Perceptions of Effectiveness of Instructional Uses of Technology in Higher Education in an Era of Web 2.0

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Abstract

Understanding learners' perceptions regarding the effectiveness of information and communication technology (ICT) use, including those in the broad category of social media, is both important and critical to the success or failure of integration of ICT in higher education settings. Using theories of educational psychology and technology integration, a 50-item survey was constructed and data were collected from 14,283 students from 12 Québec universities in Canada, using a probabilistic sampling strategy. Exploratory factor analyses followed by multiple regressions show that engaging lectures, effective use of ICT tools for individual study and group-work, as well as active and self-regulated study strategies have a positive and significant impact on students' perceptions of course effectiveness. Results are discussed in light of research on social media tools, instructional effectiveness and gender difference in technology use.

1. Introduction

Despite the fact that digital technology potentially facilitates new approaches of teaching and learning, it cannot guarantee per se that effective and appropriate learning outcomes are achieved [1]. Several researchers have investigated the link between perceptions of information communication technologies (ICTs) used in the classroom and students' quality of learning [2,3,4,5]. Understanding the perceptions of students regarding the effectiveness of technology use and their proficiency and knowledge of specific types of ICT tools are both influential and critical to the success or failure of integration of ICT in higher education settings. It is important to shed light upon perceptions of students' course effectiveness so that we make sure that technology implementation in higher education settings is congruent to better educational quality and increase in student gains.

How much ICT is to be used in academic learning situations may play a less a clear-cut role. A survey of 800 mid-west undergraduate students with regards to their ICT skills, perceived educational benefits and teachers' effectiveness indicated that students' perceived ICT competency, whether for personal or instructional activities did not strongly predict perceived ICT benefits [6]. In addition, there was a negative link observed between perceived faculty integration of ICT and students' perceived learning benefits [6]. The analysis of responses from this stratified random sample appear to suggest that the more a technology is used by a professor, the less students feel it might enhance their learning.

It seems that when students perceive themselves as competent in their use of ICT in general, they attribute the beneficial effects of ICT to their own learning [7]. They integrate in their studies several types of ICT tools, depending on the goal of the activity at hand, selecting and appropriating technologies according to their own personal needs, whilst being aware of the benefits and shortcomings of each tool. Students' decision to use technology is proportional to the time invested in learning to use that technology and its perceived benefit to them [1].

Given the complexity of better understanding the role of ICT in students' learning experiences and the fact they employ several strategies inside and outside the classroom to complete their learning, we propose an exploratory study that will enhance the comprehension of the factors impacting students' perceptions of course effectiveness, especially as they relate to the growing adoption and integration of social media in higher education classrooms. Our study is unique in that it adopts theories grounded in instructional applications of educational psychology, instructional technology and applications of social media to gauge perceptions of course effectiveness across a large sample of undergraduate students. ICT tools are perceived as being very useful to learning in higher education settings when students realize that they will be using them at work settings later on [8].

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Indeed, students demonstrate a greater inclination to use ICT tools if they know they will use them in nonacademic settings as well. At university level, students start becoming aware of the benefits that ICT offers them, not only to pass their coursework but also, for their survival in the current complex and multifaceted work settings [8].

The specific objectives of this paper are to:

1. explore the relationships between perceived use of different types of ICTs, including those of social media, and their perceived efficacies of use;
2. explain how perceived course effectiveness can be linked to perceptions of instructional methods employed by teachers and studying approaches adopted by learners.

This paper explores results from a large-scale survey of Québec university classrooms to paint a picture of how undergraduate students' perceptions of effectiveness of instructional approaches and ICT use impacts their perceptions of the quality of the courses offered. We hope our paper can contribute a social-science and educational technology-based approach to the broader discussion of how higher education classrooms are adapting to the use of modern Web 2.0 tools, as well as whether there is an alignment between students' perceptions of their learning needs and their perceptions of their instructors' pedagogical approaches.

2. ICT in Higher Education Settings

The burgeoning integration of ICT in higher education has reached a tipping point. While it may be a challenge to find academic institutions that pay no heed whatsoever to the affordances of ICT, the differential manner and extent to which its integration occurs may have significant implications for students' perceptions of course effectiveness.

