

# Time patterns in social networks and learning success among online students

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## Abstract

Online learning provides the opportunity to work on academic tasks at any time while doing other activities, such as using web 2.0 tools. This study identifies factors that contribute to success in online learning from the students' perspective and their relationship with time patterns. A survey of learning outputs was used to identify relationships between students' satisfaction, knowledge acquisition and knowledge transfer and the time spent working on academic tasks. In this study, 198 students from a university in Mexico completed the survey. These results are also contrasted with the perspective of their instructors, who responded to a corresponding survey. The findings suggest that knowledge transfer has a significant association with the number of hours spent online per day, hours spent on social networks and the use of e-learning during working hours. Learner satisfaction has a strong relationship with the time in years that a learner has been using the Internet and the number of hours devoted to the course per week. The findings of this research will be helpful for faculty and instructional designers when implementing learning strategies.

Keywords: Learner satisfaction, knowledge acquisition, knowledge transfer, student perception, time management, time pattern.

## 1 INTRODUCTION

Research on learners' success in online programs uses numerous factors, which may be pedagogical, institutional, technical, related to the learner or the teacher, etc. However, the time factor is normally neglected by researchers [1] (Barberà, Gros & Kirschner, 2012).

Time and place are the first barriers broken by online learning, and now learners have several possibilities for working on academic tasks. They can work during the day at the same time they are doing their jobs or other activities, such as using social networks.

There is new interest in knowing the effect of social media on success [2] (Abramson, 2011), as the percentage of learners using social networks is growing and research shows that between 85% and 99% of university learners use Facebook [3] (Jones & Fox, 2009). However, there is little research about the effects of the time spent on social networks on academic outcomes.

## 2 LITERATURE REVIEW

### 2.1 Outcomes

Outcome factors include what students receive from their online learning experience. In this context, there are several studies positively associating the learner's time-related factors with learning performance, success and satisfaction in online learning.

Learner time-related variables have been shown to impact on learning performance. [4] Romero and Barberà (2011) reported that time flexibility and availability for learning were related to learner performance in online courses. The average time learners spent on the online discussion and group work per week was found to be enhancing students' learning achievements [5] (Zhu, 2012).

Following the model of online success created by [6] Barbera and Linder-VanBerschoot (2011), the outcomes in online learning consist of learner satisfaction, knowledge acquisition and knowledge transfer.

### *2.1.1 Learner satisfaction*

One factor that often arises in the literature as an indicator for a learner's success in e-learning is satisfaction with the course. [7] Levy and Murphy (2002) stated that staff, researchers and instructors should have a thorough understanding of this factor to maximize effectiveness of online courses. This factor, also considered as critical, has been studied to identify factors that influence it. [8] Allen and colleagues (2007) found that time participation is a key factor for measuring satisfaction and learning gains.

[9] Puzziferro (2008) stated that success is related to the learner's satisfaction and, furthermore, [10] Puzziferro and Shelton (2008) included time spent on a task as good practice for emphasizing quality in their model for developing high-quality online courses.

### *2.1.2 Knowledge acquisition*

According to [11] Mayer (2009), significant knowledge is achieved when learners can remember, at least, the most important concepts of the lesson and when they can use this information to solve and suggest solutions to problems. They can also use this knowledge to understand new concepts and use it in new circumstances and problems. In this case, according to Mayer, the learner constructs knowledge, making it different from "non-learning" and "rote learning". Meaningful learning is personal and cannot be directly observed.

### *2.1.3 Knowledge transfer*

Knowledge transfer is the process in which the learner applies what has been learned on the course in a different context. According to [12] Holton, Bates and Ruona (2000), it is important to evaluate the application or transfer, as this is how you can identify whether there is an improvement in the student performance. According to [13] Mayer (2008), there are two types of transfer: learning transfer (when the previous learning affects new learning) and problem-solving transfer (when previous learning affects the ability to solve new problems).

Several authors [12] [14] (Holton, Bates & Ruona, 2000; Yamnill & McLean, 2001) explain that transfer mainly depends on three factors: the learner's characteristics; the course characteristics, and environmental characteristics, such as characteristics of the institution and the context. [15] Holton (2005), indicates that transfer depends not only on intrinsic factors but also on external one that should be considered. [16] Lim and Morris's (2009) study showed that prior experiences with distance learning, preference in delivery and average study time are the learner antecedents differentiating learning outcomes (knowledge acquisition and knowledge transfer)

## **3 PURPOSE AND RESEARCH QUESTIONS**

What are the effects of time-related learner factors (hours spent on Internet per day, years using the Internet, hours spent on social networks every day, hours per week devoted to the course and time patterns) on the three types of outcomes (learner satisfaction, knowledge acquisition and knowledge transfer)?

## 4 METHOD

### 4.1 Participants

The sample for this research consists of learners enrolled on online courses at the Autonomous Popular University of the State of Puebla in Mexico. Most of the courses were taught in the Social Science Department.

Table 1 shows demographic distributions for learners by gender, age, education and ICT experience. There were more female (60.3%) respondents than male ones (39.7); this is in accordance with student numbers on the University's courses and with other studies with online students.

