Measuring emotional responses to experiences with Cloud-based learning activities

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***Abstract*— Cloud Education Environments consider all the cloud services, whether they are applications, content providers, infrastructure services, as large ecosystem that can be used as an e-Learning ecosystem which can be built upon the learning objectives of a course. Any web 2.0 application might be used for learning purposes, and many of those applications that reside on the cloud have already opened the APIs for having an orchestrated integration of them. In this paper we present the design and deployment of learning activities using cloud applications and services. The experiences presented here are from Galileo University in Guatemala, with students from three different countries in Central America and Spain. In this study we present results of an instrument that measured emotional aspects and opinions about the tools and cloud-based learning activities. Several cloud-based tools were used for the different learning activities required for the courses, some featuring collaborative actions, knowledge representation and schemes, publication of information, research activities, storytelling activities and social networking. The results obtained demonstrates that students are eager to use and have new and more interactive ways of learning, that challenges their creativity and group organization skills, while professors have a growing interest on using new tools and resources that are easy to use, mix and reuse.**

Cloud-based tools, Cloud Learning Activities, Cloud Education Environments, Web 2.0, Social Networking, e-Learning.

I. INTRODUCTION

There is great potential to maximize innovation through the use of multiple cloud-based tools for learning activities and to create a new learning environment, applications, and learning experiences. Therefore there is a tendency that Virtual Learning Environments (VLE) will move from a monolithic paradigm to a distributed paradigm. Some call it the next generation of cloud-based e-Learning environment [1][2][3]. It is clear that VLE need to be more scalable and improve the real innovation they bring to education, but actual work has a focus on infrastructure layer rather than application layer [4][5]. Still VLE is a simple conversion of classroom-based content to an electronic format, retaining its traditional knowledge-centric structure. [6]

Cloud computing application technologies are a major technological trend that is shifting business models and application paradigms; the cloud can provide on-demand services through applications served over the Internet for multiple set of devices in a dynamic and very scalable environment [7]. Thus, the significance of the technology for this study lies not only in cloud computing, but in the application that reside in the cloud that can be used for learning purposes, although as it will be presented, many of them have not been intended for learning in the first place, the applications used in this case study are actually used for learning. Likewise social networking technologies provide easy pathways for sharing these kinds of cloud applications and their related data and activities and of course for socializing and possible collaborative experiences at the same time. [8]

We aim to create a Cloud Education Environment, where a vast amount of possible tools and services can be used, connected and in the future orchestrated for learning and teaching. [9]

II. THE EXPERIENCE

A. *The Galileo University Test-bed*

In this section we present our cloud-based learning experience in Latin-American countries following other successful experiences [2][3].

The experience happens in the Institute Von Neumann (IVN) of Galileo University, Guatemala. IVN is an online higher education institute. It delivers online educational programs across the country and those programs are open for other countries.

B. *Experience description*

The student population at IVN is mostly adult learners who have a job; this is something quite common in the entire University students. The courses are similar to any other University course; most of the students do their learning during the evening or in weekends because of work.
It is a complete online learning degree, the topic of the course is an e-Learning certification that consists in several modules that specializes the students into e-Learning from an instructional design reference. The course do not have

asynchronous sessions, although the use of chat with professor and other peers is possible, and students are expected to work 10 hours/week for studying materials, doing learning activities and doing collaborative activities. The courses within the e-Learning certification are designed in learning units that usually last for 1 week each unit having a diversity of online material such as video, audio, animations, interactive content, forums, assignments and a wide diversity of learning activities specially designed for enhancing learning acquisition. The course uses the institutional LMS that currently is .LRN LMS (www.dotlrn.org), although some module are alternative given using Moodle. The students have the advice and help from professional instructional designers to build their online course. The Certification is targeted to university professors, e-Learning consultants, instructors that want to enhance their knowledge about teaching with technology.

The presented experience has two groups of more than 60 students, most of them university professors, from different countries: Guatemala, Honduras, El Salvador and Spain. The courses titles are: course 2: Introduction to e-Learning; course 3: e-Moderation and course 4: Online activities design.

In this experience, students were assigned to cloud-based learning activities for the first time, most of them were not technology savvy, but they had a preliminary course that introduced them into the use of the institutional LMS and related technologies.

