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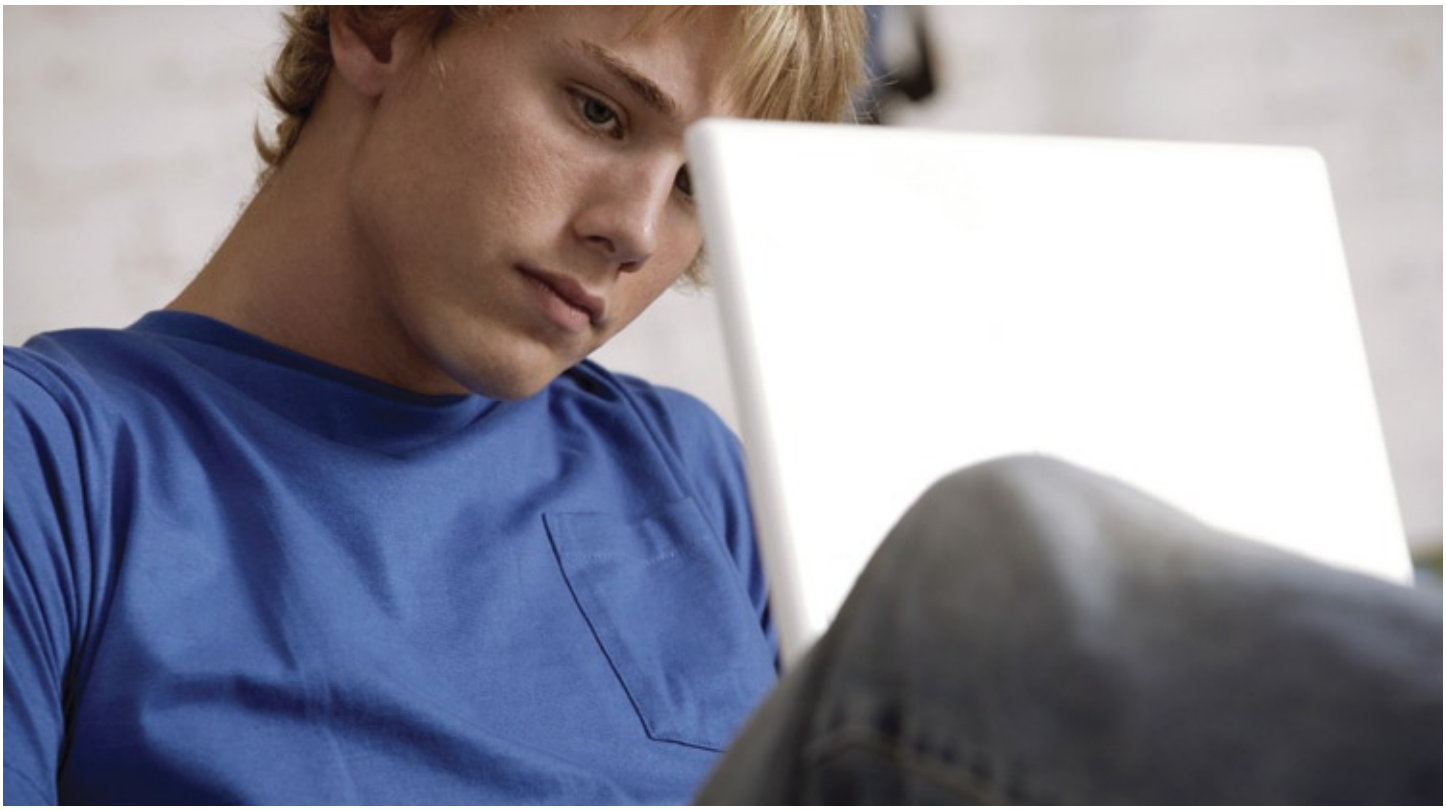
Learning in the 21st Century:

Teaching Today's Students on Their Terms



Today, information and communications technologies (ICTs) infiltrate classrooms around the world at an exceedingly rapid pace. In the wake of this influx, educators face growing challenges as they teach a very "wired"—and more and more "wireless"—generation of students using technology that is evolving every day.