ICT tools are constantly evolving and developing [9]. Universities are, therefore, not surprisingly, investing in ICT tools to meet the technological demands of today's world [10]. We are witnessing a growing trend of increasingly sophisticated ICT tools in education. As such, these may herald the telltale signs of the future indispensability of ICT tools to the educational sector. To explore the role of ICT in higher education settings, we have reviewed various critical aspects of students' learning experiences, including their knowledge of ICT, the teaching methods they are exposed to, their adoption of different learning strategies, the way they cognitively and metacognitively regulate their learning, and their perception of the benefits of ICT used inside and outside the classroom. These five independent factors are now introduced and will be used in our analyses to predict students' perceived course effectiveness.

2.1. Knowledge of ICT

The use of ICT renders information more easily accessible, decentralized, free, boundless place and time [11]. In addition, certain ICT tools can enhance social collaboration and cooperation among students. Integrated platforms with frequently updated classroom information seem particularly conducive to learning; they facilitate communication and feedback between teachers and learners. Online posting of grades and lecture notes and complementary websites are also conducive to a positive learning experience.

Students' knowledge of ICT tools and their perceptions of how these tools promote their learning are crucial for determining digital technology's added value in higher education settings. Prior research has shown that that Internet, email, and productivity tools are the most commonly used ICT tools in higher education settings [1,7]. Students perceive that browsing the web supports their learning and lets them explore beyond the limits of a book, hence creating knowledge not accessible without the use of this tool and keeping them au courant of what is happening; the most frequently mentioned Internet sites appear to be Wikipedia and Google [1,5].

Web-based technologies that are seeing increased adoption in higher education settings are blogs, wikis, podcasts, virtual environments as well as social networks [12]. The pedagogical value of integrating blogs into university-level courses, for example, is garnering increased interest. While blogs can be used with different aims in mind, such as student reflection [13] or to provide an alternative forum for regular classroom dialogue [14], the jury is still out regarding their usefulness. A quasi-experimental study involving 149 undergraduates [15] found that students who used blogs for supplementary reading and writing assignments had neither significantly higher reading performance nor learning motivation scores than their non-blogging counterparts. However, the blogging group had a significantly higher retention rate than the control group. In connection to this, moreover, teachers felt bloggers were able to create a more supportive learning community than the non-bloggers.

Wikis are also gaining currency in university teaching contexts. Apart from the unassailable presence of Wikipedia, the potential benefits students can derive from using wiki interfaces are being much lauded because they are user-friendly and offer greater flexibility than blogs [16,17].

A survey of 126 university students using course wikis over one semester show that wiki self-efficacy,

or ‘a person’s judgment of his/her capability to use wikis’ [12, p. 55], perceived ease of use, perceived usefulness and wiki use intention have a significant bearing upon student wiki usage.

Like wikis, podcasts are weaving their way into the virtual fabric of academic institutions although their effectiveness as learning tools remains unequivocal. Increasingly universities are offering students the opportunity to watch pre-recorded lectures via podcast and while students show an aversion to full-length lectures in podcast form, compulsory podcast listening may lead to improved academic performance [18]. Students themselves appear to value using podcasts because they consider them to represent where education is headed [19]. More recently, 2343 university students were surveyed regarding the effectiveness of podcasts as a tool to enhance learning [20]. According to the results, a majority of students felt podcasts had helped them to understand and remember course material, particularly around exam time. However, while instructors did not report an increase in workload, student attendance had dropped as a result of podcasts [20].

Online social networks are also being successfully deployed to initiate collaborative online communities of practice among university students and their recently employed counterparts [21]. After using the system for one semester, students improved their perceptions of its social navigation, ease of use, usefulness and overall experience. Moreover, students felt the system acted as a learning support and served to boost their teaching confidence. The more they participated in online discussions and activities, the greater their sense of community. Perhaps unsurprisingly, students articulated a desire to remain members of the online community in order to continue broadening their insights into teaching with the input of in-service teachers.

Another affordance of Web 2.0 technology that is generating discussion centers on the relatively recent but ubiquitous phenomena of online social networks. It was found that the group (in collaborative projects), the network (in discussions and queries) and the collective (in data mining) play distinct roles whenever social software is employed for e-learning [22]. Furthermore, Google, Facebook and Twitter are recognized for enabling students to learn outside of the classroom and build communities at the same time [23].

