The Use of Google Groups in a Collaborative Environment

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ABSTRACT – The main aim of this study is to determine whether respondents are in the presence of the flow experience and evaluate the quality of the answers given by students who participated in a higher education collaborative environment considering also who have used desktops or laptops. For this study, data was collected through a survey and through Google Groups, applying the five dimensions of the flow state. After analyzing the data, we concluded that students experienced the flow, with the students who used the laptops having greater values for the flow experience that the ones who used desktops. Considering the quality of messages, the data were collected from Google Groups. Regarding the type of messages of respondents who used the laptop, we can conclude that they sent more messages classified as very good, good, positive, and it was also the case for messages classified as not significant, than the desktop users.

***Keywords* – Learning, Google Groups; message types, flow experience; mobile devices; collaborative environments; higher education.**

I. INTRODUCTION

The introduction of Information and Communication Technologies (ICT) in education, as learning tools, has been very beneficial for students. Students are increasingly having more contact with ICT in schools today.

The great adhesion to the use of computer makes this a learning tool. Taking an even broader perspective, the computer cannot be understood as another tool, but also as a tool to support learning.

Technological applications and ways to use them evolved in such a way that the use of learning objects are no longer limited to a personal computer, but have extended the use of mobile devices (PDA, mobile phone, Smartphone, Tablet PC and Laptop) for a greater range of application and obtain the benefits that mobile computing offers the education sector, resulting in the creation of a technological model called m-learning.

The evolution of mobile devices and mobile communications are revolutionizing education, transforming the traditional ways of teaching in a school anywhere anytime. The use of mobile technologies in education has impacts on student motivation, collaboration between the students and the mobility of students [1].

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One of the main challenges of an educator is to motivate students and, as such, create the best possible contexts for teaching and learning. The use of collaborative environments is one of the possible strategies.

Collaborative learning provides an environment that allows an animated and rich learning process. The participation of various stakeholders in a collaborative environment improves the educational system in a particular social context, thereby enhancing the efficiency of the system. This type of environment helps to sustain student interest, providing a more natural habitat of learning [2].

The online discussion forums are one of the essential components for a student-centered model. Its popularity is due to the fact that they are available 24 hours 7 days a week, allowing users to use them anytime and anywhere [3].

The own assessment of online discussion forums, has aroused the interest of several researchers [4-7]. A simple count of the number of messages involved is not an effective way to measure the quality of the interactions. You need a much more comprehensive evaluation model, so that the use of discussion forums in a school context, can be contemplated in a normal process of evaluation.

It is necessary to perform another type of evaluation by all participants involved in the use of online discussion forums, to see if they are just another tool for teaching / learning or if they are really a tool to promote learning towards stakeholders.

This type of assessment has to do with the experience of flow introduced by Mihaly Csikszentmihalyi. The experience of the flow means the sensation that people feel when they are fully engaged in an activity, or if they want to enjoy the experience and want to repeat it. For students who are involved in what they do, you need to be in the presence of this flow

II. COLABORATIVE ENVIRONMENTS

Collaborative learning can be seen as an act that results in a coordinated process of building and solving a particular problem [3].

Collaborative learning provides an environment that can animate and enrich the learning process. The participation of various people in a collaborative environment permits the creation of an educational system more realistic in a particular social context, thereby increasing the effectiveness of the system. This type of environment helps to sustain the interest of the student, providing a more natural habitat [4].

To learn in a collaborative environment, we need to follow these characteristics [5, 6]:

- Develop and share a common goal;
- Contribute to the understanding of the problem;

• Work, respond and understand the issues of other members;

• Responsibilities for all elements of the group;

• Dependency between group members so that everyone understands that the group's success depends on everyone.

Also [7] reports that through the collaborative environment, participants gain a deeper learning, a shared understanding, critical thinking and the retention of long-term learning as the main benefits for such learning activity.

The collaborative environments contain behaviors that improve learning. These environments contribute in a positive way for both situations where the participants are physically or through technology communicating with each others [8].

[9] defines collaborative learning as a situation where two or more people try to learn something in common and together. Each element of this definition can be interpreted in several ways:

• "Two or more persons" may be interpreted as a pair of people, a small group (3 to 5 persons), one class (20 to 30 people), community (a hundred or a thousand people) or a company (one hundred thousand people), and so on.

• "Learn something" can be interpreted as an accompaniment to a course, a determine lecture of a discipline, solving a problem, as many other ways.

• "Together" can be interpreted as different forms of interaction: face to face or through the new technologies of information and communication.

