

## The Effect of Twitter Activities in a Blended Learning Classroom Guided by Activity Theory on Students' Achievement and Attitudes

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### ABSTRACT

**Purpose** – This research paper explores the effect of using Twitter activities to support a blended learning course (75% in-class and 25% Twitter activities) on the achievement and attitudes of female students compared to 100% in-class learning.

**Design/methodology/approach** – In the 2016 academic year, the researcher compared an experimental group (34 students) and a control group (34 students). The learning process of the experimental group was based on continuity between 2 hours of in-class learning and 1 hour of learning activities that were mediated by Twitter activities each week. The control group's experience was 100% in-class with no app mediation.

**Findings** – The principal results of the study are that the students in the experimental group performed better than those in the control group on the achievement test, learning tracks and attitudes. Learning track analysis shows that the students in the experimental group had greater participation in different topics of discussion in the Twitter space than did the control group.

**Originality/value** – This research paper is useful for readers, parents, students and schools in exploring the effectiveness of Twitter activities to support blended courses in higher studies.

**Keywords:** Twitter, mobile teaching, mobile learning, mobile tools, activity theory

### INTRODUCTION

Web 2.0 is new web technology that is recognized and widely used by all Internet users (Uzunboylu, Bicen & Cavus, 2011; Lenhart & Madden, 2007; Hussein, 2010). Web 2.0 users have an active role in communication and in co-operatively sharing information and generating attraction to their shares (Buzzi & Buzzi, 2011).

With their crowded rows of students, large lecture classes can make it difficult for both instructors and students to engage in social interaction through discussions, which can cause students to feel a sense of isolation (Geske, 1992). Gardiner (1994, 1998) endorsed the need for classroom change to allow students to acquire more significant kinds of cognitive learning, particularly critical thinking skills. Collins (1999) noted that students and teachers react to new educational technologies with varied emotions, ranging from enthusiasm to disabling fear. Presently, the information and communication technologies shared between online students through social interactions on mobile tools promote opportunities for online cooperation and collaboration (Barhoumi & Rossi, 2013). New educational technology based Web 2.0 is frequently used in online instruction in universities worldwide (Jimoyiannis, Tsiotakis, Roussinos & Siorenta, 2013). It offers students increased choices and opportunities in the context of online instruction. Web 2.0 is the second generation of web and Internet services. It depends on the support of communication between users of the Internet to maximize the user role in enriching digital content on the Internet and on cooperation between the various Internet users in building electronic societies; additionally, it depends on configurations of social networks and social network applications that have characteristics of Web 2.0 such as Facebook, Twitter, and blogs. As one of the leading forms of communication, social networking sites (SNSs) are maintaining user popularity worldwide. Boyd & Ellison (2007) define SNSs as web-based services that provide an opportunity for individuals to build and display either public or private profiles.

Web 2.0 applications used in online teaching and learning provide online learners with opportunities to communicate and share knowledge (Nelson, Christopher, & Mims, 2009). Tutors and instructors in online teaching and learning are using Web 2.0 applications in online courses. Thus, in this field, the pertinent question to answer is the following: How do we use mobile technologies such as Twitter in online communities? Is it

better to use Web 2.0 applications such as Twitter to perform online learning activities in a blended learning strategy?

Additionally, graduate students such as those working toward a master's degree need effective blended online learning to pursue blended courses. For these reasons, the present study is conducted with female students pursuing a master's degree in educational technology to explore the effectiveness of a blended learning strategy in a course using Twitter activities compared to 100% in-class learning. This study explores the effectiveness of the blended learning strategy in terms of enhancing students' cognitive and attitudinal levels in the context of a course titled Computers in instruction.

The overall aims of the study are very important, particularly considering the focus on using a Web 2.0 application (Twitter) to pursue learning activities, to which great potential for supporting blended learning processes has been attributed. In the present study, the effectiveness of the blended learning process based on continuity between in-class learning and learning activities mediated by Twitter is explored through a comparative study between the face-to-face course and the blended online course.

### **THEORETICAL FRAMEWORK**

In this study, activity theory guides the data analysis and interpretation of the study to explore the factors that influence students' participation in online discussions through Twitter. **Twitter**

In 2006, Twitter was created within the framework of a research project conducted within the open society of the US in the city of San Francisco. Then, after its success, the application was officially launched by the company in the same year. Afterward, this site spread, and the number of Twitter employees has been rising since 2007. Twitter is recognized as a Web 2.0 social networking application currently available to users, and it allows users to send updates, tweets, which have a maximum length of 140 characters per message and appear on the user page.

The Twitter system allows users to register on the main page. Twitter has drawn the desire of millions of users and many companies working in the media and Internet education fields. The blogging process on Twitter is based on the use of Internet technologies to write short messages of up to 140 characters, including links to other information available through the Internet. Twitter limits all user messages, status updates, replies to status updates, and private messages to 140 characters (Fox & Lenhart, 2009).

Users of Twitter have opportunities to reply to a special message or to retweet what other users have published (Gao, Luo, & Zhang, 2012). In fact, Twitter is the most famous tool used by people in the Middle East and the Arab world, especially in the Kingdom of Saudi Arabia (We are social, 2015). Twitter can be considered both a communication centre and an affiliation space, where virtual communities with shared interests are formed (Casal, 2017)

Twitter is used by researchers at academic conferences, with a conference hashtag being established by the conference's organizers or attendees. Attendees and others following the hashtag can engage in social cooperation and collaboration in social conversations, share content or simply follow the happenings at the conference.