2.2. Teaching methods

College students enjoy many educational uses of ICT since they promote their access to information related to the course and also because they allow communication and collaboration with the course instructor and colleagues [24]. The use of available ICT tools, in addition to an integrated platform with frequently updated course information, appears to be particularly conducive to student learning.

Other teaching strategies such as online lecture notes, and complementary websites are also conducive to learning. However, it appears that certain educational practices are less favorable to learning. These include PowerPoint presentations badly used, the launch of irrelevant websites or too abundant content, in addition to mandatory participation in discussion forums. Thus, it seems undeniable that the use of ICT by university instructors is an essential contribution to students’ learning, but how it is used is of primordial importance

Results from the review of 300 studies measuring the effect of blended learning on students’ experience indicate that students tend to respond in an overwhelmingly positive fashion to the integration of ICT in higher education classroom [25]. Even though students do appreciate the usefulness of blended technology with face-to-face teaching, there is an immediate need for students to appreciate the role of ICT embedded in classroom settings and the corresponding association of that on their study approaches and their engagement in various pedagogical activities.

2.3. Learning strategies

Since the early 90’s there has been increased use of networked technologies in the classroom. A critical component of the successful integration of computer technologies can be connected to student preferences. Theoretical reviews have distinguished between learning strategies and learning styles [26] and how these might be employed when a learning opportunity arises.

Over the years, much of the research indicates that an approach conducive to learning is effective when learners adapt to a situation based on individual preferences for learning strategies [27, 28, 29]. Additionally, research literature describes two levels of learning - deep and surface, where the former describes an invested approach to understanding and absorbing presented content, while the latter describes a method that intends on absorption for the purposes of accomplishing specific learning tasks [30].

Elsewhere, research has investigated the claim that ICT provides considerable gain to the student’s learning quality of the subject matter in the context of a WebCT- course module offered to 16 students [31]; this mixed methodology study argues that ICT does

promote deeper (as opposed to surface) learning. Among the reported gains of students: more ease in expressiveness, communication facilitation, and opportunities for immediate feedback and problem resolutions [31].

Millennial students are partly characterized by their relatively autonomous use of ICT tools. Individuals determine for themselves (and to varying degrees exploit) the technologies that suit their particular needs as learners [7]. Thus students will set up their own independent online learning support networks and prefer these to discussion forums created by their instructors. Similarly, while universities may invest heavily in bespoke virtual learning environments, today's students are highly selective in terms of which technologies they will actually spend time on [7]. Essentially, students consider ICT as pivotal in their learning trajectory.

In addition, using ICT tools to communicate outside of the classroom is a sine qua non in the life of today's modern student. Email allows the student to discuss, analyze or to simply ask for clarification outside the physical boundaries of a classroom. MSN and other messaging software such as Skype were the most frequently reported communication applications [7].

A survey was administered to 95 second-year psychology majors in the U.K, using the ASSIST tool, to gauge students' perceptions towards ICT tool usage in higher education settings, as well as their approaches to learning [32]. Quantitative analysis of the survey data indicated no significant relations between study approaches and perceptions of ICT utility. However, focus group analyses revealed that students who adopt deep approaches to studying have a higher appreciation of the benefits of ICT integration offered in a course module [32,33].

2.4. Self-Regulatory Strategies

Research indicates that learning styles are based on prior knowledge and experiences [34]; however, the jury is out on the application of these models to pedagogy. In the present project, we opt to use an empirically-derived theory of self-regulated learning.

Self-regulated learning strategies are crucial in ensuring that learners' cognitions, metacognitions and motivational variables act in concert so as to increase chances of academic success, especially when tackling ill-structured academic tasks in university classrooms. Essentially, learners who are self-regulated strategically apply and adapt their learners' cognitive and metacognitive thought processes in influencing their own behaviors while tackling academic tasks, taking into account their emotions as well as motivational states within a specific learning context or environment. Typical self-regulated strategies include monitoring of learning, development of comprehension of assessment criteria for academic tasks, reviewing material before and after classes, note-taking and summarizing, and reflecting on learning [35].

2.5. Perceived Benefits of ICT Use

Several studies highlight the significance of student perceptions of effectiveness of ICT use in classrooms. Students rated presentation tools as the most beneficial ICT with regards to its positive effects on learning and motivation [5]. Another study indicated that there are significant positive changes when multimedia instruction, practical activities and feedback are used for oral presentation skill acquisition [36].

