Empirical Results about Efforts for Effective Teaching to y-Generation Freshman Students

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Abstract— **New techniques are deployed to teach the new generation of students effectively. This work tries to share our experience in a blended course for over eleven years. It has been observed that the online portion of the course has to be adjusted carefully in order to obtain a high level of student satisfaction and overall throughput from the course.**

Keywords- blended learning, e-learning, y-generation.

I. INTRODUCTION

The last two decades have witnessed technological revolutions such as the Internet, web technologies, mobile technologies, and social networks that have a strong impact on the way how the new generation behaves. The generation of people born between 1980 and 2000 is labeled as the y-generation (following the x-generation born between 1960 and 1980) and the vast majority of the students currently at the university are belonging to the y-generation. The students of this y-generation have grown up in the digital/mobile age where Internet and mobile devices have become commodity for those of them who are especially born after 1990. There have been several alternative names for this generation such as the "digital natives," "millennials," "net generation" etc. As this generation has started to pursue university education around the end of 1990's, everybody has become aware of their "different" character. The literature contains numerous works that describe how this new generation is different than the previous one [1-6]. Students are used to be characterized by some very strong statements [1-6]: They are technology experts living in the connected world and consume the technology very fast; they cannot (or do not want to [2]) focus on a topic for a long time; they can efficiently do multitasking (following the instructor while browsing their mobile devices and listening to music at the same time!); they want to express their opinions anonymously and get appraisal in the virtual world; they want to learn with fun. On the other side of the coin, they have been labeled as addicts to software games; they are not social in the sense the x-generation perceives; they lack a confidence to the future, even they do not expect much from the future. Even though, there is no consensus among the researchers about all the characteristics, the abovementioned ones are cited in the literature and media quite often.

Those observations and the resulting fear that the new generation is not going to be educated well for the challenges of the new millennia, have resulted in many changes how the university education is carried out. Information technology (computer, internet, mobile) has been recognized as a fundamental component in the delivery of the university education. Traditional methods of course delivery, home study, and performance assessment have been transformed in order to match the daily experiences of the student. Learning management systems have been deployed to implement blended learning that has replaced purely face to face education with a hybrid approach where the concepts of e-learning and collaboration have been widely used. The basic fact that the instructors of this generation are mainly older than 30 years of age, (hence of the x-generation) has resulted in serious discussions whether the needs of the y-generation can successfully be fulfilled by the "older" generation. There is also no consensus about the efficiency of those new techniques that are based heavily on information and communication technologies [2, 7-10]. Some works indicate that use of online tools (especially games) would enhance the learning of the y-generation whereas others argue that the classical asynchronous methods also can be applied for efficient learning at this group of people [8]. It should also be kept in mind that the social, cultural, and economic level of the society, or the student population in the narrow sense, may also result in different observations around the globe, or even within different regions of a country. Most of the data available are based on the observations in developed countries whereas data about developing and underdeveloped regions may yield different results.

This work tries to share some of the experiences that we have gained in the last twelve years in an introductory freshman course in the engineering faculty when we have implemented several strategies for effective teaching during that period. Section II will cover the history of the course, and it will highlight the strategies applied at different eras of the course history. Section III will summarize the data collected about the course, and about the efficiency of the course based on student evaluations and surveys. Finally, section IV will conclude the paper.

II. THE HISTORY OF "ENGINEERING GUIDE AND ETHICS"

At our institution, all freshman engineering students in the (approximately 150 students each year, in three sections) are required to take the 3 hours per week course "Engineering Guide and Ethics" in their first semester. This course has been devised and conducted for twelve years by the author of this work. The main motivation (back in 1999) of the author was the following: The students in engineering departments were offered courses in mathematics, natural sciences, languages, and computing in their freshman year, followed by fundamental engineering subject courses. However, there is no course that exhibits the general characteristics of the engineering profession. The students do not know what the term "engineering" includes. As a consequence, an introductory course has been developed to exhibit general characteristics of engineering with its relationships to the society and the environment. Ethics (mainly engineering ethics) has also been included in the course in order to form a solid understanding of the concepts while guiding the students in the engineering domain. The course has witnessed two major changes until now, and each era of the course history will be explained in the following subsections.

