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Internet Contribution to the Engineering Students' Learning*

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Nowadays, the internet represents an essential tool that enables students to not only communicate but also access vast amount of information on a broad range of topics. This study investigates the impact of internet use on engineering students and how it has contributed to their academic advancement. The study offers an analysis of the responses of engineering students (n = 1376) enrolled in three major universities in Lebanon. Participants completed a survey that collected various data related to demographics, how long they have been using the internet, how many hours/week they spend on the internet, and the purpose of these activities. Participants were also asked to rate, using a 4-point Likert-type scale (1 = very little, 4 = very much), 22 items that reflected the degree to which their internet use affected their skills. An exploratory factor analysis was applied to the 22 items that generated four knowledge factors involved in internet use: non-formal, informal, professional, and social. Informal was shown to be the most important knowledge factor for participants, followed by non-formal, social, and professional. This study contributes in general to the literature of engineering education and in particular to the contribution of technology use in learning.

Keywords: internet use; informal learning; engineering education; Lebanon

1. Introduction

In 2006, the internet became accessible to almost 16.7% of the planet. After six years, the rate of internet penetration almost doubled (34.3%) [1]. With this rapid diffusion of the internet, a body of related literature has discussed the growth, uneven social diffusion, and multiple impacts of the internet on the society [2–4]. With the current digital generation, learning is significantly affected. Everyone accesses the web for up-to-date information on various aspects of daily life [5]. The various available technological tools may encourage new forms of identity construction, meaning-making, and social interaction [6].

Various researchers have examined the impact of internet use on academic performance and achievement of students, and have come to diverse conclusions. On one hand, some researchers found a negative effect of internet use. Kubey, Lavin, and Barrows [7] for example found a statistically significant relationship between internet dependence and perceived academic impairment. The American College Health Association [8] reported similar findings, where 15.1% of 20,507 students declared that their academic performance was impaired by internet use and computer games. Englander [9] also showed a negative and statistically significant impact of internet hours on grade performance.

On the other hand, Cheung and Huang [10] showed that internet usage significantly correlated with students' perceptions of learning and job prospects. Other researchers showed that students' perception that internet is a useful academic tool positively and significantly correlated with their perception that grade performance is the result of their own effort [11]. Moreover, Jones [12] reported in the findings of a PEW Research Center study that 79% of the several thousand college students in the U.S. believed that the internet has a positive impact on their college academic experience. Johnson [13] related the cognitive performance of students to the frequency of internet use and found that students who used the internet more frequently demonstrated better visual reasoning. Ku and Hu [14] suggested that internet use is strongly correlated with students' engagement, where students reported more frequent contacts with professors and participated more in active learning compared to their counterparts who attended less wired campuses. Similarly, Laird and Kuh [15] investigated the relationship between the use of internet and other forms of students' engagement and demonstrated a strong positive relationship between internet use and student–faculty interaction. Communale, Sexton, and Voss [16] suggested that higher course grades are related to more frequent internet use. A poll conducted by the National Science Foundation [17] reported that there is a positive relationship between self-ratings of academic performance and the amount of time spent per week on both the computer and internet. Another study examined 390 students from various Greek university departments and showed that the majority of students

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believe that the internet can significantly contribute to the learning process [18].

In the present study, the relationship between academic advancement and engineering students' internet use is examined using a self-reported measure to investigate the contribution of the internet on engineering students' knowledge.

2. Theoretical framework

Technology has had an enormous impact on society and on learning. Technology increases the potential for people of all ages to access information; this has created different types of learning. As such, Livingstone ([19], p.20) stated "the proliferation of information technologies and exponential increases in the production of information have created greater opportunities for informal learning . . . for people in all walks of life." If technology has the power for enhancing or impeding learning, what type of learning can technology empower in our engineering students?