The course professor introduced these cloud-based learning activities as *innovative and powerful tools for learning*, with the objective to elaborate all the benefits that can create mindset change, guiding the students through the benefits that these type of activities will have in their learning process [3], something that proved to be very helpful to avoid resistance and possible fear to new and seen as complex tools. We collected information form students in a pre-test and post-test through an online survey. Each group did two four-week courses, between the courses there was a one-week off that we used to do telephone interviews and gather further information about the experience.

C. The Learning Activities and Scenarios

We designed learning activities based on instructional objectives, using as a base the past standard non-cloud-based activities from previous editions of the courses, and transforming them to leverage the potential of the cloud ecosystem. The designed and tested activities are presented, it is important to mention that each activity was carefully designed using a custom made instructional design template that contains all activity related information such as: learning objectives, instructions, classification using Bloom's revised taxonomy [1] and grading. Each single step on the activity has a clear and explicit grading. With a clear design of the activity, the professor and instructional designer proceed to select the most suitable tool based on previous knowledge and experience with the tool, in the presented experience most of the proposed tool has been already used for other learning activities in other courses.

Course 2 "Introduction to e-Learning", had the following learning activities:
Activity 2.1: Students had to do a research of a given topic, then writing collaboratively an essay in groups of four students. This activity was prepared with a comparison group setting, where we divided the whole class in three parts, first two parts using cloud-based learning activities and the last third part using traditional desktop applications.
The first two groups were asked to use cloud services, Google Docs [14] and Wiki Spaces [15] and one of the group used traditional word processor. Then students were invited to represent the information with a time-line tool, the cloud-based time-line tools used were Dipity [16] and Timetoast [17] and the traditional tool was Power Point. Finally students had to comment and discuss about other groups results in the LMS online discussion forums.
The group parts used tools are describe in Table I.

TABLE I. COMPARISON SETTING

Number of Groups	***Tools used for the learning activity***
3	Google Docs and Dipity
3	Wiki Spaces and Timetoast
3	Word and PowerPoint

Activity 2.2: Students had to do a research and present knowledge gained through mind map tools, the cloud application used were MindMeister [18] and Cacoo [19]. Finally they were invited to discuss about other peer contributions on the LMS forum. It was designed as an individual activity.
Also a comparison setting is presented in Table II.

TABLE II. COMPARISON SETTING

Number of Students	***Tools used for the learning activity***
10	Cacoo
10	Mindmeister
16	PowerPoint

Course 3: "e-Moderation", had the following activities:
Activity 3.1: Students had to synthetize information learned in the course and publish it using the cloud-tool Issuu [20]. Then discuss other peer contribution on LMS forums.

Activity 3.2: Students had to do a research, create a storytelling script and represent it using one of the following cloud-based tools: GoAnimate [21], Xtranormal [22], Pixton

[23]. Publish it in the social network Facebook [24] and comment other peers' contributions.

Course 4: "Online activities design", had the following learning activities:
Activity 4.1: the whole group of students will build a collaborative bookmarking based on a research assignment, using a base taxonomy provided by the professor to classify the links provided by the students. The Delicious bookmarking site [25] was used for the activity.

Activity 4.2: Students had to create online satisfaction survey for courses, synthetize a method and requirements for these types of surveys using a mind-mapping tool and publish a sample survey using Google forms [14].

Activity 4.3: The third learning activity focused on modeling a process for creating visually attractive digital posters with educational intentions, first by using a mind-mapping to elaborate the concepts, and then reflect them in an cloud-based tool for online poster called Gloster [26].
In all activities, students were required to learn about the tool in order to perform their assignments.

D. Instruments Used

We used standardized instruments to measure this experience [10,11,12,13], through online surveys sent to the students with a pre-test and post-test that measured emotional aspects and opinions about the tools and cloud-based learning activities. Pre and post-test were evaluated with instructional designers, professors and students to observe and verify its validity, some enhancements were introduced after conducting an interview with survey testers.