A. Era of Web Enhanced Face to Face Instruction

During the period of 1999-2005, the course has been conducted as a 3 hours per week in-class lecture with course materials (presentation slides, case studies, supplementary reading) available on the public web. All of the supplementary reading material has been integrated into the course curriculum in such a way that the students were required to digest the material in a weekly/biweekly period for further study and class discussion. There has been 5-7 class exercises to be carried out in groups, and 5-8 assignments to be carried out individually The final project (a group work to be done by three students) has been a major component of the course where students were asked to analyze an ethics case and to make a formal presentation to the class. Table I gives an excerpt from the syllabus of the course in the academic year 1999-2000 where the aim of the course and the catalog data can be seen. This syllabus has been preserved until 2006 with minor modifications.

As the course has been conducted, efforts have been spent on adopting a teaching style consistent with the expectations of the y-generation [1-6]. The presentations and handouts have been supported by visual materials as the y-generation is "visual learner." Students have been exposed to group exercises after they have been explained why this exercise is important for their future. Each activity is tried to be linked with a need of the student. In order to maintain student attraction, some of the activities and lectures have been converted into games or schemes like games have been adopted in the delivery of some lectures. Three to four professionals have been invited into the classroom for sharing their daily life experiences in the engineering profession where the major emphasis has been put on the subject thought, e.g. design, presentation skills, professional responsibility, etc. Each year, an anonymous student satisfaction survey has been done in order to identify the strengths and weaknesses in the course delivery. The students have been asked about their opinion on a Likert scale (5: Strongly agree, to 1: strongly disagree) whether they have achieved the course learning outcomes as described in the "aims of the course." The results of the surveys can be seen in Table III.

TABLE I.   SYLLABUS OF THE COURSE IN 1999-2000.

Aim of the course: To give the student an understanding of the engineering profession and the main engineering problems with their social context. To collaborate in small groups to analyze a case, to formulate arguments for a debate and to develop communication skills. Developing skills in moral reasoning, having an understanding of ethical implications of the engineering profession.

Catalog data: The engineering profession. Engineering questions. Modeling processes and experimentation. Electronics/Computer engineering. Necessary skills for engineers: teamwork, communication, presentation. Professionalism: client-employee relations. Ethical reasoning and problem solving. Moral responsibility and whistle-blowing. Computer ethics. Codes of ethics. Case studies. (3+0+0)

Furthermore, students have also been asked two open-ended questions about what they liked and disliked most in the course. A compilation of common answers to those questions are given in Table IV. Each year, the student surveys have been examined and minor modifications have been done in the sequence and/or content of the material, however the skeleton of the course remained essentially the same. An important change has been the inclusion of a session with alumni of the faculty starting with the year 2004. As our faculty had its first graduates in 2003, the number of alumni participating to those sessions has become less than 5 in 2004 and 2005.

B. Era of Blended Instruction Using a Learning Management System

Along with the efforts of the faculty for quality assurance and accreditation, and the adoption of a state of the art LMS (learning management system) in the university, the "Engineering Guide and Ethics" course has been redesigned. The student has been put more into the focal point of instruction. The lectures have been conducted face to face but the student is expected to be more active during the lecture and before/after the lecture. Several major changes have been deployed to better utilize the features of the LMS. More than half of the material has been digitized, half of the assessments have been shifted to the LMS (short, online, multiple choice quizzes on demand of the student), and some class discussions have been carried out in online forums. The students are asked to compile more material in the web for class discussion. The proportion of time when the instructor "talks" during the lectures, has been reduced from approximately 75% to 60%. The students have been encouraged to form blogs for the course. Last but not least, the number of alumni participating to the special sessions has increased up to 28 people so that the students could really "see" what the alumni of their faculty actually do after graduation. The course objectives and the course learning outcomes for the period of 2006-2011 can be seen in Table II.

The use of the LMS has been a major change in the life of the students and the instructors: All formal messaging between the instructor and the student (announcements, course calendar, tasks, etc.) has been done using the LMS. The first year has witnessed many accidents: some students could not submit their homework or quiz on time, either because they did not care or because they experienced some network and/or hardware problems at the last minute. Students started to complain about the difficulty of online quizzes as those quizzes should be finished in a short time interval. The instructor of the course had to spend more time on the development of question pools for quizzes. The tool of the LMS for plagiarism check allowed the instructors to perform much more reliable control of student works. It has been a disappointment that the ratio of term papers plagiarized has increased suddenly, actually, the ratio was essentially the same, but the instructors could not detect all incidents before. As time passed, the instructors and the students have got used to the LMS. The adoption of the blended learning style has allowed a more flexible schedule to be followed during the lectures. The instructor could find more opportunities to discuss contemporary issues. The students could interrupt the

course for questions much more easily. More responsibility has been pushed onto the shoulders of the students as they had to read more material online.