Popular collaborative sites such as Twitter appear alternately as successful tools for learning or as sources of information and knowledge. In the education frame, collaborative learning platforms based on Web 2.0 technologies such as Twitter can become real vectors for opening the flexible knowledge or flexible learning process (Barhoumi & Rossi, 2013; Barhoumi & Amry, 2015), provided that teachers agree to enter into flows with their students. In this case, the teacher no longer has a monopoly. The teacher is no longer the sole holder of knowledge because each of the students participates in the construction and sharing of knowledge, for example, by proposing textual references. Then, teacher instead becomes rather a facilitator of learning.

The general benefits of using Twitter in a blended course are as follows:

- Accessible and fast: Twitter is free and available on one's computer, mobile, or tablet and registration is fast.
- Ease of sharing messages (retweets, the equivalent of sharing): Sharing messages on Twitter is faster than it is on Facebook.
- Important visibility: More than 100 million members post tweets every day, and Twitter is worldwide. An important acquisition of traffic is at stake; this traffic can be transformed in the future into potential customers and, thus, into sales.

- Entertainment: Twitter allows the possibility of organizing quizzes to positively point out to users and to create some commitment, sharing and the audience.
- Twitter facilitates online collaboration and cooperation between online students connected from school or home in a blended course.
- Twitter is a free application that is easy for online users to use in order to cooperate and collaborate together.
- Groups connected to Twitter can share comments, text and message. Discussions are related to the course content taught 100% in-class.
- Twitter provides students with the ability to create a class publication and thereby publish their work in the group.
- Knowledge is easily constructed and shared through Twitter.
- Despite its numerous advantages, Twitter presents certain inconveniences.
  - Strict volume of characters: One cannot post messages that include more than 140 characters. It is thus necessary to be brief and effective.
  - Twitter is considered the 2<sup>nd</sup> most popular social network after Facebook because the community that users wish to contact is maybe not on Twitter. Although it is well known, Internet users use Facebook more.
  - On Twitter, the tweets of users can mix with those of other groups whom their followers follow. Users thus have no certainty that all their tweets are seen at the exact same time and hour.

## **Learning communities and activity theory**

### ***Learning communities***

A learning community is established by a group of individuals who work together in a time determined to succeed at a task and to understand a new phenomenon or complete a collaborative task (Riel & Polin, 2004; Cross, 1998). Gagnon (2003) specifies that a learning community is established within the framework of training for purposes of learning to answer needs and very precise purposes. At the school level, a learning community would be defined as a group of students and at least one educator or online tutor who, lasting for some period of time and animated by a common vision and will, pursue the construction and sharing of knowledge, skills or attitudes. Attention, dialogue and mutual aid are fundamental in this type of learning community (Benoît, 2000). McNeil (2010) found that students were more interested in using social networking tools such as Facebook over Twitter because their friends and family were already on this SNS.

The principal objective of this community is to advance the construction and sharing of knowledge between groups through collaborative learning activities (Bielaczyc & Collins, 1999).

### ***The activity theory***

Activity theory emerges in the Russian school of human developmental psychology from the historico-cultural thesis defended by L. Vygotsky. Before a consideration of the fact of human beings as isolated individuals, learning is initially a social phenomenon because it occurs in contexts that are culturally determined, printing their specific marks on human groups in their most everyday behavior. Human activity becomes organized there and spreads by means of the tools that individuals have there, which are the language or present artifacts in the circles where they evolve.

As an outcome of the works of theorists and Soviet psychologists (Leontiev, Vygotsky, etc.), activity theory postulates that consciousness is not a discrete set of cognitive disembodied acts such as decision-making or classification. It is also different from intellectual activity.

Activity theory places consciousness in everyday practice and asserts that actions are always inserted into a social matrix composed of individuals and artifacts. Thus, as the spirit works through artifacts, its work cannot be connected unconditionally or exclusively either to the brain or to the individual; it should be perceived as distributed in the connected artifacts. The aforementioned artifacts bind (connect) individuals and actions in a permeable, changeable and factual way.

Therefore, a consideration of the context and the artifact for understanding activity and collective interaction is the fundamental characteristic of activity theory. Rather than individuals, complex systems of cooperation - at least of interaction - are the object of this theory. While certain approaches favor external representation, activity theory places great importance to the insourcing of artifacts (e.g., the IT medium within the framework of computer-aided cooperative work [cf. Engestrom] and the hand for a child who learns to count on his or her fingers) and processes of mediation.

In the filiation of the Vygotsky's ideas, Has. Leontiev (1976) suggests distinguishing three levels within activities by which borders would be left porous and unstable.

- Operations constitute the basis and correspond to actions the production of which was automated by means of successive realizations. However, an operation can be a source of new conceptualizations in unusual situations.
- Regarding actions, in the second level of the model proposed by Leontiev, they are a matter of making contact with the knowledge and the know-how achieved by individuals in the face of given situations and of answering a precise, conscious purpose. Regarding vaster motives, activities include them within specific contexts in order to answer.
- Additionally, an action can rise at the level of an activity, or an activity can correspond to an action in an activity of a more general reach .

Engeström (1987) developed an extension of the activity theory model that adds the component of community sharing of the same object. The model established by Y. Engeström (1987) ultimately constitutes one of the last major evolutions of this theoretical framework of activity theory: the "basic structure of an activity" appears, then, under a bi-triangular shape the angles of which count the various parameters of human activities, thus taking into account the social or collective dimension of activities as well as the mediatization of actions by tools mobilized in the observed contexts.