This white paper helps educators understand and embrace ICT to create better learning environments for students. It defines 21st century students and teachers and presents the challenges educators face as these students and their accompanying technology cross the classroom threshold. This paper also presents solutions to help teachers effectively meet the needs of these students while preparing them for the 21st century workforce.

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THE 21ST CENTURY STUDENT

Millennials, the current generation of students, were born between 1980 and 2000. Although some Millennials have dropped out of or graduated from academia and entered the workforce, most are still in our school systems.

On average, Millennials spend 6.5 hours[i] each day saturated in print, electronic, digital, broadcast and news media. They listen to and record music; view, create and publish Internet content; play video games; watch television; talk on mobile phones and instant message every day.

"Today's digital kids think of ICT as something akin to oxygen; they expect it, it's what they breathe and it's how they live."

—Learning in a Digital Age, John Seely Brown

Generally, these young people share the following characteristics[ii]:

- **They like to be in control.** Millennials do not want to be bound by traditional schedules, and they do not necessarily want to sit in a classroom to learn or in an office to work. Instead, they prefer to use technology to study at any time of the day or night, telecommute from anywhere in the world and define "balance" in their own individual ways.

- **They like choice.** In project-based environments, Millennials use technology to complete tasks in new and creative ways. Their need for alternative methods to complete tasks presents challenges when using traditional measurements to define productivity.

- **They are group-oriented and social.** Relentlessly exposed to the world via the media, Millennials constantly network socially. In person, they travel in packs, shopping and playing together. Online, they seek opportunities to identify with other individuals on a smaller scale, joining communities and associating with peers around the world. They are highly collaborative; sharing what they learn with others actually helps them create their own personal identities.

- **They are inclusive.** Millennials have been taught to be tolerant of all races, religions and sexual orientations. They are not limited by the information available at their local library or by linear searches in encyclopedias on topics. Instead, they use the Internet to search for information worldwide and use hypertext links to divert from original searches and learn about new subjects.

- **They are practiced users of digital technology.** The Millennial generation is the first to be surrounded by digital media. ICT has always been part of their lives, and because of this access, Millennials naturally gravitate to it. They expect it to support their learning and do what they need it to do. Indeed, Millennials can perform more functions with mobile phones, handheld devices and other wireless equipment than they can with traditional computers. In addition to using the calendaring functions of these devices to prioritize and schedule their lives, they

often prefer computer-mediated communication and have developed their own language, which consists of acronyms like "LOL" ("Laughing out loud"), "ATM" ("At the moment"), "BTW" ("By the way") and other Internet slang. Today's technology allows Millennials to voice their opinions in ways that were not available in the past.

- **They think differently.** Technology itself is not amazing to Millennials. As former generations first try to understand how a new technology works, this generation does not marvel at it; Millennials simply accept technology, adapt to it and use it. For example, when researching a topic, a Millennial simply "Googles" it. What Google™ is and how it works does not concern Millennials; they use the tool to find the information they need.

- **They are more likely to take risks[iii].** The dot-com boom of the late 1990s resulted when early Millennials shared a common mentality: "If this doesn't work out, we'll try again." Some found wealth as a result; others tried and tried again. Their parents do not think this way and are not as likely to take repeated and similar risks.

- **They value time off because they view life as uncertain.** Millennials watched events like the 1999 shooting massacre at Columbine High School and the terrorist attacks on September 11, 2001, live on television. As a result of these tragedies, they view life differently. They observe their parents working hard in anticipation of earning a certain status or achievement level before taking a break. In response, Millennials want their own time—and when it is free—to be dictated according to their own terms.

"They use digital technology transparently, without thinking about it, without marveling at it, without wondering how it works."

—Understanding Digital Kids: Teaching and Learning in the New Digital Landscape, Ian Jukes, May 2005.