Most of the respondents were either 25-34 or 36-54 years old, while a few were under 24 years old and only 2 students were older than 55. This age profile matches that of online learning students in Mexico and is different from traditional university students.

Most students are taking undergraduate level courses (95%). Only 4.5% of the respondents were from graduate level.

Half of the respondents (49.7) are intermediate users of ICT; and 36.2 % of the respondents are advanced users of ICT. 14.1% reported being beginners.

Table 1 Student background

Demographic	Frequency	Percent
Gender:		
Female	120	60.3
Male	79	39.7
Age:		
under 18	1	.5
18-24	36	18.1
25-34	87	43.7
35-54	73	36.7
55+	2	1.0
Education:		
Bachelor's Degree	190	95.5
Master's Degree	9	4.5

Experience:

Experience with ICT		
Beginner	28	14.1
Intermediate	99	49.7
Advanced	72	36.2

## 4.2 Instruments

The survey included questions on demographics, five time variables and a scale of outcome factors. This study adopted the outcome scale from the systemic and socio-constructivist instrument of inputs-process-outputs of learning created by [6] Barbera and Linder-VanBerschoot (2011).

Five items were used for each outcome factor, with a total of 15 items. All items used a four-point Likert-type scale of potential responses: strongly agree, agree, disagree and strongly disagree.

As table 2 shows, Cronbach's alpha was used to measure the reliability of the test survey with a score of 0.93, indicating high reliability.

Table 2 Learners: average score and reliability information for the scale

	$\alpha$	M	Number of items	Range
Outcome Factors	0.93	3.16	15	1-4

## 4.3 Procedure and data analysis

One online questionnaire was sent at the end of the course to collect information, accompanied by consent forms. This was originally written in English and then translated into the official language of the country. The anonymous questionnaire was sent online to University learners using a web-based data collection system.

In order to analyse data, the SPSS 19.0 was used. A descriptive analysis was carried out to find out demographic information and the means and standard deviations of time variables. A one-way ANOVA was carried out to find out the effect of time variables on the outcome variables.

## 5 RESULTS

### 5.1 ANOVA Analyses

As table 3 shows the number of hours online by day was significantly associated with transfer of knowledge, Learners who spent more than 12 hours a day on the Internet ( $M = 3.04$ ,  $SD = 0.58$ ) had a significantly higher level of knowledge transfer than those who spent between 3 and 5 hours a day on it ( $M = 2.6$ ,  $SD = 0.4$ ),  $F(4,189) = 2.09$ ,  $p < 0.05$ .

Table 3 One-way ANOVA of hours spent on the Internet per day on outcome variables

	0-2 hours		3-5 hours		6-8 hours		9-12 hours		more than 12 hours		F(4, 189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.927	.5470	3.007	.4420	2.862	.5722	2.824	.4716	2.709	.5452	1.382
Knowledge Transfer	2.791	.5537	2.667	.4076	2.846	.5336	2.878	.4896	3.040	.5817	2.09**
Learner satisfaction	2.809	.5327	2.926	.5439	2.708	.5281	2.898	.5237	2.817	.5828	1.164

Note. The maximum score is 4

\* $p < .05$       \*\* $p < .01$

As indicated in table 4, the time in years using Internet was significantly associated with learner satisfaction. Learners who had used the Internet for 5 years (M = 2.93, SD = 0.55) had a significantly higher level of learner satisfaction than those who had spent one year using the Internet (M = 2.6, SD = 0.5),  $F(9,185) = 1.93, p < 0.05$ .

Table 4 One-way ANOVA of years using the Internet on outcome variables

Years	1		2		3		4		5		6		7		8		9		more than 10		F(9, 185)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.856	.5078	2.929	.4298	2.864	.4855	2.853	.4937	2.791	.6094	2.969	.5528	3.000	.3266	2.723	.6501	3.000	.4542	2.687	.5749	.750
Knowledge Transfer	2.889	.4957	2.741	.4459	2.936	.5589	2.884	.5047	2.945	.5926	2.877	.4658	3.120	.3293	2.592	.5528	3.040	.5175	2.637	.4334	.596
Learner satisfaction	2.678	.5663	2.729	.5785	2.896	.5777	2.916	.4586	2.936	.5534	2.846	.6385	2.680	.4733	2.854	.6055	2.770	.5667	2.700	.3933	1.934*

Note. The maximum score is 4

\* $p < .05$ .      \*\* $p < .01$

As table 5 shows, the number of hours spent on social networks per day was significantly associated with knowledge transfer. Learners who had spent more than 12 hours a day on social networks (M = 2.96, SD = 0.58) had a significantly higher level of knowledge transfer than those who had spent between 6 and 8 hours a day (M = 2.67, SD = 0.46),  $F(4,189) = 1.79, p < 0.05$ .

Table 5 One-way ANOVA of hours spent per day on social networks (Facebook, Hi5, etc.) on outcome variables.