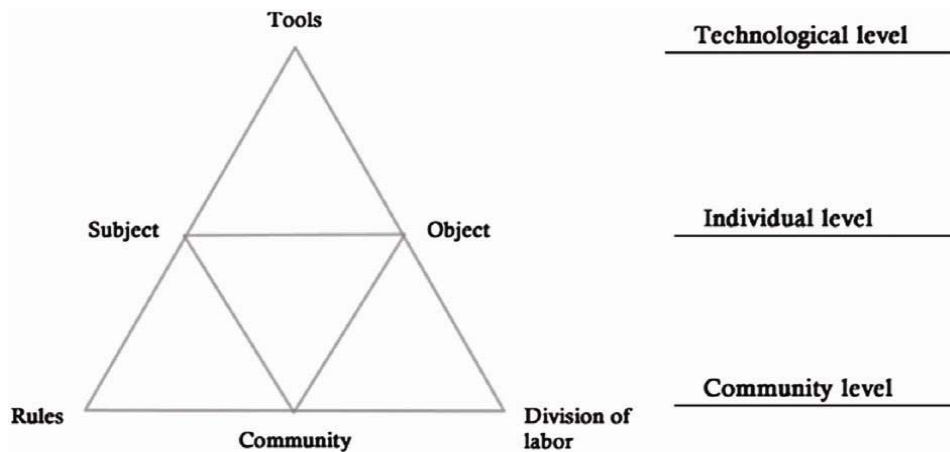
This simplistic representation thus involves seven poles: the subject the relations of which to the community are mediatized by rules and the division of labor, as well as the objective or purpose toward which the subject aims and realizes by means of specific tools. The seventh pole concerns the result of the observed activity. This model is accompanied by more than a series of "contradictions" or tensions that observe and that allow the evolution of activity. Researchers frequently use activity theory to analyze human-computer interactions (Nardi, 1996). This theory seeks to analyze the cultural and technical aspects of human action (Bertelsen & Bodker, 2003).

In this suggested model of activity theory, Engestrom added rules that mediate the learning community and the subject and that create a division of labor between the community and the object.

Activity theory is based on six related principles:

- The subject: This is the individual or subgroup that the observer chose to analyze the activity. This principle is considered the individual level of activity theory, and examples include the teacher and the learner.
- Object orientedness: This is the transformation of the environment at which the activity aims (tries to realize, the objective to reach (affect, achieve)); examples include the use of the Internet in education.
- Tools: These are material or symbolic tools that mediatize the activity; examples include the Internet, software, and new educational media.
- Community: This principle involves subjects (or subgroups) that share the same object and thereby distinguish themselves even from other communities; examples include administrative staff, technicians in the department, students, graduate students, and that which is going to be created.
- Division of labor: This principle simultaneously involves the horizontal distribution of the actions between the subjects/members of the community and the vertical hierarchy of the powers and the statutes.
- Rules are the conventions and guidelines regulating activities in the system, such as the rules of discussion between students in collaborative learning.

Figure 1 shows the three levels of activity theory: the technological level, the individual level, and the community level.



**Figure 1.** Three levels of factors that influence online participation

In their research related to learning communities, Stribos and Fischer (2007) noted that collaborative learning strategies are very useful for constructing and sharing knowledge among students in collaborative and cooperative online courses in the presence of an instructor or tutor. The collaborative and cooperative learning activities achieved by students in the activity system help researchers find the cognitive outcomes of a learning activity and the processes of knowledge creation and sharing during the learning process. Activity theory stimulates professionals to renew knowledge (Tillema & Orland-Barak, 2006).

Mercier and Higgins (2013) examined the adoption of online cooperative and collaborative learning strategies in online communities to support mathematics learning activities and found that a number of factors influence students' participation in cooperative and collaborative communities. Students are motivated and positively oriented to participate in online communities to share knowledge related to mathematics courses.

Further, we cannot forget the principal role of the instructor in online learning activities. In this context, a recent study by Lu and Churchill (2014) stated that the teacher plays a principal role in guiding students in online lectures. This study showed that social interaction that helps students construct and share knowledge is achieved through the pertinent role of the instructor; a decrease in the frequency of interactive messages in online communities is triggered when the online tutor or teacher is not present with the group in the online community. Other research in the field of mobile learning has found that online learners are using mobile educational technologies and are integrating them in online learning through learning communities and that the usefulness and ease of use of the mobile technology are the principal factors influencing students' participation and adoption of online interaction (Litchfield et al. 2007). The social presence of students in online communities is a pertinent factor that influences student's participation in online communities (Cheung et al. 2008).

In an article published in *Contemporary Educational Technology*, Tennyson (2010) noted that in the 1990s, the integration of the media artifact by the tutor or teacher in an e-learning system was the technological factor that improved online social interaction among group members in learning communities. Social online interaction in online learning communities and its analysis became an important domain of research (Tennyson, 2010).

Baran (2010) recommended the integration of auditive and visual representations of knowledge through calculators and audiovisual media, which are considered an effective tool for solving online students' learning difficulties. These technologies may have positive results in teaching and learning.

A study conducted by Yu, Tian, Vogel, and Kwok (2010) reported that online discussions between students through social learning communities networked through an artifact, such as mobile learning communities, clearly improved students' social connections, improved their self-esteem and boosted their learning performance.

Preston and his colleagues (2010) found that nearly 70% of students stated that they learn just as well in online learning communities, such as WhatsApp groups, Facebook communities, Twitter chats and Google+ communities, as they do in lectures that are held in the classroom in the presence of other students.