	Baby Boomers	Generation X	Millennials
Years of birth	Late 1940s to early 1960s	Mid 1960s to late 1970s	1980 to 2000
Relationship to technology	Later members of this generation were exposed to new media/technology during formative years[iv]	First generation to be raised on television	First generation with personal computers at home
Reaction to technology	Tries to understand how new technology works, marvels at it; generally holds to tradition, rather than adopting new technologies	Tries to understand how new technology works, marvels at it; generally adopts new technologies easily	Does not marvel at technology; accepts it, adapts to it, uses it
Exposure to digital media		7+ hours/day	6+ hours/day
Economics	Grew up during post-war times of economic growth	Born during time of economic consolidation; experienced affluence, consumerism, materialism	Growing up in one of the best economic times in the last 100 years, living luxuriously[v]
In the news	New family patterns; women's liberation; assassinations of public figures; first walk on the moon; Vietnam War; sexual freedom; civil rights movement; Watergate; the cold war; oil embargos; inflation; gasoline shortages	Ecological problems; influx of mass media; increasingly worldwide communication; globalization; failing schools; nuclear fallout	Watches 9/11 terrorist attacks, Columbine school shootings, war live on television
Goals	Work- and family- oriented: focuses energy on pursuing professional careers and founding families between age 25 and 30[vi]	Education-, time/leisure- and work-oriented: because of improved access to education, economic uncertainty and high rates of unemployment, postpones workforce entry in lieu of academic pursuits; values leisure because of affluence and lifestyle preferences[vii]	Time/leisure- and family oriented: views life as uncertain, determined to manage time—and when it is free—differently[viii]
Key attributes	• Experimental • Individualistic • Free-spirited • Social-cause oriented • Less optimistic • Distrusting of government • Cynical[ix]	• Reactive • Realistic • Creative • Financially engaged • Work-oriented • Independent[x] • Rebellious attitudes	• Group-oriented • Global • Technologically confident • Risk-taking • Optimistic

THE 21ST CENTURY TEACHER

Through its research, the National Education Association has determined today's teachers are generally white, female, 43 years old and married. They are more educated and experienced than teachers of the past; more than half hold advanced degrees and have 15 years or more of experience. And, of course, these teachers are seeing their work and their classrooms transform as they improve their lessons and teaching using technology[xi].

Generally, today's educators also share the following characteristics:

- **They may resist learning about new technology.** Coming from the Baby Boom generation and somewhat reluctant to adopt new technology too quickly, some educators feel intimidated by students' knowledge of tools they do not understand.

- **They work in environments where professional development is underemphasized and undervalued by their employers.** Of the 75 percent of teachers who participated in educational technology integration professional development courses, the majority—more than 60 percent—spent less than eight hours in a 12-month period in this type of training. When so few hours were dedicated to this training, 87 percent of teachers said they did not experience a lot of improvement in their teaching[xii].

"ICT is not only a 'thing'... (It also provides) a space that can link a wide community of learners and thinkers, where our capacities can advance through the intersection of people's social and individual inclinations."

—ICT Fluency and High Schools: A Workshop Summary, National Research Council, 2006.

- **They need support and planning time.** The number one reason teachers experience dissatisfaction with their jobs, causing them to either leave their profession or transfer to other schools, is lack of planning time[xiii].

- **New technology takes them out of their comfort zones.** Technology requires teachers to play more of a facilitator role—rather than a more directive or authoritative one. This new role conflicts with traditional teaching methods and requires teachers to step back and allow learning to happen without their hands-on direction.

THE CHALLENGES OF TEACHING MILLENNIALS

The classroom has changed since Millennials began moving through today's school systems. Curricula evolve, and new teaching methodologies are developed to reach this generation, which spends as much time stimulated by digital media as it does in school. As teachers work to engage and educate this generation of students, they face the following challenges:

- **Learning must be relevant to students.** Learning means more when Millennials understand practical applications for the information they receive. Content must be specific, concise and fast. Millennials are hungry for information and will search for it on their own if teachers do not present what they perceive to be relevant. Because so much information is constantly available, Millennials do not feel they need to learn everything immediately. Instead, they want to be taught how and where to find what they need when they need it.