Students make extensive use of productivity tools to create written work or graphs, or to prepare oral presentations [7]. They are the most frequently used by higher education students for writing or delivering assignments using word processors, spreadsheets and graphics [1]. Virtual learning environments (VLEs) are particularly beneficial to students since it can keep them up to-date with course content, messages and postings and affords greater flexibility in terms of when and where course information and relevant resources can be accessed [7].

2.6. Perceptions of Course Effectiveness

Perceptions of course effectiveness have been linked to instructional strategies employed by teachers and study strategies used by learners. In fact, research has demonstrated that utilizing the Internet, as well as interactive presentation software, such as PowerPoint contribute significantly to improving perceived outcomes on learning, enthusiasm and motivation [5]. It was also found that senior students and women prefer the lecture method for learning and motivation. The students' learning needs dictate perceptions of ICT effectiveness in the classroom. Students "want to be challenged and seek constant stimulations in the environment" [5, p. 1252].

Elsewhere, students' perceptions of online course satisfaction are affected by the impact of task value and self-efficacy and instructional quality. The combination of student motivation and perceptions of good quality instruction are good predictors of online course effectiveness [2].

Students appraise course effectiveness by focusing more on global aspects of the learning process than specific details pertaining to the course instruction. Students tend to respond in their evaluations globally to "the course, the content, the

instructor, the learning climate and themselves" [3, p.5]. Different classroom settings including online, classroom, or a mixture of both, and the use of different technologies are not the main determinants of a positive evaluation of learning [3]. Students do not take into consideration the teaching approach of their course when they appraise their learning experiences at the end of their program of study. Instead, students report their overall global perspective and/or feeling about that learning experience.

3. Methodology

Members of a working group (anonymised for initial submission) received the support of 12 Québec universities to develop a survey of students' perceptions of ICT use in university classrooms. The questionnaires used were originally developed in 2004, then redesigned in 2009, translated and piloted in 2010 with over 500 students. The pilot test led to revisions to several sections of each of the questionnaires by the working group. The final version was completed in January of 2011.

The questionnaires were theoretically-derived from the literature based in principles of educational psychology as well as integration of ICTs in higher education, the majority of which were just discussed in previous sections. They were designed to capture the level of technology knowledge of university students as well as the perceptions of the efficacy of learning strategies and teaching methods utilized in higher education classrooms. The instruments also yielded data detailing the variety of ICTs used by students in higher education settings in Québec.

Surveys were administered electronically in February and March of 2011 to 150,000 students using a rigorous probabilistic sampling strategy. Email addresses for all students were legally obtained Some universities gave access to their entire population of students; others randomly chose their coverage. A total of 15,020 students participated in the survey yielding a participation rate of 10%. Data cleaning yielded a final sample of 14,283 students, spread out across 3 years of undergraduate studies and a variety of disciplines across 12 institutions, who took courses in face-to-face classroom environments during the Winter 2011 semester.

4. Results

As previously described, five main categories of independent variables were initially developed for this survey. We first asked the students to report their knowledge of ICT tools using 12 items [1,4]. The teaching methods in a course were assessed using 9 initial items addressing the way the instructor leads lectures, the use of group work and discussions, the material used in class [5,7]. The student's study strategies in the course were measured using six items related to their learning strategies and the way they organize the concepts to study [1,35]. Six items were used to capture the study their self-regulatory competencies [2,35]. Finally the last independent variable was developed to capture how ICT facilitates students' learning experiences, improves their learning, and increases their interactions with others [4,5,7]. The dependent variable assessed the overall students' perception of course effectiveness using four items [4].

4.1 Reliability Assessment and Factor Analysis

Given the exploratory nature of our research, an exploratory factor analysis (EFA) was conducted with SPSS v.20 for each category of variables in order to explore the dataset and not test specific hypotheses or theories [37]. We used a factor analysis rather than principal components analysis in order to discriminate between shared and unique variance and only focus on shared variance, thereby avoiding the inflation of estimates of variance accounted for [37]. Given that the EFA was conducted for each independent initial variable, we used the promax rotation method which is an oblique approach that allows the factors to correlate and provide a more accurate and hopefully more replicable solution. Only solutions with a Kaiser-Meyer-Olkin (KMO) value above 0.60 were kept to assure sampling adequacy as well as those with a significant Bartlett's test of sphericity [38]. Only items having factor loadings more than or equal to 0.50 were retained [39].