### RESEARCH HYPOTHESES OF THIS STUDY

The present experimental study aims to determine the effectiveness of blended learning technology based on continuity between in-class learning and Twitter learning activities in student achievement and in students'

attitudes toward it compared to 100% in-class learning with no app mediation. The same course, Computer in instruction, was taught with the control and experimental groups.

The hypotheses guiding the present study are as follows:

**Hypothesis 1:** There is a significant difference between the control group and the experimental group at the 5% level regarding the achievement test scores of students.

**Hypothesis 2:** There is a significant difference between the control group and the experimental group at the 5% level regarding the attitudes of students after the experimental period.

## METHOD

In the present study, the researcher used an experimental research approach based on identifying the impact of the use of the blended learning process combining in-class activities and Twitter learning activities compared to the learning process that occurred entirely in the classroom.

### Population and sample

During the 2016 academic year, the researchers completed a study of the blended learning process based on continuity between in-class learning and a Twitter learning community to achieve learning activities compared to in-class learning only. The study sample was composed of two groups of female students in the college of education at Taibah University. The first group was an experimental group and contained 37 students. With this first group, the researcher applied the learning process based on continuity between face-to-face learning and a Twitter learning community to discuss the course taught in person in the classroom. The second group was a control group containing 37 students where learning occurred entirely in the classroom. The use of a Twitter learning community in learning activities and discussions was new educational technology to the students.

### Tools used for collecting data

The researcher adopted the post-achievement test and the questionnaire method to collect the data for this study.

- The first set of study data was based on the students' scores on the post-test taken after completing the experimental course.
- The second set of study data was based on the questionnaire method. The questionnaire was constructed using content validity, as established by a group of teachers at the university level. A first questionnaire was distributed in person to the experimental group to evaluate their attitudes toward the learning resource-based blended course. The control group questionnaire measured these students' attitudes toward the course conducted in the classroom without any use of a Twitter learning community.

The two questionnaires were distributed by email to a sample of teachers to measure their content validity.

### Justification of measures

The researcher began the experiment by explaining the rules for using the Twitter learning community in the blended course (e.g., do not include publications that are unrelated to the course, connect to the group at the appropriate time, be respectful). The first measures in the present study were based on the scores obtained by students on the post-test.

- Students' cognitive performance was based on their scores on the post-test. This measure was used to accept or reject Hypothesis 1.
- The measurement of the attitudes of the experimental sample toward the learning process was based on the questionnaire method. This measure was used to accept or reject Hypothesis 2. A three-point Likert scale (agree, neutral, disagree) (Likert, 1932) was used for the questionnaire distributed to the control group.

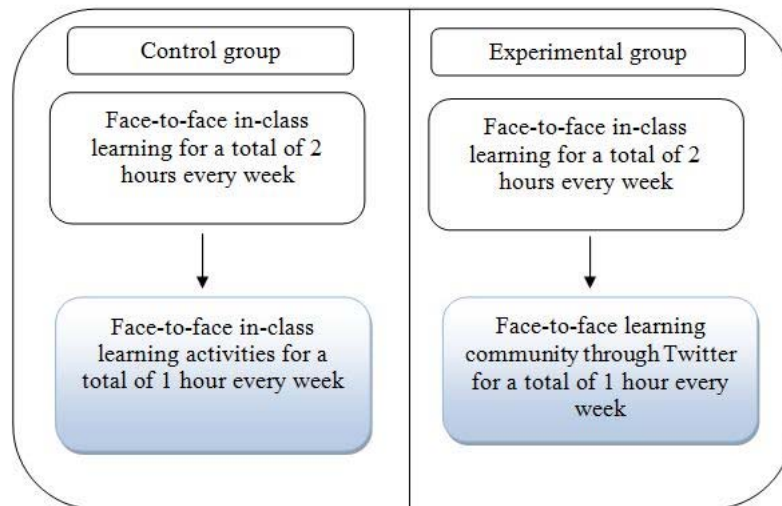
The Statistical Package for Social Sciences (SPSS) software was used to analyze the study data.

### Presentation of the learning environment

#### *The research process in the learning environment of the control and experimental groups*

The blended learning course was based on continuity between in-class learning and a learning community created by the researcher on Twitter to discuss on a weekly basis the learning resource taught in person. The blended course based on Twitter learning activities designed with activity theory was studied with the experimental group. The 100% in-class learning was studied with the control group.

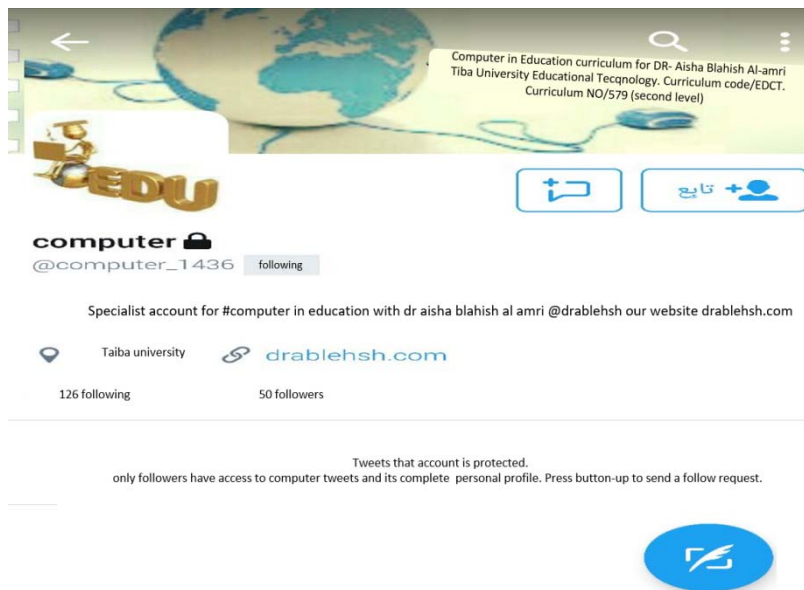
Figure 2 shows the experimental processes of the experimental and control groups.



