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## Bridging the Digital Divide in Undergraduate Business Information Systems Education

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**Abstract:** This paper presents some of the more-effective techniques of teaching with the philosophy of providing undergraduate Business and Management students the required computer skills and foundation for subsequent courses in Business Management Information Systems. Traditional academic learning techniques cause undergraduate faculty significant challenges as they fail to adequately engage the digital gaming generation. The generational gap between the baby boomers and the gaming generation has created a new digital divide and requires teachers to rethink about how they are presenting material in the classroom. The traditions of brick-and-mortar classroom teaching approaches are in dire need of improvements to bridge the ever-widening digital divide between the professor's instructional methods and the expectations of the "digital gaming teenager". A Management Information Systems course was designed with the above challenges and solutions in mind. The course introduced the use of computers, basic information system concepts and the management of information technology to support effective decision making. A number of success strategies included Web Based Assignments, Research Report and Presentation, On-line Testing, and Industry-based Case Studies. Analysis of this experiment induced the authors that the effective educational instruments were those that appealed to the students with creativity, challenges and continuous feedback. This paper concludes that educators need to develop new teaching methodologies and learn how to engage this new digital gaming generation while providing the students with both the soft skill sets and technical knowledge required for the global competitive market.

**Keywords:** information systems, gaming generation, On-line Testing, teaching methodologies, case studies, undergraduate education, soft skills, computer skills

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# Bridging the Digital Divide in Undergraduate Business Information Systems Education

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## Abstract

The paper presents some of the more-effective techniques of teaching with the goal of providing undergraduate Business and Management students the required computer skills and foundation for subsequent courses in Business Management Information Systems. Traditional techniques to foster student learning present significant challenges to undergraduate faculty as they fail to adequately engage the digital gaming generation of students. The generation gap between the mature faculty including "baby boomers" and the gaming generation represents a digital divide, and requires teachers to reconsider how to present material in the classroom. The paper discusses ways in which traditional pedagogy of on-ground teaching may be adapted to meet the expectations of the "digital gaming teenager". A Management Information Systems course was designed with the above challenges and solutions in mind. The course introduced the use of computers, basic information system concepts and the management of information technology to support effective decision making. Success strategies included Web Based Assignments, Research Report and Presentation, On-line Testing, and Industry-based Case Studies. Analysis of this experimental course persuaded the authors that effective educational techniques are those that appealed to the students by being creative, offered challenges and provided continuous feedback. The conclusion is that educators need to develop a new pedagogy and learn how to engage the new digital gaming generation, while providing the students with both the soft skill sets and technical knowledge required for the global competitive market.

**Keywords:** information systems, digital gaming generation, on-line testing, pedagogy, case studies, undergraduate education, soft skills, computer skills

## 1. INTRODUCTION

Commonly understood, learning is defined as the process by which people acquire new knowledge for enhancing their abilities, and skills to improve their performance (Rosenberg 2001). Traditional techniques to foster student learning present significant challenges to undergraduate faculty as they fail to adequately engage the digital gaming generation of students.

The generation gap between mature faculty and students of the digital gaming generation is accentuated by what has become known as a digital divide, and requires teachers to rethink how they present material in the classroom (Simpson 2005). There is a gap between the outcomes when

adopting traditional pedagogy and the expectations of undergraduate students when participating in the academic environment.

The research project examined traditional teaching techniques to obtain insight about their effectiveness with the digital gaming generation. This is presented in Section 2 Next, experience gained from teaching an information management course is described, followed by the strategies for success using a real-world case study. A summary of the design of the course is included and opportunities for improvement, along with lessons learned and some recommendations are provided.

## 2. BACKGROUND

Over ninety percent of American children, aged two to seventeen, have regular access to video games, with the size of the gaming generation estimated at over 90 million people in the United States alone (Beck and Wade 2006). The current undergraduate student is part of the "gaming generation", and as teenagers many have played electronic games 20 plus hours a week (Wankat and Oveovicz 2005). The average 21 year old has played over 10,000 hours of video games, and nearly seventy percent of students learn best actively and visually (McLester 2005). The typical middle class teen-age student has a laptop or at least a personal computer (PC), and an array of digital lifestyle devices such as an MP3 player, a PDA, a cell phone, a digital camera and an Xbox or Play station (DeCanter 2005). Consumers between the ages of 18 to 26 state that their desktop PCs and laptops are devices they cannot live without, and cell phones rank second as their most important electronic device, as illustrated in Figure 1 (Schadler 2006).