Coombs [20] defines three types of learning: formal, non-formal, and informal. Formal education is bureaucratic and curriculum driven in which the achievements are recognized by grades, diplomas, or certificates. Non-formal education describes learning that is outside of the formal educational system. This type of learning tends to be short-term and voluntary. Informal learning as defined by Coombs ([20], p.92) is "spontaneous, unstructured learning that goes behind the school . . . , and through the various mass media." Studies of informal learning reveal that up to 90% of adults are engaged in hundreds of hours of informal learning [21]. It has also been estimated that up to 70% of learning in the workplace is informal [22].

One of the key challenges that assist lifelong learning is to understand how to facilitate unlearning. With the current rapid changing environment, it has been suggested that individuals need to develop their ability to unlearn [23] because learning cannot occur until after unlearning has occurred [24]. Hedberg [25] defines the unlearning concept in relation to individuals when obsolete knowledge is replaced by new knowledge or what is called 'overwriting'. Conversely, Klein [26] suggests that the new knowledge is stored same as the old knowledge and that the old knowledge can be recalled when needed, but it will gradually degrade if not used for some time.

With the speed rate of information technology, the unlearning process of knowledge becomes major for lifelong learning [27]. Mezirow [28] suggested three domains for lifelong learning: *Instrumental learning* involves the process of learning to control and manipulate the environment, *Communicative learning* involves the dynamics of understanding others, and *Emancipatory learning* occurs when an individual decides to change some fundamental values and beliefs that shape attitudes and behaviors. The use of internet entails all of the three domains: the instrumental learning when performing a variety of problem-solving tasks on the web, the communicative learning when using the diversity of applications for web communication and emancipatory learning since the internet services and websites have an influence on users' opinions about a variety of topics. This latter domain can be seen as a process of unlearning where individuals abandon some old information to be replaced by new ones and the internet can be considered as an essential tool for the unlearning process since it provides users with the most updated information worldwide.

Meanwhile, the creation of knowledge is fundamental for lifelong learning. Nonaka and Takeuchi [29] suggested four knowledge generation processes: (1) combination such as listening to lectures and reading documents, (2) internalization or learning by doing such as reflecting on stories and models, (3) socialization where nonverbal messages are received and synthesized and (4) externalization where information is expressed through verbal or written communication. The internet tools provide users with the four knowledge generation processes where users are capable of combining knowledge by reading a vast amount of articles and visiting web resources, internalizing by using the online applications, socializing by using the social media tools, and externalizing by chatting and sending online messages.

3. Context of the study

For the purpose of this study, Lebanon was considered as a case study. Lebanon, where higher education institutions provide a prosperous source of fresh engineers for the Gulf region [30], is considered among the best educational systems in the Middle East. Three universities from the top five ranked universities in Lebanon were targeted: The American University of Beirut (AUB), The Lebanese University (LU), and Balamand University (BU). The American University of Beirut, established in 1849 by American Protestant missionaries, opened the school of engineering in 1951. The Lebanese University, established in 1951, is the only state-operated university; it opened the college of engineering in 1980. Balamand University was founded by the Greek Orthodox Church in 1988; it established the faculty of engineering in 1993.

According to the latest Internet World Statistics [1], there were 2,152,950 internet users estimated in

Table 1. Internet penetration rate in Lebanon

Year	Penetration rate
1995	0.07%
2000	7.9%
2005	10.1%
2006	15.0%
2007	18.7%
2008	22.5%
2009	30.1%
2010	43.7%
2011	52.0%

Lebanon as of June 30, 2012. The reported internet penetration rate in Lebanon was 52.0% compared with the Middle East's penetration of 40.2%. Table 1 shows the growth of the internet in Lebanon as provided by the World Bank statistics [31] starting in 1995 where internet penetration was almost null until 15 years later in 2011 where it reached more than half of the Lebanese population.

4. Purpose of the study

The internet with its many applications and tools is the key to learning with technology. Given the number of hours that engineering students spend on the internet these days, this study examines its use by engineering students in three leading universities in Lebanon by asking the following questions: How does the internet influence students' knowledge in general and their learning in particular? What are the types of learning that engineering students acquire from the internet? Because the engineering profession involves lifelong learning, the focus of this study is to identify and discuss the importance of these learning aspects for engineering career.