- **Technology can be distracting.** Although Millennials respond best to high technology, these students and—more often—their teachers may become very distracted by it. ICT in the classroom requires students and educators to be taught how and when to use technology as a tool appropriately and safely.

- **Technology can be expensive.** The costs associated with implementing new technological resources in academic institutions are daunting. Funding hardware, software, infrastructure, professional development and technical support must be an ongoing priority. ICT costs are recurring, as is the need for teachers to be repeatedly trained and prepared to use technology.

- **Millennials risk being over-schooled and overworked[xiv].** The most scheduled generation ever, Millennials are pushed to succeed unlike any previous generation. High school students who excel arrive at college to find themselves unchallenged, sometimes finding no use for the first two years of higher education.

At the same time, only 75 percent of public high school students in the U.S. graduate on time[xv]. The remaining 25 percent drop out because they do not believe their coursework is relevant, the teaching they are subjected to does not match their learning styles and they experience a lack of personal attention[xvi]. The U.S. is not alone; individuals all around the world enter the workforce without graduating from secondary school:

- In New Zealand, where young people are required to attend school from age six to 16, six percent of 15-year-olds have dropped out[xvii].

- In Canada, the high school dropout rate among 20 year olds is approximately 12 percent[xviii].

- In the United Kingdom, 16 percent of individuals of working age lack the appropriate qualifications[xix].

- In Australia, student retention rates are only about 67 percent, and a study by the Business Council of Australia estimates 80,000 young people aged 15 to 19 will drop out of the educational system and fail to find fulltime work[xx].

- In South Africa, only 60 percent of students advance through the country's school systems[xxi].

- **Some Millennials will not pursue post-secondary education.** When formal education is not of interest, Millennials move into career clusters, which provide skills education, rather than academics. Although they may go to work in family businesses or trades, they still need a minimum standard of business, communication, creative, interpersonal and technical skills, as well as strong work ethic and personal integrity to succeed.

SOLUTIONS FOR USING TECHNOLOGY TO TEACH 21ST CENTURY STUDENTS

To effectively engage and teach Millennial students, school systems must be outfitted with a prerequisite of ICT resources, and curricula must be designed to promote a collaborative learner-centered environment to which students will relate and respond. As ICT is integrated into classrooms, educators must have professional development and certification of computing skills. Students must also be taught ICT skills relevant to their entry into the workforce.

Equip Classrooms with ICT Resources

Schools and school systems must outfit classrooms with ICT resources vital to the learning needs of 21st century students. In addition to hardware, software and infrastructure, ongoing technical support and maintenance is crucial.

For about $5,000 (USD), a "presentation station" with a teacher's workstation, data projector, interactive whiteboard, printer and digital camera can be created. On an individual level, one state was recently able to outfit students with laptops, software, technical support and maintenance for as little as $289 per student per year[xxii]. When funding does not allow for computers for each student, workstations may be mounted on wheeled carts to provide access for multiple classrooms to share.

New Curricula Design

Eight out of 10 teenagers play networked, online video games[xxiii]. Designing curricula to simulate a video-game environment may help educators better engage media-saturated Millennial students and provides the analytical-thinking, team-building, multitasking and problem-solving skills employers need[xxiv]. Consider the following characteristics of well-designed video games and ideas for how these characteristics can be applied in the learning environment[xxv]:

- **Well-defined goals.** Video games provide players a clear explanation of the desired outcome of the game and a definition of how to play. For example, a video game's objective may be, "Save the princess." Its definition of play may include, "Travel through worlds. Complete heroic tasks." In the classroom, teachers must set clear, realistic, attainable expectations for success. Not all students will achieve a goal in the same way or at the same speed, but every one must be given the same criteria for passing. For clarity, provide rubrics, multiple measures and examples, considering how individual students learn.