Table 1 provides the final list of items retained, labeled in categories, with their respective loadings and the KMO elements. Out of the 47 initial items for the five independent variables, ten of them were finally deleted. One can observe that three of the initial independent variables are now split into two new constructs each, and were relabeled to reflect more precisely their content.

Table 2 contains the descriptive statistics for the new constructs and their intercorrelations. All reported Cronbach's alpha values are above the recommended value of 0.70, indicating satisfactory item reliability. All average variances extracted (AVEs) are above 0.5 which is a good indication of the content validity. The numbers on the diagonal correspond to the square roots of the average variances extracted (AVE) whereas off-diagonals values represent the correlations between the

constructs obtained with SPSS. All values on the diagonal are superior to those in the table, indicating acceptable discriminant validity [40].

The knowledge of ICT tools was split into two new constructs, one related to Web 1.0 technologies (Web1.0 in Table 2) and the second one related to social media (labeled as Web2.0); we saw a clear distinction between the first wave of the Internet – more oriented to consumption of content, and the second one – which has a focus on interactivity and user-generated content.

The teaching methods were subdivided in two - one related to the way the instructor lectures to his/her students (Lecture) [1,4], the second approach is related to the use of group work in during the course delivery (Groupwork) [5,7]. The use of ICT during a course was also revised into new constructs. The first one is related to the use of ICT to facilitate individual study (ICTIndividual) [4], whereas the second one reflects more how ICT is used to facilitate interaction among students (ICTSocial) [4,7]. Students' learning strategies were split into two – one focusing on individual habits (StudyStrategies) [2,35] and the other on those that were linked to those of a cognitive and behavioral self-regulatory kind (SelfRegulatory) [1,2,35]. Finally, global course evaluation (CourseEvaluation) [4] was created as a single construct representing the four items in the questionnaire.

4.2 Regression Models

We next conducted a stepwise linear regression analysis to capture which constructs had a significant impact on the students' perception of the quality of the course they had taken. Table 3 provides the results of these regressions.

Of the eight constructs initially entered during the analysis, only Web 1.0 and Web 2.0 were excluded from the model. The most important finding is that the construct Lecture represented 49% of variance in the predictor variable, course evaluations. This indicates that when considering the quality of their courses, students place emphasis on the way their instructors choose and prepare their instructional material, the manner in which it is delivered, the ways in which instructors address various learning styles, and the intellectual challenges presented during the course. Interestingly enough, since the use of Web 1.0 or Web 2.0 tools were not significant, teaching style is predictive regardless of the kind of technology use that students engage in during the course.

Table 1: Results of EFA

Knowledge of ICT Tools	**Loadings**
12 items initially, final KMO = 0.825	
Web 1.0	
Indicate how often you have conducted internet searches.	.542
Indicate how often you have used instant messaging (chat).	.536
Indicate how often you have listened to audio files on the Web.	.862
Indicate how often you have watched video segments on the Web.	.938
Web 2.0	
Indicate how often you have consulted an online forum.	.543
Indicate how often you have taken part in an online forum.	.721
Indicate how often you have contributed to a wiki.	.678
Indicate how often you have read a blog.	.555
Indicate how often you have written a blog.	.704
Teaching Methods	
9 items initially, final KMO = 0.851	
Lecture	
In this course …	
I consider that the instructor led lectures are effective.	.734
I consider that the material is relevant and significant.	.845
I consider that the instructor accommodate different learning styles.	.652
I consider that the material offers stimulating intellectual challenges.	.661
Group work	
In this course …	
I consider that group discussion is encouraged.	.805
I consider that collaborative or group work is encouraged.	.716
I consider that we are encouraged to listen to other students' opinions and to take them into account.	.553
Study Strategies	
6 items initially, KMO = 0.709	
In this course …	
I am actively involved in my learning.	.690
I develop my own learning strategies.	.835
I use the optional material and do the optional activities.	.556
I organize the material, concepts and/or ideas (in the form of graphs, conceptual maps or themes).	.535
Self-Regulatory Strategies	
6 items initially, KMO = 0.654	
In this course …	
In order to be well prepared, I did the suggested reading and/or assignments before each class.	.618
I reviewed the material I didn't quite grasp in order to ask the instructor about it.	.743
In order to better understand the material, I reviewed my notes between classes.	.568
ICT use	
14 items initially, KMO = 0.931	
ICT- individual study use	
ICT Tools used during this course ..	
make access to course documents easier	.652
allow me to be actively involved in my learning.	.769
make it easier to review the material I didn't quite grasp in class.	.882
make it easier to organize the material in a way that is meaningful to me.	.895
help me define realistic learning objectives.	.723
make me more confident about my ability to develop a good understanding of the material.	.642
make the course content more relevant to me.	.523
are appropriate for my needs and my level of understanding.	.588
ICT- social use	
ICT Tools used during this course …	
increase my interaction with the other students and the instructor.	.804
make it easier to complete group assignments.	.575
are sufficiently versatile to suit different individual learning styles.	.657
make it easier to have discussions and express my opinions.	.877
Global evaluation	
4 items initially, KMO = 0.846	
Overall, I think …	
I will recommend this course to others.	.940
This has been good course.	.904
My interest in the subject matter has increased as a result of taking this course.	.890
I learned a lot in this course.	.879