**Figure 2.** The experimental processes of the experimental and control groups

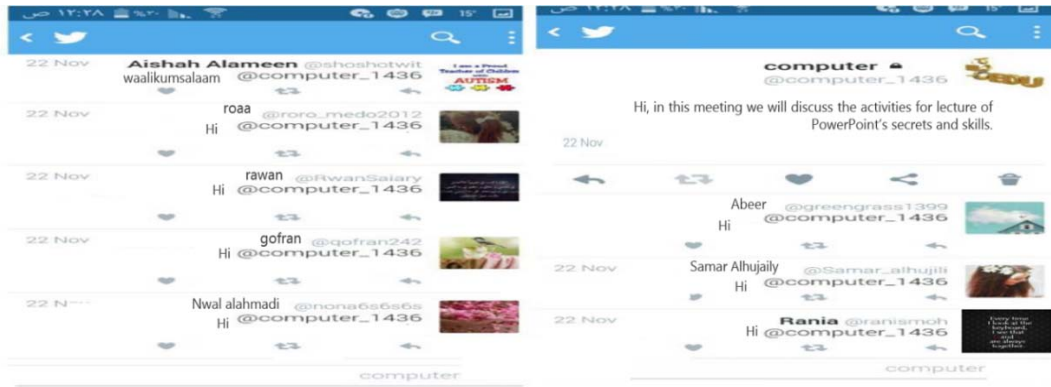
***Print screens of the learning environment of the experimental group***

Figure 3 shows the learning environment of the experimental group based on Twitter learning activities using activity theory.



**Figure 3.** The learning environment of the experimental group

Figure 4 shows collaborative activities of the experimental group based on activity theory and the online instructor guiding students in the learning process by answering questions and discussing the course taught in person in the classroom using the Twitter group.



**Figure 4.** Print screen showing social interaction between students and their teacher in the learning community

**FINDINGS**

**Test results**

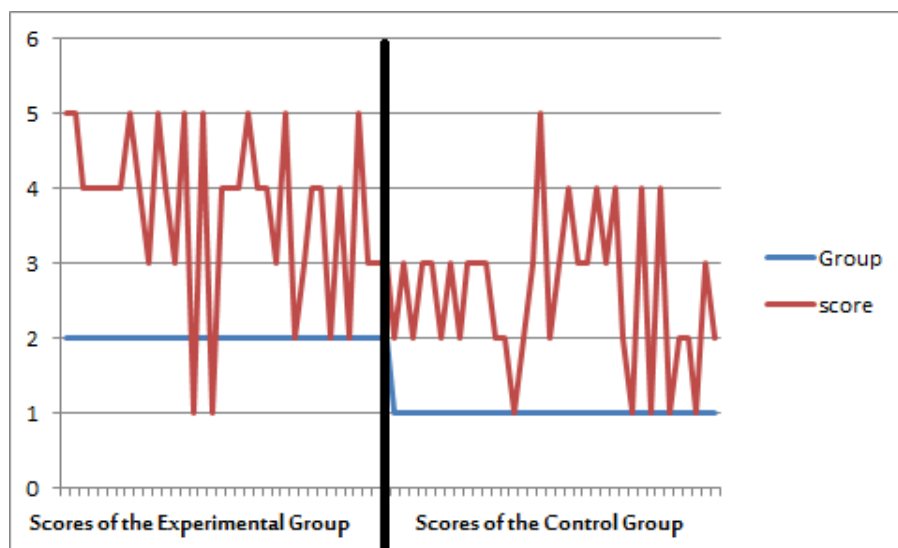
Table 2 shows the means of the experimental and control groups and the standard deviation scores derived from statistical tests.

Table 2. The means and standard deviation of the scores on the test achieved by the control and experimental groups after the experiment

<i>Group Statistics</i>			
Group	N	Mean	Std. Deviation
Control group	36	2.58	1.142
Experimental group	36	3.72	1.195
Total	72	3.18	1.260

Table 2 shows that the mean of the control group on the achievement test is 2.58 and that the mean of the experimental group is 3.72 (see Table 2). The results of comparison between the means of the experimental group and the control group show that the mean of the experimental group (3.79) is greater than the mean of the control group (2.58). In the next paragraph, the researcher will use the t-test to explain the difference between the values of the means of the two groups in Table 3 below.

Figure 5 is a graphic showing the difference between scores of the experimental and control groups with a clear visual representation of the information.



**Figure 5.** Graphic of the scores of the experimental and control groups



Table 3. Values of t-test obtained from independent-samples t-test used for the equality of means on the achievement test

		T	Df	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Achievement test	Equal variances assumed	4.578	70	1.139	.249	1.635	.643
	Equal variances not assumed	4.578	65.93	1.139	.249	1.635	.643

The results of Table 3 help the researcher to validate or reject the first hypothesis, and we note the following:  
**Hypothesis 1:** There is a significant difference between the control group and the experimental group at the 0.05 level regarding the achievement test scores of the students after the experiment.