5. Method

This study offers a response analysis of 1376 undergraduate students in engineering programs who participated in a Likert-scaled survey investigating the impact of internet use on their daily learning.

5.1 Material

The material included questionnaires employed in previous studies [9, 32–34] related to the internet use by students. Along with questions related to demographic characteristics, the survey included questions investigating the number of hours the students spent using the internet, the purpose of using the internet, and whether the internet had any impact on their GPA. Other questions were related to their level of expertise using the internet and if the internet was an essential requirement in their daily activities. The instrument also included 22 statements, reflecting different types of learning, where participants were asked to rate on a scale of 4 (1 = very little, 4 = very much) the extent to which internet use influenced their knowledge.

5.2 Participants and procedure

Undergraduate engineering students from the three universities participated in the survey. As of spring 2012, the numbers of students enrolled in engineering programs in the three selected universities, AUB, LU, and BU, were 1715, 2594, and 865, respectively. Professors from different disciplines in the targeted universities were contacted and asked to distribute the survey questionnaires to their students. The survey invited students to voluntarily participate while ensuring them of complete anonymity. The survey was randomly distributed to the targeted population of 5174 students and data collection ended when a sample size of 1376 was reached, thus satisfying the appropriate sample size for the given population [35] with a 26.6% response rate. Descriptive statistics were calculated to obtain the measures of central tendency and variability for each of the identified items.

6. Findings and discussion

Participants were mostly male (77%) with only few females (23%). Such percentages are not surprising because previous engineering education studies have discussed the unsatisfactory participation of women in the field of engineering in Lebanon [36]. The sample was distributed among the fields of civil (35%), electrical (32%), mechanical (21%), and others (12%). Table 2 shows that the majority (98%) of participants own a computer at home, 93% of them have an internet connection and 75% of them have access to the internet more frequently at home than at other places such as college or cybercafés. In the last five years, the ministry of communication in Lebanon made internet service available through digital subscriber line (DSL) technology that is the most widely adopted technology worldwide for accessing broadband internet. The power of this technology comes from the fact that the internet connection is made over the existing telephone wires. This technology is spread across all regions in Lebanon and has affordable monthly prices, which explains the high percentage of access.

The majority of participants (67%) revealed that they have been using the internet for more than five years, which implies that they started using internet services when they were at high school. Moreover, 68% of participants spend more than 10 h/week surfing the internet where their main purpose is to work on research and projects (88%) and communicate (86%). This finding is similar to studies in

Table 2. Internet use of participants

		Students (n = 1376)
Own a personal computer	Yes	98%
	No	2%
Have an internet connection at home	Yes	93%
	No	7%
How long have you been using the internet	Less than1 year	2%
	1–3 years	8%
	3–5 years	23%
	More than 5 years	67%
Weekly hours you spend using the internet	Less than 5 hours/week	10%
	5–10 hours/week	22%
	10–20 hours/week	30%
	Over 20 hours/week	38%
Place you most frequently use the internet	College/work	22%
	Home	75%
	Cybercafé	1%
	Other place	2%
Main purpose of internet use	Research/Projects	88%
	Entertainment/games, music	69%
	Assignments/school work	73%
	Communication/email, chatting	86%
	Surfing for fun	53%
Weekly hours for social networking	Less than 1 hour/week	19%
	2–5 hours/week	31%
	5–10 hours/week	23%
	10–20 hours/week	18%
	Over 20 hours/week	9%
Internet services affected my academic pursuit	GPA has improved remarkably	19%
	GPA has been on the decline	9%
	No impact	72%
Internet is essential my for daily activities	Yes	77%
	Neutral	20%
	No	3%
Internet has a positive impact on my life	Yes	67%
	Neutral	29%
	No	4%
Internet has a positive impact on my education	Yes	62%
	Neutral	27%
	No	11%

other countries. For example, Bouazza and Mahrooqi [37] found that most arts and social science students at Sultan Qaboos University use the internet for learning (81%), followed by general cultural purposes (64%) and communication with friends and colleagues (42%). Similarly, the majority of students in an introductory psychology course at a college in western Canada revealed that they used the internet mainly to complete schoolwork and for communication [38].