A group of people can never reach a perfect consensus of all of life, they need only to reach a reasonable consensus in order to continue the job they are doing [10].

The use of information activities has been considered crucial to the success of collaborative activities [11].

In nowadays, we see daily information activities, since we go to the Internet and we see appealing symbols about some new news, the publicity that we receive in our homes on promotion of a product, from receiving in our mobile phone SMS to inform us of new promotions, etc.. Due to a competitive society that we live in, it is crucial that there are such information activities, so that our society can survive and strive.

The same is true in education, that is, if there is a greater volume of information activities the greater is the students' attention. If students have information about what is happening in a particular subject the greater is the interest of students, as demonstrated by [11].

It is necessary that the group members are aware what each is doing, so that the collaboration between them can succeed [12].

In a collaborative environment, it is necessary to have social awareness of other members, this is, if they are reachable or not, if they are well prepared or not, if they can be disturbed. This social knowledge is essential because we can act according to their situation, for example, if an element is sick maybe we should save the discussion for another day [13].

Information services have been developed in collaborative environments, in order to monitor and notify members of the group if any work has been done during the group work [14, 15].

Since the notion of cooperation is inherent in collaborative learning, research can also be applied to collaborative learning environments. Both the cooperative and collaborative learning are built around the idea of socially constructed knowledge [16].

The two terms (cooperative learning and collaborative) are therefore often used synonymously, there is a considerable ambiguity [17].

Sometimes the collaborative and cooperative environments can be interpreted in the same way, but these two types of environments have different aspects.

[18] make a distinction between cooperative and collaborative learning. They indicate that cooperative learning is a protocol, which at the beginning the initial task is subdivided into subtasks, so that the various participants are able to develop them independently. Collaborative learning describes situations where two or more subjects are built synchronously and interactively in order to reach a common solution to a problem [18].

Cooperative learning generally leaves the authority structures unchanged. The end is defined in the beginning by an instructor, who also describes the means by which the objective will be achieved and evaluate the whole process [16]. As reported by [17] who defended that cooperative learning is based on the use of small groups, so that students can work together to maximize the learning of them self's and to others.

Collaborative learning is relatively cooperative, but it takes all participants a step forward: involving participants in a self-reflective process that often generates a series of questions, "meaning" and "power" and that forces them to confront issues that are implicit in any process of learning in the classroom, but are rarely explicitly defined and treated [16].

III. EVALUATION OF ONLINE FORUMS

Although the use of forums in the context of higher education is already widely used, some issues associated with its utilization arise, such as, what is its potential and how can we make its own evaluation.

The evaluation issue is quite complex and raises many questions and uncertainties to the evaluator. According to Santos (2003), this fact "... certainly has to do with the meanings and concepts of assessment practices that each teacher has, as well as their own evaluative experience" (Santos, 2000).

So what does the term "evaluate" mean? In the dictionary (Priberam, 2009) the term "evaluate" means "to determine the value of", "understand", "judge", "appreciate". Evaluating student's results is an understanding, appreciation and judgment of their work, by the teacher, using different set of instruments in order to determine a qualitative or quantitative value.

Another important issue, for this research, will be the evaluation of students participating in online discussion forums. There are a number of studies using various forms of assessment to get in use in online discussion forums (Drops, 2003, Mesquita, 2007, Meyer, 2004, Maor, 1998).

With the simple counting of posts of each participant in an online discussion forum, you cannot measure the quality of interactions. Moreover, we can state that quality is not synonymous with quantity (Drops, 2003).

Meyer used four different kinds of methods to analyze seventeen online forums of a doctoral program in order to validate its efficiency (Meyer, 2004). In particular, for the present study, we considered the approach proposed by (Mesquita, 2007), who follows a model that basically follows three steps:

Classify each message of each student as being significant or not significant. This is, messages like “Thank you”, “until tomorrow”, “Hello”, are classified as non-significant and other messages that are related to the content of the topic in question are classified as significant.

Once each message has been classified, we should classify each one according to a scale of 1 to 3 (1 - Positive, 2 - Good, 3 - Very Good). Finally, calculate the number of meaningful messages through their multiplication factor, this is, multiply the number of messages with a classification of very good by three, multiply the messages with a classification of good by two and finally multiply the messages with a classification of positive by 1, adding in the end, all these components. After this operation is performed, it is necessary to convert these values to a qualitative classification. As for the conversion of these values we can use as basis, the student who has more meaningful messages, this will be awarded with 20 points and the others will use the direct proportionality. In this model, the student who has written more posts does not necessarily have better ratings than the student who has participated less.