- **Patience[xxvi].** Video games allow players to perform tasks over and over. Multiple ways to complete a task may be available, and players are allowed to try repeatedly until they are successful. For example, when players attempt to kill a dragon and the dragon kills them first, they can always restart and try again. Likewise, if at first players try to use swords to kill the dragon and fail, they may try again using other weapons. In the classroom, allow students to complete portions of assignments and submit them for review. Give them opportunities to correct work and resubmit it. Be patient with their attempts, allowing students to learn from their mistakes and try again.

- **Team play.** Networked, online video games offer players opportunities to work together to win. Some games even require players to be part

of a team to win. The collaboration involved in these games also extends outside of the game to online fan sites and discussion boards[xxvii]. In the classroom, utilize group projects and peer review. Allow students to introduce themselves to their groups so classmates can see who they are working with, identify areas of shared interests and discover how they are individual, different and unique. Physically arrange classrooms to allow for collaboration and idea sharing. Assign tasks, and evaluate students as groups[xxviii].

- **Tracking.** Video games are organized in levels, allowing players to easily track their progression toward a goal. In the classroom, students need to understand where they are on the pathway toward their goal and must be able to see success at every level on the way. For example, say, "You are on step three of a 10-step process." By tracking where they are, students are better able to see the big picture. By showing how specific skills are relevant to jobs, students also see how skills development keeps them on track to achieving their goals in life.

- **Change.** Video games keep experiences moving. Players constantly change environments and progress to new and different areas of challenge when they are ready. Similarly, nothing in the classroom should be static. When possible, break up large projects into smaller tasks and teach students how task division moves a project along. Through these experiences, they see progress toward accomplishing their goals and learn time-management skills.

- **Immediate consequences.** Video games engage players by allowing them to see the impacts of their actions instantly. In the classroom, provide immediate, useful feedback and meaningful assessments. Help students understand what works for them, how it helps them achieve their goals, the value of their learning and how it impacts their environment. Remember, students need to see how learning is relevant to their lives.

- **Personalization.** Video games allow players to perform as different characters, customizing their experience and allowing for varying levels of expertise. In the classroom, teachers must help students set targets they can meet and identify where they may struggle. Although passing criteria is the same for all students, they should be encouraged to work in different roles to discover their strengths, preferences and interests. Give them opportunities to explore and move out of their comfort zones.

- **Patterns.** Despite varying levels of complexity, video games are designed to allow players to recognize certain patterns to solve problems. Learning to identify patterns and make logical decisions helps students cultivate higher-level thinking skills.

The following table compares the requirements of video-game and learning design:

Requirements	Video-game design	Learning design
Well-defined goals	Players understand the desired outcome of a game and how to play	Learning objectives are clear
Patience	Players may perform tasks repeatedly if necessary	Students may redo assignments repeatedly if necessary
Team play	Players work together to win	Groups of students work together to complete and review tasks
Tracking	Games are organized in levels, and point values of accomplishments are known	Students see progress at every level and as a whole
Change	Games keep moving, and players keep progressing	Students divide large tasks to learn time management and to progress toward goal achievement
Immediate consequences	Players see impacts of actions immediately	Teachers provide immediate/useful feedback and meaningful, formative and diagnostic assessments
Personalization	Players customize each game experience by playing as different characters; they enjoy a different experience every time they play	Students explore different roles, which are shaped by their interests, to discover strengths and achieve goals
Patterns	Players experience success because the game design is predictable	The learning environment makes sense

By structuring academic courses to reflect the attributes of well-designed video games, educators better reach Millennials and allow them to be in control, make their own choices, interact in groups and take risks. When teachers set clear expectations and allow students to chart their own courses toward task completion, students learn to manage their own education. In this self-directed-learning environment, they divide tasks, make decisions and learn from the consequences of their actions.

To win a video game, players recognize patterns and prioritize tasks. Similarly, when courses are designed to provide patterns students can follow, tasks they can prioritize and opportunities for group collaboration, students achieve success.