Approximately one third of participants spent two—five hours per week on social networking sites via the internet. Such an amount of time is considered reasonable for engineering students to spend socializing online because they need to give sufficient time for studying their course materials. The majority of participants (72%) believed that the internet has no impact on their GPA while 19% claim that their GPA has improved remarkably; 9% declared a decline in their GPA owing to internet use. Similar to these findings, Ogedebe [39] who examined the relationship between academic performance and internet services of 350 accountancy and microbiology students at the University of Maiduguri, Nigeria showed that 8% of the participants believed that their GPA had improved remarkably owing to internet use, 6% of the respondents agreed that their GPA had been declining, 28% responded that it assisted them in preparing better for semester examinations, while 58% of the respondents did not respond to the question. Tella [40] who examined the implications of internet use on the academic performance of 434 undergraduate students from different specializations at the University of Botswana found that a high percentage (78%) of participants agreed that use of the internet as a supplement to the information given by their teachers improved their GPA. In the same study, participants were asked to self-rate themselves on the relationship between internet use and their academic performance during the 2nd and 3rd years of their study. The percentage changed in

the self-rating of perceived academic performance for those respondents who use the internet up to five hours per week: 37% claimed a decrease in their GPA, 43% claimed an unchanged GPA, and 20% claimed an increase in their GPA. Englander, Terregrossa, and Wang [9] found a negative and statistically significant impact of internet hours on grade performance after analyzing the grade performance of 128 students in an introductory micro-economics course. Such diverse results should be scrutinized because they can vary based on the type of the major of students in the study and their related learning activities.

Moreover, the findings show that the majority of participants (77%) valued the internet as an essential need for their daily activities, 67% believed that the internet had a positive impact on their life and 62% considered the internet had a positive effect on their education in general. Surprisingly, only 41% of students revealed that both parents had graduated from college whereas 35% of students said that neither their father nor mother had earned a college degree; 15% of students' fathers held a college degree and 9% of students' mothers held a college degree. Such findings imply that regardless of whether parents have graduated from college, computers and internet connection are available at home and appear to be an essential need for today's generation. Similar results were found when investigating internet usage among American college students, which showed that the level of parental education did not have a significant effect on students' internet use [41]. In terms of improving their academic work, the majority of participants (73%) considered that internet facilities were the best way to serve their interests, followed by lecture notes (65%), books (49%), direct contact with professors (44%), handouts (43%), and library facilities (33%).

Using a 4-point scale, students were asked to indicate their level of expertise of using the internet, as shown in Table 3. It appears that the majority of these engineering students are confident and comfortable about using internet services. The table also shows that 77% of respondents are willing to learn things on their own, and a high majority (>90%) agreed that they do not need any help when using the internet and are able to solve internet problems. An important aspect of their internet proficiency self-rating is that respondents seem to be self-learners in using technology. These findings are congruent with the previous studies showing that the use of technology promotes more independence, self-efficacy, and autonomy for students [33, 42, 43].

To examine the impact of internet use on their learning, engineering students were asked to rate 22 items reflecting aspects of academic and non-academic skills that are needed for the pursuit of an engineering career. The 22 Likert-scaled items revealed a reliability of 0.913. Descriptive statistics were calculated to obtain the measures of central tendency as well as the measures of variability for each of the identified items.

An exploratory factor analysis (EFA) was employed to the data to determine which of the 22 items formed related subsets. EFA was applied with principal components extractions, eigenvalues greater than 1.00, and absolute values of more than 0.40 [44, 45]. Results of the Kaiser-Meyer-Olkin (KMO) measure of sampling equal to 0.926 and Bartlett's test ($p < 0.0001$) showed that using EFA was appropriate for this study [46]. The EFA with the principal components extraction yielded five factors that accounted for 54.74% of the total variance. Table 4 shows the rotated factor loadings, which are the correlations between the variable and the factor. The size of each loading reflects the extent of the relationship between each variable and factor. For items that were loaded under two factors, only the highest loading was retained. The variance (σ^2) reported by factor1 was 36.05%, factor2 was 8.28%, factor3 was 5.35%, and factor4 was 5.05%.

