible means of expression, and engage learners of the digital age makes it a natural fit with UDL and a vital part of today's inclusive classrooms. And while interactive

whiteboards in general play a critical role in education, those with flexible, intuitive interfaces, plentiful, high-quality digital resources, an established track record and strong customer support hold the most potential for universal appeal and effective classroom use.

For more information

SMART education consultants (all former educators) and SMART-authorized resellers work with educators to determine the right products for their classrooms. They can be contacted at www.smarttech/wheretobuy.com.

To learn more about SMART products and services, go to www.smarttech.com.

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