III. Results and Discussion of the Experience

From a total of 36 students, 25 of the students gave their consent to participate in the study (Participation were equally distributed with 48% of female and 52% of male participants, M=37, σ =14) by filling out at least one out of the two presented questionnaires. Participants were asked about the experience and some of the more interesting positive and negative impressions are presented with the emotional aspects evaluation:

A. Positive impressions

- "I liked to know new activities and tools in the web for more interaction with the student"
- "I learned about many great tools that will help me with my teaching activities, the experience showed me that the activities can be very interactive and innovative"
- "The use of new tools for learning was fun and can be applied with creativity to teach scientific content."
- "What I liked is that I started using the tools in my current courses."
- "I liked that the activities awaken creativity and obtained interesting results and products."
- "The activities promote meaningful learning, learning by doing so you will not forget, allows flexibility in learning and I feel very satisfying to achieve something new and different."
- "The tools used for the activities are pretty dynamic and will make courses more interactive."

B. Negative impressions

- "I needed more time to get to know the tools and how to use it"
- "The work load was increased for activities within the new tools with an overhead with learning the tools"
- "I needed a lot of more time to achieve the results with tools like Gloster, and I felt frustrated"
- "The instructions were not clear"
- "With some of the tools you need to purchase a membership to upgrade and enable some functionality"
- "Some of the tools are not accessible and you can't use it in all operating systems, e.g. Flash based tools"

C. Emotional aspects evaluation

In the experience evaluation the results of the pre-test showed about the motivation, the instrument was based on the Computer Emotion Scale (4pt. scale) [12] developed by Kay and Loverock to measure emotions related to learning new computer software/learning tools in general, then the post-test measured the motivation after using the tool proposed for the learning activities with the following comparison in Table III.:

TABLE III. Computer Emotion Scale Comparison

Emotion	Pre-test results	Post-test results
Satisfied	2.50 (σ = 0.65)	2.48 (σ = 0.65)
Anxious	1.42 (σ = 0.97)	1.24 (σ = 0.78)
Irritable	0.28 (σ = 0.45)	0.44 (σ = 0.51)
Excited	2.33 (σ = 0.72)	2.16 (σ = 0.85)
Dispirited	0.31 (σ = 0.47)	0.28 (σ = 0.46)
Helpless	0.47 (σ = 0.56)	0.52 (σ = 0.65)
Frustrated	0.39 (σ = 0.55)	0.32 (σ = 0.56)
Curious	2.33 (σ = 0.68)	2.12 (σ = 0.83)
Nervous	0.47 (σ = 0.56)	0.60 (σ = 0.65)
Disheartened	0.32 (σ = 0.42)	0.35 (σ = 0.46)
Angry	0.19 (σ = 0.40)	0.32 (σ = 0.48)
Insecure	0.47 (σ = 0.70)	0.40 (σ = 0.58)

The summary with the four variables of the CES [12] scale is presented in Table IV:

TABLE IV. SUMMARY COMPUTER EMOTION SCALE COMPARISON

Emotion(4pt. scale)	Pre-test results	Post-test results
Happiness	2.39	2.25
Sadness	0.30	0.28
Anxiety	0.71	0.69
Anger	0.29	0.36

The evaluation of emotional aspects from the participants, shows little difference in the results between pre-test and post-test measures. Results with a 4pt. scale show a positive reaction to "Happiness" and low levels of "Sadness", "Anxiety" and "Anger" while working with cloud-based tools used for learning activities.

Some of the main results of the post-test were:

- 35% of the participants think that it was difficult to complete the learning activities
- 50% of the participants think that they would need more information and instructions to complete the learning activities
- Only 10% of the participants expressed the learning activities were boring
- 95% of the participants liked the idea to use innovative learning online tools to represent new knowledge
- 70% of the participants considered that the time for the activity was appropriate
- 80% of the participants were positive about the expression that sharing results within groups and comments about other participants helps to learn new concepts related to the activity.

IV. CONCLUSIONS AND FUTURE WORK

The presented learning experience showed the main impressions from professors while they are doing and planning learning activities using innovative cloud-based learning tools. The impressions from participants showed the interest in this kind of activities highlighting the interaction, innovation, flexibility and creativity.

Still there are many open questions that will be explored about the experience with measures of previous experiences, motivation, usability and new cloud-based learning tools.

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