After evaluating the items loaded under each factor, factor1 was labeled informal knowledge, factor2 was labeled non-formal knowledge, factor3 was labeled social knowledge, and factor4 was labeled professional knowledge. Four new variables were computed based on the mean of the items falling under each factor. To compare the

Table 3. Level of expertise of internet use

	Students (n = 1376)			
Question	**S. Disagree**	**Disagree**	**Agree**	**S. Agree**
I don't hesitate using the internet	1%	8%	41%	48%
I am comfortable using the internet	1%	5%	44%	50%
I feel excited toward using the internet	2%	15%	52%	31%
I am confident about using the internet	2%	10%	46%	41%
I could probably teach myself most of the things I need to know about the Internet	3%	14%	55%	27%
I do not need an experienced person nearby when I use the Internet	3%	9%	43%	46%
If I get problems using the Internet, I can usually solve them one way or the other	2%	8%	57%	34%
I can use the Internet independently, without the assistance of others	1%	4%	39%	56%

Table 4. Rotated factor matrix with extraction method: principal component. Rotation method: Varimax with Kaiser normalization

	Informal knowledge	Non-formal knowledge	Social knowledge	Professional knowledge
Learning about various specializations for future education	0.776			
Keeping me updated with news/events/discoveries	0.663			
Being more familiar with computers and technologies	0.643			
Advancing my knowledge about science and technology	0.507			
Supporting knowledge provided by the educational system		0.674		
Advancing my knowledge about my field of study		0.631		
Providing me with alternative source of learning		0.606		
Learning subjects on my own		0.563		
Improving my academic performance		0.480		
Promoting my research skills		0.466		
Advancing my social networking			0.642	
Enlarging the circle of my influence			0.576	
Organizing and managing my daily activities			0.528	
Gaining knowledge about different cultures			0.496	
Learning about future career opportunities				0.755
Advancing my confidence in myself				0.695
Advancing my problem solving skills				0.677
Advancing my oral communication skills				0.683
Empowering my reasoning and logical thinking				0.669
Facilitating working in a team				0.636
Advancing my writing communication skills				0.592
Enhancing my creativity				0.444

factors as rated by users, one-way repeated measures ANOVA was applied on the four variables. Repeated measures ANOVA indicated significant differences among the four factor scores ($F(3, 4125) = 599.968$, $p < 0.001$). Figure 1 shows that informal knowledge received the highest rating from participants with a mean of $\mu = 3.14$ followed by non-formal knowledge ($\mu = 2.95$), social knowledge ($\mu = 2.71$), and professional knowledge ($\mu = 2.53$).

The internet, as an evolving informational tool, became an essential environment for learning because it contributed to the development of different learning types by providing various learning styles [47]. People navigate the internet for various