This generation has developed intuitive computer skills, and their preferred learning style is essentially inductive learning without formal instruction. They are hands-on interactive learners who think doing is more fun than studying; they have little need to read instructions; and have been conditioned to the "trial-and-error" approach of rapid feedback and consequences learned from computer games (Wankat and Oveovicz, 2005). The digital gamer generation spends hours instant messaging, and half the population of the United States plays video games. The elements of interactive gaming, adaptations, competition and communication are becoming the traits of successful students and workers (DeKanter, 2005). "The current generation of learners is a generation of privilege who have grown up with ready access to technology and are capable of multitasking using several technologies at one time. They are very capable of thinking quickly, being creative, handling multiple stimuli and utilizing technology, but at the same time, they are easily bored" (Beard et al. 2007).

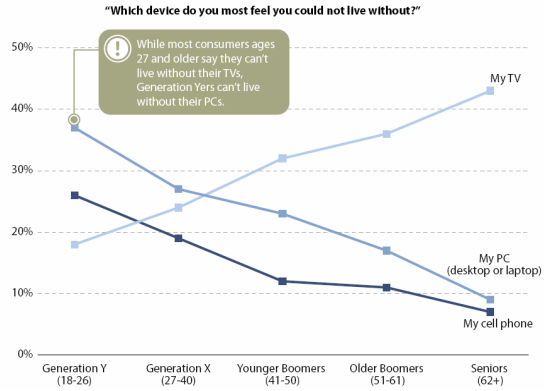


Figure 1 Consumer Trends of Young Consumers (Schadler 2006)

Clearly, the tradition of brick-and-mortar class room teaching approaches are in dire need of improvement to bridge the ever-widening generation gap, or digital divide, between the professor's pedagogy and the expectations of the "digital gaming teenager". The gaming generation is unhappy in school, they are not challenged and they are bored (Simpson 2005). It is concluded that curricula for undergraduates should incorporate new teaching approaches that appeal to them, and faculty must understand student expectations in order to support their learning more effectively.

There are also new challenges and requirements to properly educate knowledge workers of the future. To adequately prepare students to thrive in the emerging global knowledge society, educational changes are required with new "approaches to learning that both fit current economic realities and are more attuned to the socio-cultural, psychological and spiritual needs of an emerging global knowledge society" (O'Hara 2007). Higher education needs to be responsive to the needs of the changing world and the global marketplace by providing students

with the skill sets required to keep our society competitive. The rapid pace of change of information turnover and obsolescence requires changes to what we learn and how we learn. "Learning to learn becomes a core competency and learning how to harvest information from multiple sources, just in time, will be more important than accumulating a body of knowledge" (O' Hara 2007).

## 3. COURSE OVERVIEW

A Management Information Systems course was designed to address some of the challenges mentioned in Section 2. The intent was to lead the students in self-managed learning, fostering the skills and habits that could enable them to be successful in the field of IT, and develop an understanding that learning is a continuous life long process. This course should provide the foundation for subsequent management information system courses in the curriculum of undergraduate business students.

The syllabus includes topics on an introduction to the use of computers, basic information system concepts, and the management of IT to support effective decision making. The targeted audience for the course included both working professionals in industry and full-time undergraduate students, with ages ranging from twenty to forty years of age. One hundred twenty students attended the three sections of the course offered in a term, with an average registration of 40 students per section.

Goals of the course were to provide the students with understanding of the following topics:

- Why information systems are essential to business and society.
- The application of IT toward achieving business goals and objectives.
- The foundations of information systems, particularly with respect to personal computer hardware and software, including Microsoft Office products and Internet usage.
- Concepts of the software development life cycle, project management, relational databases, web application development, operating systems, computer networks and security.

Specific objectives of the course included:

- Examining how IT may be used, designed and managed to support effective business decision making.
- Providing students with an understanding of topics, such as the fundamentals of telecommunications, business processes, information systems development, application tools, the use of the Internet, and software development life cycle.