	0-2 hours		3-5 hours		6-8 hours		9-12 hours		more than 12 hours		F(4, 189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.922	.5274	2.813	.6217	2.806	.5420	2.842	.5093	2.875	.3959	.337
Knowledge Transfer	2.804	.5680	2.917	.4122	2.673	.4632	2.921	.5808	2.969	.5839	1.791*
Learner satisfaction	2.778	.5116	2.800	.5317	2.945	.5081	2.770	.5812	2.781	.5975	.623

Note. The maximum score is 4

\* $p < .05$       \*\* $p < .01$

The number of hours devoted to the course per week was significantly associated with learner satisfaction. Learners who had spent less than 2 hours a week on the course (M = 2.96, SD = 0.48) had a significantly higher level of satisfaction than those who had spent more than 12 hours a week on it (M = 2.67, SD = 0.5),  $F(4,189) = 1.162, p < 0.05$ . (Table 6)

Table 6 One-way ANOVA of hours per week devoted to the course on outcome variables

	0-2 hours		3-5 hours		6-8 hours		9-12 hours		more than 12 hours		F(4, 189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.769	.5407	2.775	.6456	2.961	.4780	2.884	.4954	2.810	.4939	.838
Knowledge Transfer	3.062	.4718	2.855	.5359	2.810	.4836	2.891	.5386	2.795	.5612	.769
Learner satisfaction	2.969	.4820	2.840	.5382	2.780	.6615	2.876	.4784	2.678	.5018	1.162*

Note. The maximum score is 4

\* $p < .05$       \*\* $p < .01$

As table 7 shows, the time during the day spent on academic tasks was significantly associated with knowledge transfer. Learners who worked on their academic tasks during the morning (M = 2.97, SD = 0.49) had a significantly higher level of knowledge transfer than those who did so at no specific time (M = 2.71, SD = 0.54),  $F(4,189) = 1.206, p < 0.05$ .

Table 7 One-way ANOVA of the time of day learners attend their online classroom on outcome variables

	Morning		Midday		Evenings		Nights		Indifferent		F(4, 189)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Knowledge acquisition	2.945	.5629	2.845	.4426	2.927	.4894	2.750	.5764	2.794	.5904	.908
Knowledge Transfer	2.979	.4996	2.815	.4470	2.894	.5309	2.894	.5942	2.717	.5438	1.206*
Learner satisfaction	2.848	.5944	2.855	.5620	2.722	.5610	2.811	.4874	2.856	.5118	.484

*Note.* The maximum score is 4

\* $p < .05$

\*\* $p < .01$

## 6 DISCUSSION AND SOME CONCLUSIONS

The research question concerned the overall perception of the level of knowledge transfer and time variables. Results show that there is a significant association with the number of hours online per day. Learners who spent more than 12 hours a day online had greater knowledge transfer than those who were online between 3 and 5 hours a day. It seems that learners spent a large amount of time because they had access in their workplace or via smart phones. These findings have a relationship with the number of hours spent on social networks per day because this was significantly associated with knowledge transfer. Learners who spent more than 12 hours a day on social networks had a significantly higher level of knowledge transfer than those who spent between 6 and 8 hours a day on them.

Learners who had full-time jobs could spend the whole day online and could be also on social networks for more than 12 hours a day. They could also be online on smart phones after work, and they could manage their time and complete their required tasks during the morning, when they get to work. Furthermore, this study found that the time during the day spent doing academic tasks was significantly associated with knowledge transfer. Learners who worked on their academic tasks during the morning had a significantly higher level of knowledge transfer than those who worked on them at no specific time. [17] Petrova and Sinclair (2005) and [18] Spennemann (2007) echoed this view when they examined student use of computer infrastructure. They found that students preferred to work during the day and almost no-one preferred to work in the evenings.

It seems that learners with full-time jobs spend more than 12 hours a day online. They are connected to social networks for long periods of time and normally complete their academic tasks in the morning. They had skills in applying knowledge in different contexts, like the workplace or on other courses.

This findings support [16] Lim and Morris's (2009) study, which reported that knowledge transfer was most influenced by prior experience with distance learning opportunities, preference in delivery, and average study time.

Learning satisfaction was significantly associated with the learners' time in years using Internet. Learners who had used Internet for 5 years had a significantly higher level of learner satisfaction than those who had spent one year using Internet. Learner satisfaction was also significantly associated with the number of hours devoted to the course per week.

Learners who spent less than 2 hours a week on the course had a significantly higher level of satisfaction than those who spent more than 12 hours a week on it. This echoes [5] Zhu's (2012) findings that the average time learners devoted per week was found to be enhancing students learning achievement.

This result suggested that learners with more experience using the Internet are more confident in using the platform and completing the tasks. They have enough skills for finishing activities in a short period of time and using the course as a useful learning experience.

This research did not find a significant relationship between knowledge acquisition and time variables.

## 7 LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This study had some limitations. The sample was small and all learners were volunteers, so future research could generalize the findings with learners with other characteristics and look for relationships between other variables, for instance, gender, size class or course design. The access to learners' social network profiles was limited due to privacy concerns. Future research should find out the relationship between learning outcomes and variables related to social networks, for instance, number of friends, shared content, likes, etc.

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