There have been some observations regarding the behavior of students towards the blended nature of the course. First of all, class attendance has dropped significantly in the first two years. The instructor has tried to do his best to convince the students that the exams will not be based on memorizing the written materials in the LMS. However, some of the students' perception was that the lectures were of no use for the exams because the actual content had to be learned by the student. This misconception has resulted in lower grades for two consecutive years of 2006 and 2007. The students' attitude has changed as they have been informed by their upper classes about the course in subsequent years. Secondly, the students did not prefer to carry out online discussions in the forum unless they are offered extra credits. This phenomenon has been observed for more than 5 years, and the students argue that they find it of no use for themselves. This has clearly showed us that the y-generation has enough channels to express himself in the online community so that the forums of

TABLE II.   SYLLABUS OF THE COURSE BETWEEN 2005-2012.

Course objectives:

1. To be a guide for students in their undergraduate study.
2. To give the student an understanding of the engineering profession and the main engineering problems with their social context.
3. To collaborate in small groups to analyze a case and identify the problem, to synthesize a solution, to formulate arguments for a debate and to develop communication skills.
4. Developing skills in moral reasoning, having an understanding of ethical implications of the engineering profession. Consciousness in academic ethics.

Course Learning Outcomes:

1. To understand the academic system.
2. To understand knowledge management and its importance.
3. Ability to use office applications software for word processing, spreadsheets, and presentation.
4. Ability to communicate in written and verbal form, and ability to make presentation.
5. Ability to collaborate with classmates for discussion, problem solving, and project work.
6. Ability to define engineering, its characteristics, and main concepts associated with engineering: systems approach, modeling, optimization etc.
7. To understand the impact of engineering in society, culture, and environment.
8. Ability to define tasks of engineers and their work areas.
9. Ability to define ethics and the relationship of engineering and ethics.
10. Ability to analyze an ethical case, and to develop a solution/comment about the case.
11. Understand codes of ethics and academic ethics.
12. Understand the need for lifelong learning.

the LMS are regarded as unnecessary. The same behavior has been observed in the formation of blogs for the course. The students appear to have two different and mutually exclusive domains of presence in the online community. Even though some students are known to be very active in blogging, the course could not attract their interest. Thirdly, the majority of students think that research on Internet is synonymous with a search on popular search engines. As the experience shows, the first few items supplied by the search engine are considered to be the relevant items for the subject. Structured online databases for academic journals and conferences are not preferred when the students have to find specific information. The instructor of the course has worked in collaboration with the library personnel in order to increase use of those online databases for information retrieval; however, there have been several reasons that prevented students' engagement. The students complain that the material in online databases is usually "very academic" so that the freshman students cannot fully understand the material. Moreover, many students already have developed the habit of typing "everything" into the search engine. Fourth, many of the students are observed to be not being capable of differentiating scientific/specific knowledge and comments about scientific knowledge. It has been observed many times that students rely on information in forum pages, social media, and websites for some kind of propaganda without questioning the content. The Internet is thought to supply correct information all the time. However, we have witnessed many occasions where the information supplied is misleading especially in social and ethical issues. An interesting observation is as follows: the students get very surprised (and even upset) when they are told that the information is not correct. They insist on the correctness, and they cannot believe how the Internet supplies incorrect information.

We have also carried out surveys to monitor student satisfaction as before. They have also been asked after the course final exams whether this course should be carried out with more online presence where we will meet for seven times for one hour and for project presentations only. For the three consecutive years of 2008, 2009, and 2010, 68%, 73% and 69% of students have favored a more online course respectively.