The results of comparison between the means of the experimental group and the control group show that the mean of the experimental group (3.79) is greater than the mean of the control group (2.58) (see Table 2). Based on the results obtained in Table 3, the researcher used the t-test to explain the difference between the values of the means of the two groups. The value of the t-test of the table for 70 DF is 2.00, and the value of the t-test in Table 3 is 4.57, which is greater than the value of table, which is equal to 2.00. This result shows that Hypothesis 1 is accepted based on the rules of an independent-samples t-test. There is a significant difference between the control group and the experimental group at the 0.05 level regarding the achievement test scores of the students after the experiment.

**Attitudes of the experimental and control groups toward the experimental learning processes**

Table 4 shows the structure of the questionnaire designed by the researcher and distributed to both the control and experimental groups. The questionnaire described in Table 4 shows the variables, course, items and sample of the questionnaire of the attitudes of the experimental group in the course, Computers in Education. The questionnaire distributed to both the control and experimental groups was based on three levels (the technological level, the individual level, the social level).

Table 4. Variables, course, items and sample of the questionnaire of the attitudes of the experimental group in the course, Computers in Education

Items	Technological level
	The blended learning process (70% in person + 30% Twitter) is easy to use.
The blended learning process (70% in person + 30% Twitter) is useful in my academic life.	
In the blended learning process, the Twitter interface and its components are easy for me to use.	
In the blended learning process, Twitter gives me the opportunity to communicate with the learning community.	
Individual level	
In the blended learning process, I believe that Twitter is an integrated system to share instructional information for transferring knowledge.	
In the blended learning process, Twitter makes it easy to tweet, share information, and discuss with others.	
In the blended learning process, Twitter gives me the opportunity to discuss learning resources and to interact with the learning community.	

	In the blended learning process, Twitter responds to my special instructional needs.
	Social level
	In the educational groups, I believe that good social relations have a positive impact on the use of social networks.
	In the blended learning process, based on my experience in the use of Twitter in education, I believe that there is a high standard of social presence, and I believe that this application further strengthens social interaction in the educational group.
	In using Twitter, I believe that students not only share information but also create a favorable environment for social interaction.
	I take it that we are capable of participating in the educational group without the presence of the supervisor and that we respect the roles and laws with regard to using Twitter.
<i>Course</i>	Computers in education
<i>The learning process</i>	Blended learning process (70% in person + 30% Twitter)
<i>Items</i>	I agree, Neutral, I disagree
<i>N</i>	36

Table 5 describes the questionnaire distributed to the students in the control group to explore their attitudes toward the use of the learning process based on 100% face-to-face learning.

**Table 5.** Structure of the questionnaire of the attitudes of the control group in the course, Computers in Education.

<i>Items</i>	Technological level
	The blended learning process (70% in person + 30% discussion in person) is easy to use.
	The blended learning process (70% in person + 30% Twitter) is useful in my academic life.
	In the blended learning process (70% in person + 30% discussion in person), discussion in person is easy for me to use.
	In the blended learning process (70% in person + 30% discussion in person), discussion in person give me the opportunity to communicate with the learning community.
	Individual level
	In the blended learning process (70% in person + 30% discussion in person), I believe that discussion in person is suitable for sharing instructional information for transferring knowledge.
	In the blended learning process (70% in person + 30% discussion in person), it is easy to share information and to discuss with others.
	In the blended learning process (70% in person + 30% discussion in person), discussion in person give me the opportunity to discuss learning resources and to interact with the learning community.
	In the blended learning process (70% in person + 30% discussion in person), discussion in person responds to my special instructional needs.
	Social level
	In the blended learning process (70% in person + 30% discussion in person), in discussion in person, I believe that good social relations have a positive impact on the use of social networks.

	In the blended learning process (70% in person + 30% discussion in person), based on my experience in the use of discussion in person in education, I believe that there is a high standard of social presence, and I believe that this application further strengthens social interaction in the educational group.
	In the blended learning process (70% in person + 30% discussion in person), I believe that students not only share information but also create a favorable environment for social interaction.
	In the blended learning process (70% in person + 30% discussion in person), I take it that we are capable of participating in the educational group without the presence of the supervisor and that we respect the roles and the laws of communication.
<i>Course</i>	Computers in Education
<i>The learning process</i>	Blended learning process (70% in person + 30% discussion in person)
<i>Items</i>	I agree, Neutral, I disagree
<i>N</i>	36

Table 6 describes the means of the attitudes of the experimental and control groups.

**Table 6.** Means of the group statistics in the attitudes of the students of the control and experimental groups toward the learning process

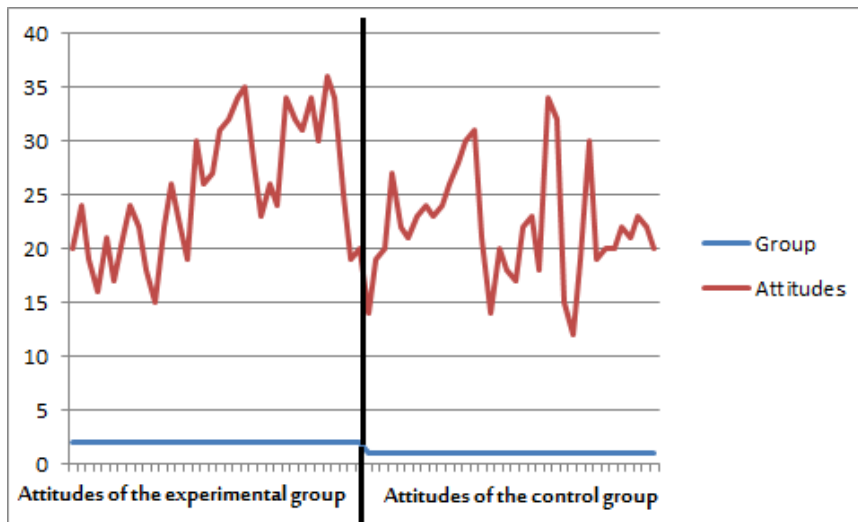
	<i>Group</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
Attitude	Control Group	36	22.06	5.143	.857
	Experimental Group	36	25.47	6.073	1.012