Digital Literacy Certification for Educators

ICT resources and well-designed curricula will only achieve optimal results in the 21st century classroom if educators have a foundation of basic computing skills. College and university-level teacher education programs should require educational technology courses for graduation. When new teachers enter school systems, they must come prepared with computing skills to seamlessly integrate technology into their classrooms.

Existing teachers are not exempt from the need for these skills. Professional development for all educators is critical to ensure technology is used with ease in the classroom. Just as school districts appropriate funds for teacher

development in reading, writing, mathematics and other subjects required by departments and ministries of education, they must also allocate funds to train teachers with the skills required to integrate ICT with the lessons they teach.

Of course, an individual's technological expertise is arbitrary unless it is measured and validated against a standard. Certiport® Internet and Computing Core Certification (IC³®), for example, is based on a standard that certifies knowledge of the critical computing and Internet skills valued in today's academic and professional environments. Developed in partnership with the Global Digital Literacy Council and with input from hundreds of subject matter experts from business and academia worldwide, IC³ is aligned with International Society for Technology in Education National Educational Technology Standards and has been given credit recommendations by the American Council on Education. The industry recognition, portability and validity of IC³ make it compelling proof of an individual's digital literacy.

Schools around the world have successfully included IC³ in teacher development programs. For example, Freeman School District, which is located just south of Spokane, Washington, implemented a teacher training and certification program to establish a base level of computing knowledge among teachers and to ensure teacher development was efficient and cost effective.

"We've struggled for years to provide technology in-service trainings to meet the needs of our teachers," said Bill Thurston, former superintendent of Freeman School District. "On these occasions, about one-third of the members of our staff say the training is what they need, one-third have knowledge and skills above the level of training we are providing and one-third are below it. It has been difficult to target the needs of our staff and establish a base of knowledge to provide everyone. We knew if we could put a certification standard in place, all of our staff would have the same knowledge base from which we could continue to provide training."

Several years ago, Freeman School District set a goal to have staff earn IC³. Dave Teague, Freeman School District technology director, said IC³ was chosen because of its task-based methodology, the concepts it covers in its three component exams—Computing Fundamentals, Key Applications and Living Online—and its logical gateway to other certifications in the ICT world.

"Staff development is a priority," Teague explained. "But it's difficult because the members of our staff are at all levels of knowledge about technology. IC³ provides our teachers a level playing field and an equal foundation from which they can develop their ICT skills."

Mary Ellen Wall, a third-grade teacher at Freeman Elementary School, said IC³ opened a door to a whole new world for her. "I wasn't raised with technology. I've had to take classes and work with it. Earning IC³ was difficult for me, but once I passed the tests, I realized its benefits. It gave me confidence to approach new technology and use it."

The investment the district made in teacher development flowed into the classroom. "We are a school district that receives little federal funding," Teague explained. "Therefore, all of our activities are taxpayer funded. Staff certification is a tangible way we are putting technology in classrooms and using taxpayer dollars wisely. Now that our teachers are familiar with IC³, they are better able to incorporate technology into their lesson plans and integrate it into their classrooms."

Thurston said the district is implementing multimedia functionality in its classrooms, providing more students access to technology. "The base knowledge IC³ provides has helped our teachers utilize these new opportunities," he said. "The new resources are being used effectively with little training."

"I now have enough background knowledge to not be afraid of technology," Wall said. "It has changed my job. We use online tutorials, we're moving to a more-paperless system to reduce waste, we use an intranet at school for communication, we access student test scores online—in all these ways we are better serving our students thanks to technology. My job is easier because I can now communicate with parents via the Internet. I can also format my lessons in so many different ways to adapt to different student learning styles[xxix]."

Training and certification of computing skills are critical to success in the classroom. Equipment means nothing unless teachers and other ICT professionals within school districts can productively use it to supplement teaching. "Highly qualified teachers" are imperative to education reform in many countries, including the U.S. The No Child Left Behind Act specifies U.S. schools are required to have a highly qualified teacher in every classroom[xxx]. One quantifiable way to ensure teachers are qualified is to require certification of digital literacy skills.