The course was web facilitated with faculty providing the primary lecture materials, and leading class discussions, supported by the Blackboard™ Learning System. The Blackboard™ website was utilized for posting the syllabus, course announcements, lecture material, class assignments, on-line examinations and student grades. On-line feedback for assignments and test grades were also provided via Blackboard™ and individual email to students.

## 4. SUCCESS STRATEGIES

Success strategies discussed in this section describe the efforts exerted toward establishing web-based assignments, preparing a research report and presentation, online testing, and an industry case study.

### 4.1 Web Based Assignment

The assignment required students to develop a web site for a dental office, which provided the following information: hours, services, staff information, emergency contact information, and external links to other dental web sites. One graphic image or photo on each web page were to be included, the web site were to contain a minimum of three linked web pages, and links to other useful web sites for dental patients. To support this assignment, students were provided with lecture material about the format of html files. The students were given the ability to use either text editors such as Notepad to create the html file or web creation tools such as Microsoft Front Page.

The web based assignment provided students with a hands-on learning experience and reinforced lecture materials regarding e-commerce, web languages, and Internet usage. The graphical nature of the assignment, the technical challenge of learning web development languages, and the chal-

lenge of planning and organizing the format and content of the web pages provided high student motivation. Students were provided with a greater appreciation of course content utility and a skill set directly applicable to the business world. This course assignment provided a problem-centered learning opportunity, which fosters a hands-on activity to produce solutions beneficial to a real life application, and is a successful and effective learning environment (Laware and Walters 2004). The web assignment engaged students in an active learning experience that allowed them to implement methods beneficial to e-commerce business applications.

### 4. 2 Research Report and Presentation

IT courses must help the student become knowledge workers, by developing the skill sets necessary to become independent learners who can identify information needs, utilize technology to gather, organize, and analyze information to solve problems (Miertschin and Willis, 2003). Additionally, employers of IT graduates have requested that educators place increased emphasis on soft skills such as speaking, writing and interpersonal communications (Howard 2005). In addition to high technical knowledge, and basic IT competency skills of Internet usage and search skills, employers also expect additional value competencies in IT professionals such as teamwork, communication, oral and personal presentations, project management, leadership and problem-solving. One of the objectives of the research project and class presentation was to offer students the opportunity to develop their search skills in Internet usage and library resources search, and to provide the opportunity to develop presentation and communication skills.

Students had the entire semester to develop a research report and research presentation which assisted them in developing their time management and project management skills. The syllabus instructed each student regarding the requirements of a research report and class presentation on current IT business trends or IT business standards. The research report required at least three technical references and were to be in the range of 700 to 1000 words. The project presentation called for a PowerPoint slide presentation of approximately ten minutes. Each student was given an opportunity to present their topic, and a question and answer session with the class was facilitated.

Since this was the first IT course for undergraduate students the Blackboard™ web site posted useful web site links as shown in Figure 2 to assist the student in developing their research reports and presentations.

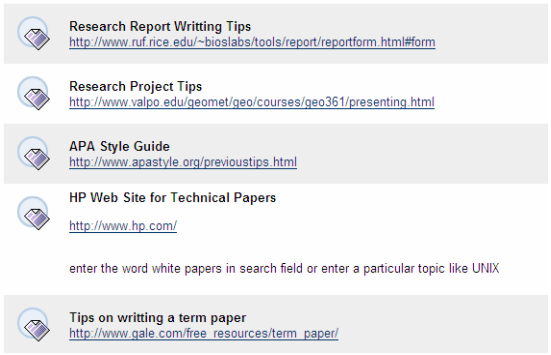


Figure 2 Web Links for Research Project

The research report and presentation provided the class with the following learning opportunities:

- Utilization of the library and Internet search engines for technical references to encourage students to maintain and improve their knowledge.
- Exposure to a wide range of diverse topics related to IT.
- Preparation for industry in the form of soft skills of communication and presentations. Students received feedback by email within two days with their grades for the research presentation, the appropriateness of the topic to the course, and suggestions for improving their presentation style.