Table 2. Descriptive Statistics and Intercorrelations

	Cronbach	Mean	SD	Web 1.0	Web 2.0	Lecture	Group Work	Study Strategies	Self-Regulatory	ICT Individual	ICT Social	Course Evaluation
Web 1.0	0.797	4.56	1.62	*0.758*								
Web 2.0	0.809	2.31	1.33	0.483	*0.750*							
Lecture	0.817	5.36	1.20	0.049	-0.009	*0.804*						
Groupwork	0.751	4.95	1.43	0.123	0.049	0.539	*0.814*					
StudyStrategies	0.747	4.86	1.19	0.081	0.018	0.379	0.278	*0.752*				
SelfRegulatory	0.677	4.21	1.45	0.054	0.039	0.232	0.215	0.559	*0.780*			
ICTIndividual	0.914	5.20	1.26	0.102	0.081	0.431	0.337	0.325	0.232	*0.791*		
ICTSocial	0.820	4.57	1.41	0.106	0.130	0.368	0.433	0.284	0.229	0.651	*0.806*	
CourseEvaluation	0.947	5.56	1.47	0.069	0.020	0.707	0.432	0.397	0.255	0.426	0.367	*0.929*

Table 3. Regression analysis results

Dependent variable = Course Evaluation	Beta	Sig.
Entire sample (N=14283)		
Constant		0.144
Lecture	0.591	0.000
ICT Individual use	0.094	0.000
Study Strategies	0.100	0.000
ICT social use	0.043	0.000
Group Work	0.027	0.000
Self-Regulatory	0.026	0.000
With Demographics (N=14283)		
Constant		0.443
Lecture	0.590	0.000
ICT Individual use	0.094	0.000
Study Strategies	0.101	0.000
ICT social use	0.041	0.000
Group Work	0.030	0.000
Gender	-0.024	0.000
Self-Regulatory	0.031	0.000
Status	0.017	0.004
Full time - Men (N=4362)		
Constant		0.087
Lecture	0.566	0.000
Study Strategies	0.110	0.000
ICT Individual use	0.087	0.000
Group Work	0.046	0.000
Self-Regulatory	0.046	0.000
ICT social use	0.035	0.015
Full time - Women (N=7419)		
Constant		0.25
Lecture	0.595	0.000
ICT Individual use	0.103	0.000
Study Strategies	0.097	0.000
ICT social use	0.037	0.001
Group Work	0.026	0.007
Self-Regulatory	0.023	0.014
Part time - Men (N=840)		
Constant		0.293
Lecture	0.628	0.000
Study Strategies	0.106	0.000
ICT Individual use	0.101	0.000
Web 2.0	0.049	0.046
Part time - Women (N=1662)		
Constant		0.291
Lecture	0.614	0.000
ICT Individual use	0.083	0.000
Study Strategies	0.114	0.000
ICT social use	0.076	0.001

Other constructs such as study strategies, self-regulatory behaviors, as well as the use of ICT for individual and group work all regressed into the regression models presented herein, but did not account for more than 3% of variance; their role in influencing course evaluations is minor.