This is the algorithm described by Mesquita (2007) that serves as the base for the current evaluation of the quality and the participation of the students in an online discussion forum. This approach assumes that we are in a collaborative learning environment and that the teacher has with him an evaluation grid in order to grade each of the messages of the various participants.

In conclusion, the formula follows:

Partial classification of the student = nrespx * ntipo1 + nrespx * ntipo2 + nrespx * ntipo3.

Where nrespx represents the number of significant responses and ntipo refers to a scale of 1 to 3 (1 - Positive, 2 - Good, 3 - Very Good)

The student's final grade is calculated on the basis of the student who has more meaningful messages (partial classification of the student) who will be awarded with 20 points and the other using the proportionality rule.

IV. The Flow Experience

An aspect related with the interaction of the users with collaborative environments has to see with the flow experience introduced by [1]. The experience of the flow means the sensation that people feel when they are completely involved in what they are doing, that is, people like the experience and want repeat it [30]. This means that for students to be involved with collaborative environments, it is necessary that they presence the flow state.

The theory of the flow allows us to measure the interaction of users with the computer systems, verifying if these are more or less playfulness [31].

The flow experience is used in this article to characterize the interaction between the human and the new technologies [31].

When one is in the presence of the flow experience, this will bring to the users, a sense of pleasure of what he is doing. This satisfaction will encourage the user to repeat the task again [32].

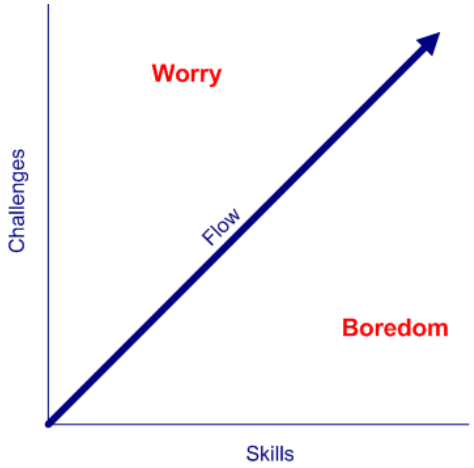
Csikszentmihalyi says that a person who is in the presence of the flow state has the following characteristics [1, 33]:

Clear goals and immediate feedback;

Equilibrium between the level of challenge and personal skill;

- Merging of action and awareness;
- Focused concentration;
- Sense of potential control;
- Loss of self-consciousness;
- Time distortion;
- Autotelic or self-rewarding experience.

For a person to be in the presence of the flow experience it is necessary a balance between the level of challenge and personal skill [30].



Flow Experience [30].

The sensation of an excellent experience in the accomplishment of any daily task is our reason of living. If we do not feel this excellent experience with our everyday tasks, we will question our self, if it is worth living [30].

Previous researches have used the flow experience to measure playfulness, involvement, satisfaction and other states with the involvement in computational environments [31, 34-37].

Trevino and Webster (1992) define four dimensions for the flow experience:

Control;

Attention Focus;

Curiosity;

Intrinsic Interest.

There is one more dimension, sense of time, that is also important to measure the flow state [38] .

Control

Individuals should experience, feelings in control, within computer interactions [1].

Attention Focus

Attention focus is another important element of flow. When individuals are in the flow state, their minds are narrowed to what they are doing, filtering out irrelevant thoughts and perceptions [32].

Curiosity

Curiosity is aroused when in the flow state. The curiosity sensation can be aroused through varied, new and admirable stimulations. For example, the new technologies will be able to cause this sensation of curiosity through colors and sounds [32].

Intrinsic Interest

When people feel they are in the flow state, these are involved for the amusement and pleasure [32].

Sense of time

When people feel they are in the flow state, there is a perceptual transformation of time, characterized by the sensation of time slowing down or speeding up [38].

People who interact with computers, with an entertainment spirit, transmit a much more positive experience, of those, who are in the computer for obligation [32].

V. THE STUDY

To evaluate the flow experience and to verify its occurrence in collaborative tools, an experience was carried through involving students from a university school. The main tool used was Google Groups, for this experience. This section presents the efforts carried through experience, the data obtained, as well as the statistical procedures applied.

Previously to this study, a test with five students was done, to analyze the effectiveness of the survey. From this previous study, we concluded that some questions were ambiguous for the population in the study.

After the accomplishment of the project given by the teacher, in witch they used Google Groups, the students answered the questions of the survey.

The survey was passed through the Internet with the help of "LimeSurvey" Web-based tool. The data collection was performed in the first week of November of 2009.