In Hawaii, the department of education has placed special emphasis on the importance of ICT training and certification for teachers, administrators and staff. When the state gave every teacher an IBM-compatible computer, Macintosh-proficient teachers were unable to use the new machines. "Project Inspire," a comprehensive online professional development program, was introduced to help teachers use their new computers and better integrate ICT into their classrooms. The program provides foundational, productivity and more advanced computing skills training and testing. After completing

three courses at the foundational-skills level, Hawaii teachers are required to take IC³ exams. Earning the certification is necessary to progress to the next level of the Project Inspire program and qualify for reclassification benefits[xxxi].

In North Carolina, the board of education approved The Impact Model, a set of teaching and learning guidelines to increase technology integration in classrooms. The program helps teachers merge technology into their teaching, increases student technology awareness and improves students' academic achievements. Focused on collaboration between teachers, technology facilitators and media coordinators, The Impact Model establishes an infrastructure of technological support and provides new, hands-on technology experiences.

The results of The Impact Model have contributed to school reform in North Carolina. ICT now spans grade levels and subject areas, including music, art, physical education and special education. Traditional reading, science, math and social studies subjects meld together, assessments are problem-based and authentic and learning is measured by portfolio activities in addition to tests. ICT is integrated effortlessly into teaching plans, and students are met each day with personalized, individualized, exciting learning prospects. Teachers have a new vision; the time and money invested in their professional development has helped them and their students grow academically and personally[xxxii].

Technology integration programs like The Impact Model are less about the inclusion of ICT in classrooms as they are evidence of the value of emphasizing educator professional development and collaboration. Certainly, technology shapes the learning environment, but, in reality, it is an instrument by which students and teachers come together to learn about their worlds. Well-trained and certified teachers are no longer distracted by the ICT in their classrooms. Given adequate training and time to develop ways to integrate technology into coursework, these teachers improve their teaching and results.

Digital Literacy Certification for Students

Exposure to computers in the classroom or at home and use of mobile technology does not always equal understanding or efficient use of ICT. Core digital literacy must be taught and validated to ensure students have current and relevant skills to enter institutions of higher learning and perform productively in the workplace. Certification of student computing skills ensures everyone in the classroom is prepared to learn, rather than be concerned with basic ICT functions.

Many school systems around the world use IC³ as both a standard of student digital literacy and a requirement for graduation. One example, Papakura High School, is a large, co-educational secondary school for students in Years 9 through 13 in Papakura, Auckland, New Zealand.

Of Papakura High School's 1,400 students, many are Maori and Pacific Island students without access to ICT at home. To achieve optimal success, teachers focus on individual student needs. "Some students have had more computer access than others, so we focus on differentiated learning using pre-assessments to determine how well individuals perform specific tasks," explained Jules Nicholas, head of ICT at Papakura High School. "From pretests we learn what to emphasize with the whole class and what needs less explanation."

The school's ICT courses have been designed to offer students IC³, which comprises the fundamental computing skills required to earn credits to move to the next grade level and to earn New Zealand's National Certificate of Computing Level 2.

"Not only do students earn their units, but they are getting an internationally recognized qualification," Nicholas said. "What our students gain from earning this certification can be used elsewhere. They have to have ICT literacy skills of a certain level when they leave our school. If they also have a certification, they are that much ahead[xxxiii]."

A globally recognized standards-based certification for basic computing skills, IC³ tests computing knowledge to ensure students have mastered core-computing concepts in the areas of Computing Fundamentals, Key Applications and Living Online. Using performance-based exam methodology rather than rote memorization, IC³ demonstrates students have essential skills. It ensures students understand both how to perform a task and why this knowledge is important.

Similar to other legislation around the world, the U.S. No Child Left Behind Act bridges the Digital Divide by requiring that all students are technologically literate by the time they finish eighth grade. Certification of these skills gives educators a valid method to report successful completion of this requirement, unbiased examination of student ICT skills through psychometrically validated exams and a universally portable and global standard of digital literacy. Available worldwide, IC³ is more cost effective and time efficient than assembling other assessments to meet national or local requirements.