The results of the attitudes of the students of the control group and of the students of the experimental group toward the experimental learning processes show that the mean of the control group in the attitudes toward the learning process was 22.06. The mean of the attitudes of the experimental group toward the learning process based on continuity between in-class learning and Twitter learning activities was 25.47. The results show that the attitudes of the experimental group toward the learning processes are greater than those of the control group. To interpret the difference between the means, the researcher used the value of the t-test described in Table 7.

**Table 7.** T-test for the equality of means in the attitudes of students toward the experimental learning processes

		<i>t</i>	<i>Df</i>	<i>Mean Difference</i>	<i>Std. error Difference</i>	<i>95% Confidence Interval of the Difference</i>	
						<i>Lower</i>	<i>Upper</i>
Attitude	Equal variances assumed	2.576	70	3.471	1.326	6.062	.771
	Equal variances not assumed	2.576	68.152	3.471	1.326	6.063	.770

**Hypothesis 2:** There is a significant difference between the control group and the experimental group at the 5% level regarding the attitudes of students after the experimental period. The results of the t-test in Table 7 show that the t-test calculated for the equality of means is 2.54, which is greater than the t-test value of the table (2.00). This result shows that the hypothesis 2 is validated and that there is a significant difference between the control group and the experimental group at the 0.05 level regarding the attitudes of students after the experimental period. The difference between the attitudes of the experimental and control groups is in favor of the experimental group; the attitudes of the students in the experimental group toward using the blended course (70% face-to-face course work + 30% Twitter discussions) are more effective from the students' viewpoint. Figure 6 shows the attitudes of the students of the experimental and control groups based on the questionnaire method.



**Figure 6.** Results of the attitudes of the experimental and control groups

### DISCUSSION OF RESULTS AND IMPLICATIONS OF THEORY

This study explores the effectiveness of a learning process based on continuity between 70% in-class learning and Twitter learning activities based on activity theory compared to a learning process based on continuity between 70% in-class learning and 30% in-class learning activities. The experimental results show that the blended learning process based on continuity between 70% in-class learning and 30% learning activities in a group to discuss the course taught in-class is more effective based on the scores of students and their attitudes toward this blended learning process.

The scores of the students of the experimental group after course completion show the cognitive performance of this sample through these students' achievement tests scores compared to the control group.

The results of the attitudinal data from the questionnaire distributed to the control and experimental groups show that the students of the experimental group are more motivated to adopt the learning process based on continuity between 70% in-class learning and 30% Twitter learning activities to discuss the course taught in person. The attitudinal data based on the questionnaire method show the following: The learning process of the experimental sample (70% in person + 30% discussion on Twitter) facilitates learning, it is useful in the academic life of students, and Twitter give students the opportunity to communicate with the learning community, students believe that Twitter is an integrated system for sharing instructional information for transferring knowledge.

The learning process based on continuity between 70% in-class learning and 30% Twitter learning activities helps the students of the experimental group effectively discuss the course content taught in-class and find answers regarding concepts that are unclear to them. Twitter learning activities can be powerful and effective tools for students to discuss unclear concepts of the Computers in Education course taught for graduate students.

In the domain of habits and usability, the researcher notes that Twitter is an easy-to-use interface for the students, many of whom are familiar with its use from everyday life. This study shows the effectiveness of social networking tools based on Twitter learning activities for sharing knowledge with a familiar tool for social interaction and the rapid sharing of ideas.

Some factors influence the students' motivation to interact with their peers online in course discussions through Twitter. Activity theory is a suitable theoretical framework through which to examine the factors influencing student participation in online discussion and social interaction. These factors are examined at the technological, individual and community levels. The factors of the technological level of activity theory are concerned with the habits and usability of students. The individual level concerns the affordances of the tool as perceived by the students. The social presence, sense of community, and community roles and rules operate on the community level.

In the next section on theoretical implications, the researcher concentrates on the factors that influence students' participation in and motivation to use Twitter learning activities in online discussions of the course taught in person to explain the difference in the achievement and attitudinal results in favor of the experimental group.

#### **Technological level: usability and habits**

The use of social networking tools has increased in facilitating online communication and the sharing of information and knowledge.

A usability study based on, first, the technological level (usability and habits) was conducted with students in a blended online course based on continuity between in-class learning and Twitter learning activities to determine the ease of use and satisfaction with the tool. First, students' habits and past experiences using Twitter and the app's perceived ease of use shape their attitudes toward this social networking technology.

Based on the results of the technological level, the blended learning process (70% in person + 30% Twitter learning activities) is easy to use. The results also show that the blended learning process is useful in the academic life of students. In the blended learning process, the Twitter interface and its components are easy for online students to use to pursue the learning activities of the Computers in Education online course. In the blended learning process, Twitter gives students opportunities to communicate with the learning community. It is clear from the results of the technological level that the experimental students' attitudes are positive and oriented toward the learning process integrating Twitter learning activities to discuss the course taught in person.