The Instruments used were Google Groups, Google Docs and Facebook and a survey consisting on some questions, in order to verify, in the end of the study, if the students were in the presence of the flow state. This survey will use the four dimensions: control, attention focus, curiosity and the intrinsic interest [32], as well as the dimension sense of time [38]. Beside these questions, this survey also contains other generic questions. All the related questions from this survey were built on a Likert scale of five points, since one (I totally disagree) up to five (I totally agree). Two questions for each dimension were elaborated.

A. Sample

This study intends to determine if the students inquired are in the flow state. The data has been collected through one hundred and twelve surveys of students. The surveys have been submitted to a rigorous test, having not excluded any individual; therefore, the sample consisted on one hundred and twelve valid surveys. The criteria of exclusion of inquiries were: students who had not discriminated their sex or age in the survey; students with incoherent answers throughout the survey (e.g answers that always presented values in the extremities of the scales, or incompatible); students who left 80% of the survey in blank. Once, one hundred and twelve valid inquiries were obtained, the sample is considered sufficiently satisfactory.

The statistical treatment of the data and the respective procedure [39, 40], that will be announced next, was carried through the software "S.P.S.S. - Statistical Package will be Social Science" (version 12.0 for Windows, http://www.spss.com/):

Descriptive Statistics of the variables in the study;

Evaluation of the index of internal consistency (Cronbach's alpha) for the dimensions of the flow experience;

Correlation between the variables of the flow;

Factor analysis in order to reduce the number of variables.

O Estudo

Este estudo pretende determinar se os indivíduos inquiridos se encontram na experiência de fluxo e qual o tipo de mensagens que os alunos enviam, perante a utilização de um fórum de discussão em linha.

Os Instrumentos fundamentais utilizados para este estudo foram o Google Groups e um inquérito. O inquérito foi constituído por várias questões, de modo a verificar, no final do estudo, qual a experiência do aluno perante algumas ferramentas colaborativas.

O inquérito foi passado via Internet com auxílio do "LimeSurvey". A recolha dos dados foi realizada na primeira semana de Novembro.

Os dados foram obtidos através de cento e doze inquéritos escolhidos de alunos com idades maiores que os dezasseis anos do ensino superior. Os inquéritos foram alvo de uma "limpeza" rigorosa, não tendo sido excluído nenhum indivíduo, obtendo-se o total de cento e doze inquéritos para a amostra.

Results

This study was composed of 78.57% males and 84,82% had ages between sixteen and twenty four years. Most of the students have already used discussion forums in a fairly way.

The majority of the respondents used the laptop (72.32%) to access the tools for the project development, followed by the Desktop (27,68%).

We verified that Cronbach's alpha is always superior to 0.7, being able to conclude that the data is related to one same dimension, that is, the questions of the survey for the use of Google Groups, allowed us to determine if the individual finds himself in the presence of the flow experience, for students using a laptop or a Desktop.

To determine how the variables are correlated with each of the different devices used (laptop and Desktop), a correlation matrix was created for both types of the devices, where the correlation coefficient, R, is presented, that is a measure of the linear association between two variables. We can conclude from the correlation analysis that the correlation between the variables, for laptops, has a greater number of variables positively correlated than the desktop.

After the studies mentioned previously, we used the factor analysis in order to reduce the number of variables, both for laptops and desktops.

The extraction of the factors is given by considering the percentage of variance explained by the factors (Table 1).

NUMBER OF FACTORS TO BE RETAINED (MOBILE DEVICE AND DESKTOPS)

	Mobile Devices		
	Initial Eigenvalues		
Component	Total	% of Variance	Cumulative %
1	2,371	47,422	47,422
2	,881	17,625	65,047
3	,707	14,136	79,184
4	,631	12,613	91,797
5	,410	8,203	100,000

	Desktop		
	Initial Eigenvalues		
Component	Total	% of Variance	Cumulative %
1	2,374	47,475	47,475
2	1,053	21,053	68,528
3	,704	14,077	82,604
4	,565	11,301	93,905
5	,305	6,095	100,000

To set the number of components to be retained, we choose, by default, those that have eigenvalues greater than one. If the total variance explained by the factors retained is less than 60%, then, at least, one more factor should always be selected. Thus, for this case study, two factors were retained in each type of device. For the mobile device, it appears that the first factor explains 47.422% of the total variation and the second 17.625%, both explaining 65.047% of the total variation that exists in the five original variables. For the Desktop, the first factor explains 47.475% and the second 21.053%, explaining both, 68.528% of the total variation.