  Students enjoyed the ability to present and discuss the results of their research with the class, and benefited from the wide range of topics and interesting subjects, that were discussed , such as the following:

- New York Stock Exchange Electronic Trading : Under John Thain, CEO, the NYSE has acquired the electronic exchange Archipelago in December 2005, become a publicly traded company in March 2006, and acquired the Euronext Exchange which is comprised of numerous European Bourses that was finalized

on April 4, 2007. With the utilization of electronic trading and the two recent acquisitions results in cost savings predictions are for $200 million in 2005 and 2006 and another $475 million in 2007 ( Bruno J. B., 2007). The NYMEX already uses an intranet that allows traders on the stock exchange floor to use tablet PC's to enter orders. An extranet for sellers is already in place and allows sellers and market makers to execute sell orders from remote locations. Electronic Data Exchange is the key issue in this situation. The data of the world's financial markets requires maximum security. Recent actions taken by the NYSE Group, Inc and their future plans, truly impact the global financial marketplace.

- IT project management - Organizations implement changes to become more competitive by using projects, that are temporary endeavors undertaken to accomplish a unique product or service. Project Management is the application of knowledge, skills, tools and techniques in projects in order to meet project requirements. Project management is the development and implementation of a plan and includes oversight of the project phases of planning, implementation, evaluation and support / maintenance. A project manager performs many activities including organizing work, assigning tasks, directing activities, estimating and allocating resources, obtaining material and human resources. Advantages of using a formal project management system include better control over the companies financial, physical and human resources, improved customer relations, lower costs, shorter development times and higher quality.

  Project Management is a growing field in the business world. More than 16 million people in the U.S. regard project management as their profession. The job of IT project manager is in the list of top ten most in demand IT skills and Project Managers, on average, earn more than $82,000.00 per year. The global economy, Internet and increased competition have fueled the growing need for effective project management and there is a rise in research and training for certification iin project management.

- E-Commerce Initiatives for Medical Prescriptions: Electronic Prescribing (e-Prescribing) is the ability to electronically transfer data from a physician's office to the pharmacy. Utilizing Electronic Data Interchange, the doctor can enter a prescription with his/her computer; send it to the pharmacy via the Internet. The advantage is that a pharmacist no longer has to decipher a physician's handwriting on the prescription. The doctor would select the drug from a database containing all of the available drugs. Included in the database would be all pertinent medical information related to that individual drug, including side effects, possible drug-to-drug interactions, and warnings regarding appropriate laboratory tests that should be performed when using certain medications. The potential for improper dosages would be significantly reduced as will the risk of death and injury. It is alarming to know that there are approximately 7,000 deaths and approximately 1.5 million Americans injured annually from incorrectly dispensed prescriptions.

  Though cost is a big factor in preventing e-Prescribing from becoming universally available, it is not the only consideration. This type of application is in its early stages, and to be successful it is important that all of the participants needs be met. All physicians must be able to communicate with all pharmacies. It also means that appropriate infrastructures must be built to accommodate all players. There are also federal regulations that must be addressed, and consideration of varying state regulations that complicate the standardization of data exchange.

- Wireless Networking and Security - 200 million Americans, which is more than 65% of the U.S. population, own and use some variety of wireless networking. Wireless networking eliminates the need for cables to communicate by using radio or light waves in an air medium to transfer information. These waves are sent between wireless access points and wireless clients. A wireless access point is a base station that is attached to the wired network. A wireless client is the network interface with computer devices such as PC's, PDA's, or cell phones that commu-

nicate with access points. Every wireless device has serious security issues. The information being sent through the air is susceptible to outside attacks. Although the interception of private information is a huge security concern with wireless voice and messaging devices, it is not the only concern. It is also possible to intercept signals from these devices and to clone the device ID numbers (Electronic Serial Number and Mobile Identification Number, or ESN/MIN). this means that criminals could bill their own transactions to a stolen ESM/MIN.

Personal Digital Assistants and Internet-enabled cell phones (smart phones) are handheld devices that can connect to the Internet across a digital wireless network. These devices employ services such as e-mail, news, messages, stock quotes, and simple transactions. Others linked to the same public wireless network can monitor another PDA's activity and gain access to files. A solution to accessing private information is using a virtual private network (VPN). This sets up a secure 'tunnel' for the transmission of information between the traveler and the home office. Encrypting all e-mail before transfer will prevent others from reading this information. Many different attacks may occur among voice and messaging systems, handheld systems, and data networking systems. However, they do occur most often in the data networking systems of WLAN and Broadband. Specifically, Active Eavesdropping, Man-in-the-middle Attacks, and DoS Attacks may be the most damaging and hardest to thwart.