Standards-based certification of basic computing skills should be required for advancement from middle to secondary school or for graduation from secondary schools. Career education and workforce readiness skills, like those required by IC³, have been shown to affect and reduce secondary-school

dropout rates[xxxiv]. IC³ also equips students with computing skills beneficial to higher education and vital to success in the international business world.

> At the university level, Priscilla Hagebusch, clinical professor of information systems at the A.B. Freeman School of Business at Tulane University in New Orleans, has witnessed firsthand the need for students to come to college prepared with computing skills. When policy changes allowed students to start business school in their freshman year rather than taking prerequisite courses to enter in their junior year, Hagebusch said Freeman School became concerned with foundational computing skills. Administrators needed a way to equip freshmen with the learning tools they would need throughout their university experience. IC³ proved to be a viable solution.
>
> Initial IC³ results surprised Freeman School students and faculty. During sample testing the first week of school, students scored significantly lower than passing on the Computing Fundamentals and Living Online IC³ exam components. "The standard for these exams has been set by a panel of 450 industry experts from around the world," Hagebusch said. "So my students were, on average, not up to that international standard upon entering the course."
>
> Students used assessments to measure their initial computing skills, increased competence and took IC³ exams for extra credit.
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> "More and more high schools around the country and the world are adopting digital literacy standards to ensure a uniform level of computing knowledge," Hagebusch said. "Because not every high school student goes on to college, I believe it is essential for high-school graduates to present these recognized credentials to the workplace to be competitive. We believe it is critical for A. B. Freeman School of Business students to be well armed with these skills for their academic and employment futures[xxxv]."

Indeed, with employment on the horizon, Millennial students must be able to demonstrate a solid foundation of computing skills and experience. Employers reviewing job applications and interviewing candidates expect and require certification of digital literacy standards. This validation enables employers to confirm and be assured individuals have core ICT skills to function productively, efficiently and competently in the workplace.

Like the well-designed video games defined in this paper, IC³ meets students' needs in a format with which they can identify. The following table illustrates how IC³ accomplishes the goals of well-designed course curricula:

Requirements	IC³
Well-defined goals	Exam objectives are published to provide clear descriptions of the requirements to pass
Patience	If an exam is failed, it may be retaken as many times as necessary until passed
Team play	The annual IC³ World Cup is a team-based contest for teachers and their students; teams use assessments and IC³ exams to earn points, competing for prizes and worldwide recognition
Tracking	IC³ is divided into three component exams; passing all three exams results in certification. Individuals easily track their progress and results using their digital transcript of certifications.
Change	IC³'s rolling-development cycle ensures it is always valid and relevant, measuring proficiency in the latest key technologies
Immediate consequences	IC³'s "live," performance-based testing provides direct, authentic measurement of skills; results are available immediately following exam completion
Personalization	Using Certiport Internet & Computing Benchmark™, individuals can easily identify the skills they need to learn and map out custom learning paths to achieve IC³
Patterns	Certiport Internet & Computing Benchmark and Internet & Computing Mentor™ tools show how well individuals complete learning objectives and whether they are answering objective questions correctly or incorrectly

IC³ requires critical-thinking skills and the ability to evaluate real-world scenarios and precedes higher-level skills validation. The Educational Testing Service (ETS) and workforce development organizations around the world recognize IC³ equips students for 21st century careers.

CONCLUSION

As ongoing study of the rising Millennial generation continues to define this unique population of students, best-practice education resources and requirements will evolve. Technology already serves as an extraordinary tool to shape and enhance the learning environment. Along with equipment, digital literacy skills are absolutely necessary to ensure the technology is used to supplement—and not substitute for—high-quality instructional methods. Undeniably, the instruments in our hands are not as important as how they are used to effectively shape the learning environment for today's students.

Great teachers using digital technology with certified computing skills will be the most powerful educators in the 21st century.

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