C. Era of Blended Instruction with More Online Content

The course has been transformed into a more online course in 2011 as an attempt to investigate possibility of transforming it to an e-learning course. For this purpose, major changes are implemented: All presentations have been narrated, notes have been added and they are put in the LMS in a way to check weekly access of students with online quizzes. Some professional online training tools have been deployed to teach basic skills in office software. All assessments except the midterm and final are performed using the LMS and discussions are rewarded with points (as students were not willing to participate if they do not get points). Group works have been assigned to be carried out online at a time when all group members can be online. The students have met for seven times in the classroom for very specific activities: group work, games, surveys, and class discussion. There has been no instruction carried out in class. The instructor has announced

extra support hours for the students both in the office and online.

At the end of the semester, only 43% of the students were happy with the online nature of the course where many students have put remarks indicating that the course should have more group work. They have complained about the difficulties of online collaboration, and about their inadequate level of success in some online content. There have been some more serious observations that have resulted in rethinking the delivery of this course: More than 20% of the students failed because they did not attend a minimum of 70% of online quizzes.

Question: Do you agree that you have achieved the following outcome?	1999-2005	2006-2010	2011
To understand the academic system.	NA	4.1	3.7
To understand knowledge management and its importance.	NA	4.0	3.8
Ability to use office applications software for word processing, spreadsheets, and presentation.	NA	3.7	3.9
Ability to communicate in written and verbal form, and ability to make presentation.	3.7	3.7	3.5
Ability to collaborate with classmates for discussion, problem solving, and project work.	4.2	4.3	3.7
Ability to define engineering, its characteristics, and main concepts associated with engineering: systems approach, modeling, optimization etc.	4.0	3.9	3.3
To understand the impact of engineering in society, culture, and environment.	3.9	4.2	4.0
Ability to define tasks of engineers and their work areas.	4.1	4.3	3.9
Ability to define ethics and the relationship of engineering and ethics.	4.0	4.3	3.6
Ability to analyze an ethical case, and to develop a solution/comment about the case.	3.7	4.2	3.6
Understand codes of ethics and academic ethics.	3.8	4.2	3.1
Understand the need for lifelong learning.	NA	4.5	3.9
Number of respondents	652	741	144

The usual ratio of failing students was around 7%. The support hours have not been utilized by students: they argue that they did not need to consult anything, but the exam scores indicate a lower level of success in the course. Furthermore, students could not collaborate adequately for their final project because they could not arrange their free times easily. The students lacked the class consciousness as they did not meet with their classmates. Those observations can partially be related to the fact this has been the first time those students are taking such a course. On the other hand, comments of students, as can be seen in Table IV, indicate that students prefer in-class instruction as long as it is not boring.

III.   EVALUATION OF DATA

In this section, we want to summarize the results of the student surveys for the three eras of this course. Some questions have not been included in the first era, so that they have been labeled as NA (Not applicable). The students have been asked to express their opinion whether the learning outcomes of the course have been achieved. Based on the Likert scale from five to one, the average agreement scores of students for the learning outcomes are given in Table III. There are several observations related to the data. Firstly, the general perception of students about achieving the learning outcomes has increased in the second era with respect to the first era, and there is a drastic drop in the third era. It should also be mentioned that the instructor evaluation survey carried out independently indicates a slight increase in the instructor's course grade in 2011. However, the students do not feel to have achieved the outcomes as effectively as before.

Furthermore, Table IV summarizes what the students liked and disliked most during the course. It is interesting to note that many of the items did not change between the two eras. Two items deserve special attention: In 2011, group work is not listed among the things liked as the students could not carry out effective group work. Moreover, the things disliked indicate that the reading material has to be revised and the attraction of students has to be guaranteed in asynchronous reading. In short, those students, as members of the y-generation, really want to play and interact rather than performing long readings.

In this course, what did you…	2006-2010	2011
like most?	• Problem solving exercises, games • Group work • Presentations	• Problem solving exercises, games • No attendance requirements • Presentations
dislike most?	• Readings about ethics • Difficult online quizzes • Boring class notes	• Difficult online quizzes • Long reading materials • Boring class notes

IV. CONCLUSION

Our empirical evaluations indicate that some of the assumptions about the behavioral stereotypes of y-generation students are not necessarily valid in all circumstances. The students are not experts of technology; rather they have overconfidence in their abilities. Online collaboration seems to be difficult to achieve in academic issues. Students are still happier to face an instructor that can manage to keep the interest of the students alive instead of online instruction without the warmth of the classroom. Multitasking abilities of students are heavily undervalued in online learning tasks as the students' focus is easily distracted in the absence of an instructor.

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