In Active Eavesdropping, attackers listen to all network traffic, hoping to find unencrypted networks. In a Man-in-the-middle Attack, the attacker is able to get the data packets before the intended receiver. An Address Resolution Protocol allows the attacker to redirect network traffic through his/her device and then change the content of the transfer. A Denial of Service (DoS) attack uses frequency devices to send continuous noise on a specific channel to ruin network connectivity. A constant network security station is the only way to substantially prevent these attacks.

The overall benefits of the designing and implementing the course are summarized as:

- It provided students with the ability to learn about the application of technology to business contexts.
- Students were given the opportunity to develop their research skills, their communication skills, and their presentation skills.
- A broad and diverse subject matter of topics were presented, including history of popular web sites such as Yahoo and Google, Airport Security, The High Cost of Spam, Identity Theft, Usage of Social Networking Sites, ITIL IT Infrastructure Library, EDI – Electronic Data Interchange, ERP – Enterprise Resource Planning, XML – Extensible Markup Language, CPU technology comparison from Intel and AMD, and High Definition Graphics Cards for Gaming Applications.
- Students were allowed wide latitude in selecting their topic; topics were approved and modifications were suggested by the faculty prior to actually initiating the research activity.
- The combination of preparing a research report and giving a presentation provides students with an opportunity to experience the four learning styles of reading/writing, visual learning through the development of the graphical presentations of materials, aural learning by listening to other presentations, and kinesthetic learning for students who learn by doing of subject material that is relevant to the course topics and interesting to the student. This supports the findings of Howard (2005) that students are more interested and engaged in the research project presentations since the presentation material included class discussions and was more interactive.

### 4.3 On-line Testing

A midterm and final examination, based upon the lecture material from the text book, were taken in open book mode. The utilization of Blackboard™ for the examination, which consisted of fifty multiple-choice questions, was mutually beneficial to the students and professor. Students were given

several days to complete the exam utilizing the Blackboard System, and could schedule their examination session around their other courses, family life and work schedule.

The Blackboard™ System provided the students with the feedback on their answers, and allowed students to take the examination twice, providing them with the opportunity to improve their grades. The use of Blackboard™ for testing purposes provided immediate and automatic grading feedback to the student and the professor, which was very beneficial and time saving considering the number of students in the course.


Figure 3 IBM 1956 4.4 Megabyte Hard Disk Drive

### 4.4 Case Studies from Industry

This part of the pedagogy exposed students to a number of real world case studies. The faculty provided a newspaper clipping about identity theft at a retail store chain, articles about the newest from Microsoft about the Vista operating system, case study reports from Forrester Research about Supply Chain operations at IBM, and the Wal-Mart Approach to IT. Other relevant information provided to the students included Automotive E-commerce lecture material, software development life cycle and project management methods utilized by industry, and computer security. Students could relate the theory of the text book and the lecture material to the industry case studies.

One class topic presented the illustration shown in Figure 3 of an IBM 4.4 Megabyte Disk drive dating from 1956 and asked student to rate the size and the cost of their own personal memory sticks. This was an effective means to illustrate the principle of Moore's Law and obtain student participation. The IBM 4.4 Megabyte disk drive weighed over 1 ton and was used by the 305 RAMAC computers, which was the first computer to have a hard disk drive ("Computer Storage", 1956). In contrast the memory sticks can store 4 gigabytes of data, which is 1000 times more storage capacity, two inches long and weighs only one ounce.

## 5. ANALYSIS

Pedagogical techniques that proved to be effective with the student population, were those that required creativity, posed challenges and provided immediate feedback. Students were more engaged in the material that was presented in interactive mode. The web development and on-line testing enabled the student to see the results of their efforts and challenged their skills, knowledge and creativity. It also provided students with the type of learning environment in which the digital gaming generation excels, namely where the consequences of their actions are immediately displayed, they have the ability to make decisions and changes interactively, and have immediate feedback. Furthermore, development of web pages presented students with opportunities to express creativity using clip arts and graphic images. It also fostered a spirit of competition in terms of showing their web presentation abilities.

The research assignment and report provided students with a task, which provided immediate public feedback and instructor praise, which appeals to their competitive gaming nature and pride. This supports the findings of (Beck, Wade, 2006). The digital gaming generation loves multitasking, being immersed in data and gamers want to be heroes. The gaming generation places a high value on competence and wanting to be an expert in the first place (Beck, Wade 2006). This was demonstrated in the research presentation which serves to illustrate to their classmates and instructor how they became experts in a particular subject matter. Avoiding the traditional instructor lecture by

having the students give presentations is an approach that students find appealing.