Twitter makes the social media site faster and easier to use. Many of the changes are fairly subtle, but they are aimed at creating a more uniform experience for users on different platforms. Twitter learning activities provide an easy-to-use interface coupled with a news feed feature, allowing online students to be quickly informed of updates within the community and to respond in a timely manner.

Technologically, Uzunboylu, Cavus and Ercag (2009) observed that mobile phones are small, portable and easy to use to connect to Twitter. Thus, students carry cell phones with them (Cavus & Ibrahim, 2009), and they use Twitter on their mobile phones. Many researchers have stated that the personal use of mobile phones has increased in recent years (Chen et al., 2000; Lundby, 2002; Roschelle & Pea, 2002).

In this respect, the findings of the present study confirm those of previous research projects that underscore the effectiveness of using Twitter in online instruction. In the study by Preston and his colleagues (2010), nearly 70% of the students stated that they could learn just as well from online lectures as they do from face-to-face lectures.

#### **Individual level: perceptions**

Students held different beliefs regarding the affordances of the two learning processes (that is, the objective that can be achieved by using the tools). The results of the individual level show that in the blended learning process, the students of the experimental group believe that Twitter is an integrated system for sharing instructional information for transferring knowledge. Additionally, in the blended learning process, on Twitter, it is easy to tweet, share information, and discuss with others. Twitter gives all students opportunities to discuss learning resources and to interact with the learning community. From experimental students of the sample, Twitter responds to their special instructional needs. The learning process of the control group based on 70% in-class learning and 70% in-class learning activities is a formal academic learning process that is mostly used to disseminate information rather than to enhance interaction. The students of the experimental group consider the learning process based on continuity between 70% in-class learning and 30% Twitter learning activities to be a valuable process for sharing knowledge to improve learning, exchange experiences and ideas, discuss various academic and social issues and seek help and support during their learning activities.

#### **Community level: social presence, roles, and rules**

The results of the community factors of activity theory show that in the educational group, the students of the experimental group believe that good social relations have a positive impact on the use of social networks. Based on students' experience in the use of Twitter in education, students believe that there is a high standard of social presence, and they believe that this application further strengthens social interaction in the educational group. The experimental students of the sample believe that they not only share information but also create a favorable environment for social interaction. The students of the experimental sample are capable of participating in the educational group without the presence of the supervisor, and they respect the roles and laws with regard to using Twitter. The presence of the teacher in the learning process is very helpful for students in constructing and sharing knowledge. A recent study by Lu and Churchill (2014) published in the Australian Journal of

Educational Technology showed that the social interaction in online learning was teacher-centered; the teacher played a central role in collaborative learning.

Strijbos and Fischer (2007) argued that research on collaborative learning, both face-to-face and computer-supported, has thrived in the past 10 years. They argued that the impact of social interaction on learning processes affects motivation and organizing collaboration and that it helps students construct and share knowledge.

Daugherty and Funke (1998) indicate that the issue of isolation is an important criterion for student satisfaction with web-based online courses. This feeling is often 'based on the physical separation between student and instructor' and is one that educators may be able to ameliorate but are unlikely to ever be able to successfully eradicate (Daugherty & Funke, 1998).

The results of this study based on the technological, individual and community factors of activity theory support a blended learning process based on continuity between 70% in-class learning and 30% online Twitter activities to discuss the course taught in person. The blended learning classroom gives opportunities to students to interact together and to share knowledge through the Twitter tool.

### LIMITATIONS

The limitations of the present study are as follows:

- The present experimental study occurred in the context of a single course, Computers in Education, and should be replicated in other online disciplines.

### CONCLUSION AND RECOMMENDATIONS

Social networking websites, such as Facebook, Myspace, and Twitter, have become an indispensable part of the lives of numerous students (Junco, 2011). The number of individuals using Twitter is increasing significantly each day. Twitter allows students to connect with each other and to create uninterrupted communication (Dunlap & Lowenthal, 2009). Elavsky, Mislán and Elavsky (2011) noted that the impact of Twitter on social interaction remains a fertile area for research.

There is a general growing research interest in collaborative learning activities and the sense of learning communities in the educational context, and affective benefits of collaboration and social interaction between online students have been found. The goal of this usability test was to assess user-friendliness, user satisfaction, and the perceptions of Twitter by first-time users. It is anticipated that through the subsequent and recurring use of Twitter, user performance will improve over the results found in this study. However, it should be noted that first impressions are vital to whether users will use the website in the future. Issues found within this usability test may discourage novice users from returning to Twitter and using its services.

Based on the results of this study, the researchers advise teachers and actors in online education to use Twitter to pursue learning activities in a blended course integrating both face-to-face learning and Twitter learning activities. Twitter proved to be an effective tool for educational development and for collaboration with students that can change the rules of the course and model good pedagogical responsiveness to the learning needs of students (Grosbeck & Holotescu, 2008).

The benefits of Twitter in a blended lecture environment based on continuity between in-class learning and a Twitter group to discuss the course taught in person in the classroom are as follows:

- Twitter facilitates online discussion and social interaction in a blended course.
- Twitter is a tool that is easy to use for all students.
- Twitter is a useful tool for sharing knowledge.
- In a blended course, students can easily discuss different topics related to the course taught in the classroom.

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