We also found that introducing gender and status in the regression analysis had a significant impact on the students' perception of their course. Therefore, we conducted more regression analyses by subsamples.

We notice that the results for full-time students are the same as for the overall sample, with no differences between men and women. That may be due to the fact that 82% of our sample is represented by full-time students. However, when we look at the part-time subsamples, we see some interesting differences. The social use of ICT, the importance of group work, and the level of activities outside the classroom are significant for the overall sample as well as for the full-time sample, but not for the part-time sample. These three factors are related to socialization, team efforts, and activities conducted outside class time, which all require that more time be made available for classmates; this is a luxury that most part-time students cannot afford.

Finally, when we pay more attention to the part-time students, men compensate differently by using Web 2.0 tools regardless of their instructional use, whereas women prefer to use ICT tools that support their interactions with the students and the instructor and facilitate completion of course assignments.

5. Discussion and Conclusion

Our regression models provide fodder for research in the area of differing perceptions of ICT use between the different genders. Our findings indicate that the way instructors lead their lectures, the individual and social use of ICT and the level of student's individual study and self-regulatory strategy use significantly contributes to students' satisfaction toward their courses. Our research findings reveal that the positive perception that students have of their courses depends largely (almost 50% of variance explained in our regression models) on the degree of intellectual stimulation experienced in the classroom as delivered in lectures.

Our results also build on work such as those conducted by [41], who surveyed male and female learners enrolled in computer mediated communication-based distance education with regards to their preferences for learning strategies, communication patterns, and participation barriers; results indicated that male students prefer to learn unaccompanied while female students favor group-oriented work.

Gender differences were surveyed in motivational factors related to the utilization of technology for learning purposes in a sample of 211 higher education learners [42]. It was found that males might exhibit more confidence in using technology for learning purposes due to socio-contextual factors as opposed to inherent competences.

In fact, many scholars have researched the differences between male and female students in their usage of ICT tools for pedagogical purposes [43]. Previous research findings have shown that males are more skillful in using technology and are more positive towards its usage for learning [44,45]. As such, when males were given the same opportunities in the classroom, they were more prone to choosing ICT tools than their female counterparts [46,47]. This could be due to the influence of gender stereotyping that categorizes technology and computing as male-dominated subject areas, sometimes even forcing female students to doubt their academic accomplishments [46,48] or even letting them avoid the selection of computer-related courses at a higher education level [45].

Elsewhere, research has claim that females are less confident [45, 49] and more anxious [49,50,51] when it comes to using technology for pedagogical purposes. In addition, females sometimes have more trouble investigating certain applications on computer networks than their male counterparts [52].

Numerous studies posit that computer-mediated instruction is as effective as face to face instruction [53,54,55,56,57,58,59], sometimes even exceeding the latter with regards to active learning when critical teacher-student interchanges in the classroom are restricted because of a high number of student presence in the class [60, 61].

Some scholars claim that ‘‘computer communication technology continues pre-existing patterns of hierarchy and male dominance in academia more generally” [62,p.7].

In light of this, the effect of gender on the quality of learning in students' online discussion groups was investigated [59]. The contents of 50 students' discussion groups enrolled in three online comparative politics courses were studies. Findings pinpoint that mixed-gender discussion groups exhibited more dynamic interactions that other discussion group compositions.

Finally, our findings build upon a large body of research which has investigated the integration of ICTs in higher education and provides perspective on how course effectiveness can be influenced by differing perceptions of pedagogical approaches, study strategies, and types of ICT usage. Building on these results, future research needs to address issues of how integration of ICT can be made even more effective, perhaps by supporting pedagogical approaches appropriate to the objectives of the curriculum. In addition, integration of ICT may be more effective when these tools support meta-cognition and the cooperative learning approach using collaborative learning devices. When used properly, ICT integration shows positive effects on motivation, student interest and instigates complex cognitive processes [63]. We urge caution in interpreting our results due to the emphasis on student perceptions, but point to recent meta-analytic research [64] that indicates strong correlations between learning outcomes and course evaluations. The sheer size of our sample, and the probabilistic methods used to recruit participants make this research generalizable to populations of learners across North America and Europe with similar educational and information technology infrastructures. We hope to pursue our inferential analyses and speak to multivariate relationships between different sections of our questionnaire – we have only begun to scratch the surface with the present analyses.

6. References

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