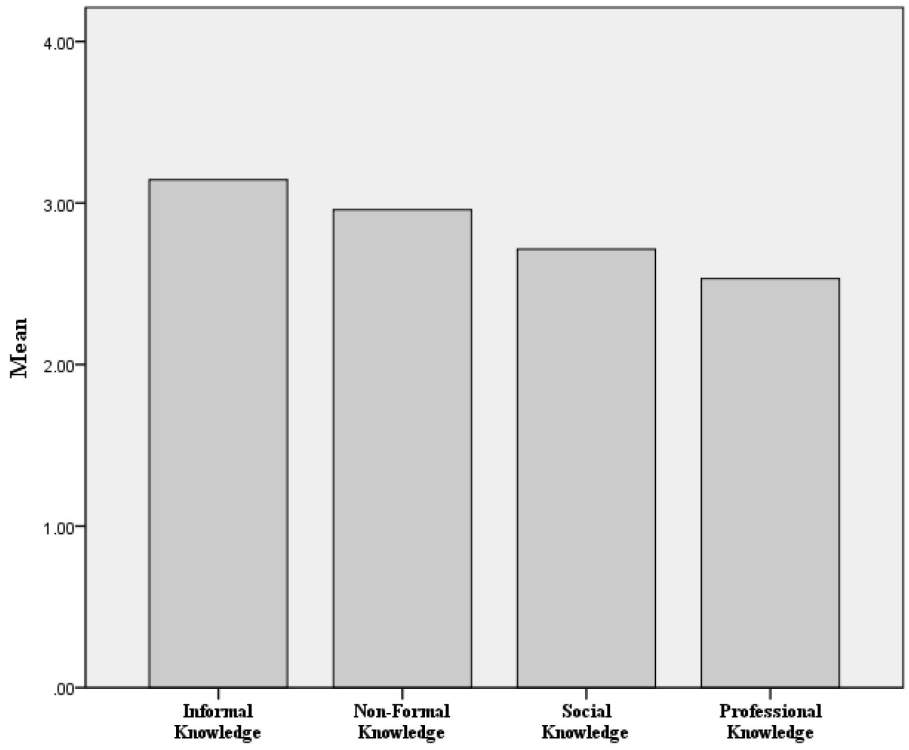

Fig. 1. Comparing the four types of knowledge acquired through the internet.

reasons: some browse for fun and discover information by chance and others look systematically for specific information [48]. Calvani and Rotta [49] believe that each type of internet search promotes a specific type of knowledge that is either independent or part of a cognitive schema. Because it encompasses unlimited learning resources, virtual experiences, and social relations, the internet helps users to be more creative and flexible [19, 50]. Learners on the internet are not passive because they are involved in a learning process requiring the use of students' cognitive, social, intellectual and emotional abilities [51]. Learning can be accomplished through simulation and virtual reality, searching and exploring specific information, reflection and case studies, or accidently while browsing.

The results reveal that students in this study acquired various types of knowledge. The first type, as ranked by participants, is the informal knowledge resulting from daily activities on the internet. This knowledge is related to learning about specializations for future education, and about getting updated through news, events, and discoveries. In addition, participants are becoming more familiar with computers and technologies for advancing their knowledge through the various applications and tools accessible on the internet. Nowadays, computer applications are not limited to proprietary software because a range of free, open source applications are available online that students can download and learn to use on their own. This type of learning empowers students with specific skills that cannot be acquired through formal academic learning. Students become more self-directed in their learning when they take the primary initiative for planning, carrying out, and evaluating their own learning experiences [21]. They assume ownership for their own thoughts and actions leading to the notion of "personal responsibility in learning" [52]. Recently, governments have started to recognize the profound importance of informal learning in people's lives because it can help people gain personal satisfaction, development, and fulfillment by bringing people and communities together. As such, the Organization for Economic Cooperation and Development (OECD) education ministers agreed to develop strategies for promoting "lifelong learning for all." The approach has been endorsed by ministers of labor, ministers of social affairs, and the OECD Council at ministerial level [53]. It is an approach where informal learning outcomes are viewed as having significant value. Lately, the UK government has also formally recognized the benefits of informal learning through "The Learning Revolution" [54].

The second type of learning that students acquire from using the internet is non-formal knowledge. Students use the internet as an alternative source of learning to support information provided by the educational system and advance their knowledge in their field of study. The use of the internet also promotes research skills and improves their academic performance. It is obvious that professors use various internet resources to support their teaching materials and therefore students will use the internet as a reference for their studies.

The third type of learning is the social knowledge that students acquire from interacting on the internet. Students become more knowledgeable about different cultures by making friends around the world. Given the number of social networking tools available, an important benefit of using the internet is that students learn how to manage their time and daily activities. Indeed, students have to allocate specific time for social activities otherwise they will not be able to successfully pursue their engineering degrees. This was shown in the data collected suggesting that the majority of students were not addicted to social networking and only 9% of them spent over 20 h weekly on social activities.