As reflected in the student grades shown in Figure 4, students prefer activities such as debates, roundtable discussions, and student presentations and they fell they learn more from the interactive formats (Sherman, 2005).

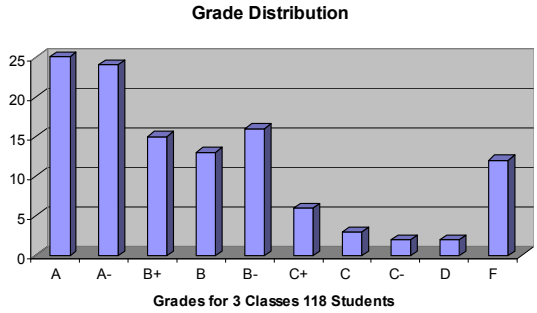


Figure 4 Grade Distribution

Student feedback by means of anonymous teaching questionnaires was that lecture material from text book Power point slides was boring, which is consistent with the expectations of the digital gaming generation. One student commented that attendance should be required "because then the student would be more stimulated to learn."

## 6. OPPORTUNITIES FOR IMPROVEMENT

Classroom attendance and classroom participation were not mandatory and did not contribute to the overall grade. Many students felt that there was amble opportunity to obtain the required lecture material from the Blackboard™ web site and lacked enthusiasm for class attendance. There was a strong emphasis on textbook lecture material and presentation material to cover the fundamental knowledge areas.

Future class sections will mix lecture material with more interactive class discussions. Reading assignments will require class participation for analysis, discussions and presentations of issues. Students will be required to report on and discuss a contemporary IT management issue as reported in professional news journals. Class attendance and class participation will be included as part of the overall grading criteria. The use of case studies, analysis and class discussion will be expanded to enhance critical thinking skills, and soft skills sets of communication. The benefits of case study analysis is to bring the business world into the classroom by providing real world problems, enabling students to develop problem solving skills, and professional knowledge (Lei et al. 2003). Students will be provided with discussion questions for each of the case studies presented and will be graded on their participation in class discussions of the questions. It is hoped that by promptly posting grades on Blackboard for class participation and discussion students will be motivated and challenged to participate more.

Although the quality of the research reports generated by the students was of remarkably high quality in terms of content and topics addressed, the research references were weak. This is consistent with findings by (Liu and Houdek 2006) that undergraduate students lack the skills to effectively utilize library resources to perform literature searches and evaluate the credibility of different information sources. There is a lack of scholarly literature search skills and many students used reference sites, such as Wikipedia, Google, or a URL from where they obtained the information. Future course offerings will include library instruction on how to perform literature searches, increase students awareness for peer reviewed texts and potential credibility issues, and improve the students judgment on the publication venue and citation information. Additionally, the course will provide a reading list of suggested articles, reference literature, and case studies as a starting point for the research activity. Grades for the research report will be reflecting the quality of the literature citations.

## 7. CONCLUSIONS

The digital gaming generation made it clear that traditional teaching methods do not satisfy their learning needs. They refuse to be force fed a "canned education", such as Death by PowerPoint presentation lectures. Therefore, they require fundamental shifts from traditional pedagogy.

Our individual teaching experiences coupled with the review of literature made us realize that indeed there is a clear digital divide between maturing faculty including the baby boomer generation and the gaming generation. This gap requires teachers to rethink how material should be presented in the classroom. When educators clearly under-

stand that 75% of students learn best when actively and visually engaged, they will begin to implement the necessary changes to close this digital divide. Changes that are proposed include teamwork on course projects for case study analysis - the alignment of theory with practice, discussions of current industry trend and events, collaboration with faculty and other students, and online participation.

IT educators must create a classroom environment that includes a diverse number of learning styles, interactive exercises, and discussions to foster critical thinking, engagement, enthusiasm and learning. Educators need to develop new teaching methodologies and learn how to engage this new generation while providing the students with both the soft skill sets and technical knowledge required for the global competitive market. The use of online learning tools such as Blackboard™ for online testing and other learning features proved to be beneficial and effective.

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