The matrix of components after rotation (Varimax method) aims to exaggerate the value of the coefficients that relates each variable to the factors retained, so that each variable can be associated with only one factor. The higher the value of the coefficient that relates one variable to a component, the greater is the relationship between them. We present below the matrix of components after rotation (Table 2) and the bold factor associated with each variable.

TABLE 2 – THE MATRIX OF COMPONENTS AFTER ROTATION

	Mobile Device Component		Desktop Component	
	1	2	1	2
Concentration	,411	**,614**	**,751**	,001
Control	**,653**	,317	,011	**,955**
Curiosity	**,874**	,057	**,714**	,461
Intrinsic Interest	**,705**	,383	**,841**	,155
Sense of time	,033	**,877**	**,694**	,121

Having concluded the following for the case of the laptops:

Factor group 1: (Intrinsic Interest, Control and Curiosity)

Factor group 2: (Attention Focus and Sense of time)

And for the case of the desktops:

Factor group 1: (Attention Focus, Sense of time, Intrinsic Interest and Curiosity)

Factor group 2: (Control)

Comparing messages from students who used the mobile device with the students who used the desktop, it appears that students who used laptop sent more messages to the online discussion forum, or sent more messages from levels 1, 2 and 3 of the students who used the desktop to access the online discussion forum (Table 1).

Table 1 - Número de mensagens (sem ponderação)

	Number de Mensagens				
	Significant Messages			***Not Significant***	***Total (Significant)***
	3	***2***	***1***		
Mobile	185	113	157	45	455
Desktop	53	37	46	25	136

Comparing the average messages sent by students, who used the mobile device with the students who used the desktop, it appears that students who used laptop sent more messages to the online discussion forum, or sent more messages levels 1, 2 and 3 of the students who used the desktop to access the online discussion forum (Table 2).

Tabela 2 - Número médio de mensagens enviadas por aluno

	Number of messages			
	Significant Messages (Average for each student)			***Total (Average for each student)***
	3	***2***	***1***	
Mobile	2.28	1.40	1.94	11.58
Desktop	1.71	1.19	1.48	9.00

VI. CONCLUSIONS

In order to evaluate the use of mobile devices and desktops and the potential of mobile devices in collaborative environments versus desktops, it was performed an experiment involving students of higher education. This study has the main objective to validate if the students that use laptops or desktops are in the flow experience and witch of them are more in the flow experience.

Most people all around the world use mobile devices. Due to the advance of the new technologies, and its size, users can carry them anywhere; can connect with a wide range of information to anywhere whenever they go.

Despite the widespread use of mobile devices today, there is a lack of reference to identify the advantages and disadvantages of the m-learning in collaborative environments, this is, we cannot see the m-learning as an extension of e-learning but a rupture in the process of teaching and learning.

The analysis of data allows us to conclude that the majority of the students were males, had ages between sixteen and twenty-four years and that most of the students have already used discussion forums.

When going further to the analysis of the data, we verified that the variables described all the same characteristic (threw the determination of the Cronbhach's alpha), that is, the variables describe the flow experience.

We can conclude from the correlation analysis that the correlation between the variables, for laptops, has a greater number of variables positively correlated than the desktop.

From the factor analysis it was possible to isolate two factors that explain the majority of the total variation. Such factors had been Factor group 1: (Intrinsic Interest, Control and Curiosity), Factor group 2: (Attention Focus and Sense of time) for the laptops and Factor group 1: (Attention Focus, Sense of time, Intrinsic Interest and Curiosity) Factor group 2: (Control) for the desktops.

In order to determine the presence of the flow experience for each type of device, it was verified that, on average, the students were above value three (Likert scale of five points), that is, the majority of the students, in each of the different devices used (laptop and desktop), are in the presence of the flow experience, for the five variables mentioned for this study (attention focus, curiosity, control, intrinsic interest and sense of time). We can also see, that the average of the five variables associated with the flow experience, for students who used the laptops, were greater than those using the desktop to access the tools of the project development.

From this study we can conclude that the flow experience exists for people that use Google Groups, both for people that used the laptop or even the desktop, but having a more positively effect for users of the laptop. With this we can say that mobile users interact with Google Groups, with a more entertainment spirit and sense of involvement and satisfaction then the users that have used the desktop to access Google Groups. Considering that people use mobile device for m-learning and desktops for e-learning, we can conclude that people that use m-learning have a more positive effect on learning, when using Google Groups, than the people that use e-learning.

Analyzing the averages of the five variables associated with the experience of flow, we can see that students who used the mobile device are more in the flow experience than those that used the desktop.

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