The last type of knowledge acquired by engineering students is professional knowledge. Students use the internet to learn about future career opportunities and advance their problem solving skills. In fact, it has been shown that engineer graduates possess adequate theoretical knowledge and technical skills, but noticeably weak creativity and innovation. Interpersonal and personal skills in leadership, management, and multidisciplinary teamwork were found to be the most overlooked aptitudes in college despite their importance in work settings [55]. With the available Web 2.0 applications, users can work collaboratively while chatting and conversing online. Such features help students enhance their team work skills including their oral and writing skills. In addition to technical knowledge and hard skills, engineers should possess soft skills in personal and interpersonal behavior to meet current employment market standards.

Finally, students should benefit from internet services because they help improve their academic performance, promote research skills and critical thinking, encourage independent and/or collaborative learning while enhancing motivation and strengthening self-confidence.

In this study, the post hoc tests using the Bonferroni technique indicated significant difference ($p < 0.05$) between the four factors. However, this significance cannot be seen as meaningful because the difference is not remarkable on a 4-point scale. Such a result suggests that the four types of knowledge provided by internet use contribute almost equally to the students' learning.

6.1 Female vs. male perceptions

By examining the frequencies, no significant differences were found between female and male in the time spent using the internet. In fact, females spent 14 h on average per week while males spent 15 h on average per week. Moreover, consistency in the evaluation was observed where both female and male students agreed on the three types of knowledge provided by internet services, except the non-formal knowledge. Apparently, female students used the internet for non-formal learning (μ = 3.01) more than males did (μ = 2.91). An independent sample t-test was applied to compare the samples (female and male) and it showed a slight significant difference between the two groups for non-formal knowledge (t = 2.8, $p < 0.005$). Some differences were shown in how male and female undergraduates used the internet; specifically, significant differences persisted in the purposes for which male and female went online [41].

7. Limitations

Because the current study includes only engineering students in three universities in Lebanon, the generalization of the findings is limited. To address this limitation, future studies are needed in various geographical locations, economic contexts, and cultural settings. Moreover, the findings were based on a self-report questionnaire that was based on personal values and beliefs. Students may possess different perceptions regarding the relationship between internet use and their GPA performance. Therefore, this relationship needs to be investigated through an experimental study reflecting what connection, if any, exists between internet use and the students' grades.

8. Conclusions and implications

This study investigated the impact of internet use on engineering students and how the internet has contributed to their learning development. The Likert-scale data suggested four types of knowledge acquired by engineering students when using the internet; of these, informal knowledge appeared to be the most significant one in the learning process. There is no doubt that the internet influences this generation by providing youth with a myriad of tools ranging from communication to education and entertainment. Lifelong learning includes a combination of formal, non-formal and informal learning. Informal learning may possess its particular nature as a result of context and setting, but it remains the major mode of learning for professionals throughout their career.

The results of this study imply that students seek informal knowledge from the internet not only because of what the internet world offers as information but also because the current formal educational system does not sufficiently meet the needs of today's digital generation. Through internet navigation, learning processes are maintained in an innovative approach where unlearning is essential to become acquainted with the variety of topics, information, and alternatives of applications. Therefore, internet users need to unlearn an unlimited amount of instructions to become flexible, creative and proficient with the most updated and available tools.

After all, the internet's role is fundamental to fill the gap that professors and academic institutions face in working within formal learning settings. Therefore, the findings of this study have various implications for policy and practice. For engineering students, internet services appear to offer significant gains in learning and personal development in various areas. For that reason, students are encouraged to become proficient in different types of information technology in order to maximize the benefits of college. Engineering colleges should determine how students are using information technology and how it affects their learning, not only their formal learning but also their personal and professional development growths. Professors should consider new methodologies in teaching course materials through research-based learning and informal styles of learning. Later, an adequate assessment of the outcomes should be implemented to help learners evaluate their own informal learning techniques. These outcomes include the ability to be a self-learner, to be self-directed in learning new concepts, to function effectively as a team member, and to communicate effectively. These skills, which can be acquired through informal and non-formal learning, are urgently needed to not only produce well-rounded professional engineers but also maintain the growing learning demands for a challenging career.

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