

## Students' effort vs. outcome: analysis through Moodle logs

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**Abstract**— Previous research shows how student's effort is found in Learning Management Systems (LMS). In this paper, we verified if positive effort in face-to-face courses supported by Moodle LMS carries on to their completion. We used logs of several courses and compared them with teachers' diaries. We developed an algorithm to analyze data and retrieve information about students. The results confirm that students with good or high effort are more able to complete the course.

**Keywords**- *effort, success, logs, learning management systems, Moodle.*

### I. INTRODUCTION

Typically, students must have enough grade and attendance to finish a course. However, to obtain that, they must read books and handouts, pay attention in class, clarify doubts, do the homework and deliver assignments on time. All these actions represent the student's effort [11]. The author adds that when students demonstrate effort, they achieve better school rates. [12] states that effort refers to the time the student reserve for tasks. [5] expands the definition, stressing that it consists in: "How much attention students pay in class, how much of their time is reserved for study, and how often they use the available learning resources".

Currently, evidence present in the attitudes of students denote their effort to the school life. The student's interest to deliver activities in time and attend classes are some examples. In a traditional classroom, the teacher can perceive these attitudes. However, within a LMS, he/she would need to analyze access logs, delivered tasks and participation in the forum in order to verify how dedicated a student is.

[3] reinforce that students will not learn unless they put a reasonable amount of effort into the learning process, regardless of the course design. In addition, many studies of student participation and effort focus on the simple measurement of attendance.

Effort in this research is measured by how students access Moodle courses, as verified on the logs of each course. It was assumed that greater participation in Moodle means greater effort, which would also increase their chance of passing the course. The use of logs for analysis of students has been observed in several studies [1, 4, 6, 7, 8, 9, 14].

This research intendeds to assist teachers in a complementary analysis of their students' affective state of effort. The profile analysis of students can contribute positively in the relationship between them and in the

teaching-learning process. A student who is shy in class, for example, may show greater commitment in Moodle [10]. Furthermore, effort is very present in the classroom as a form of assessment and it should not be ignored in the LMS.

The study addresses the question: Is there a direct relationship between effort and the approval of students in a course? An algorithm to perform inference of this affective state was developed, in accordance with Moodle logs. After that, the hypothesis "The effort of the student, identified through a LMS, positively influences the approval of the same" could be verified and considered true.

### II. RESEARCH DESIGN

The study used the approach of research ex-post-facto [13]. It aims to investigate the cause and effect relationship from the occurrence of events, that is, it allows us to understand a phenomenon after its completion.

Thus, the first step of this study is to obtain data: Moodle access logs and class diaries. To that end, an invitation was sent via email to teachers interested in participating and assisting the development of the research. Along with the invitation, two questions were asked in order to know the profile of teachers as users of Virtual Environments:

1. How often do you post content on Moodle?
2. Do you consult logs from your courses? If not, why?

Teachers sent logs and class diaries from 17 courses (high school and undergraduate), available between 2012 and the first half of 2013. These courses add up to a total of 306 students. Of these, 39 failed and 267 were approved.

We began the analysis of Moodle logs to identify the records that referred to the effort of the student. First, semi-structured interviews to obtain the characteristics of students that had proper effort according to their teachers.

The most frequent characteristics mentioned by teachers were: (i) student participation; (ii) attendance; and (iii) delivery of the activities. As to the most used features, were cited in this order: (i) resources, (ii) tasks and (iii) forums.

The Department of Information Technology of the institution provided information on the use of Moodle for 295 courses. Through this, it was possible to prioritize which features would be used in the algorithm to predict effort. The information reported by teachers matched the DIT data, since among the features offered by Moodle, the most used were resources (64%), tasks (48%) and forums (46%).

We decided to verify the student's participation in resources and tasks in order to relate their effort on the LMS

with their approval in classroom. Student participation, when applied to Moodle, can be found in reading the resources provided by teachers and delivering activities.

An initial survey selected a course where 11 out of 30 students failed by forfeit and 1 by insufficient grade. The first step was to verify the class diary, checking who was approved and who failed. Still, it sought to analyze how each student behaved within the LMS, through the resources and tasks accessed, compared to the total amount of resources and log tasks. With these, it was possible to propose Equation 1 to infer the affective state of effort. The equations return a value from 0 to 1, where the closer to one, the better.

$$Effort = \frac{\sum resources\_viewed + \sum assignments\_submitted * 2}{\sum total\_resources + \sum total\_assignments * 2} \quad (1)$$

The samples of logs and classes were extended to 17 courses and 4 teachers, therefore considering 306 students. All the courses use Moodle as a support tool for classroom teaching. It was found that there is no relation between approval and failure. Although failure begins with lower values, the average is still between 0.1 and 0.6 for both.

For better accuracy, logs would need to be validated, i.e., to have a minimum usage to make the inference of effort possible. Equation 2 divides the amount of resources and tasks by the amount of days since registration, in order to check how Moodle was used in the course.

$$Accuracy = \frac{\sum learning\_objects}{course\_duration} \quad (2)$$

### III. DEVELOPMENT

We implemented a report that summarizes the results obtained from logs. It contains the list of resources and tasks that students participated, as well as a suggested effort status for the student, based on a scale. The values were based on prior analysis, in which the average for successful students was 0.53 against 0.45 for students who failed. Values greater than or equal to 0.7 are considered high effort due to the grading system adopted at the institution.

### IV. CONCLUSION

This study allowed to explore a subject rarely addressed in scientific community, i.e., the affective state of effort in LMS. Previous research sought to extract information from learning, not directly focused on the LMS or even connected with Affective Computing. Thus, this work presents a contribution to the areas of Information Technology in Education, Affective Computing and Learning Analytics.

Its results reveal that the relationship between approval and the affective state of effort cannot be considered a sole factor due to all the other forms of assessment used in classroom. Yet, with the average effort for students who were approved or failed below the required by the institution, it is concluded that there is a direct relationship, but not unique.

It is noteworthy that the inference of the effort, when applied to the LMS, requires minimal use of course in this medium. The greater the participation of the teacher and students in it, the better to check effort there.

We sought ways to verify that effort could positively affect the approval of students in the classroom. This was done with a thorough analysis of Moodle access logs and class diaries. As a result, it can be seen that the relationship between LMS and classroom for subjects using the technological environment as aid is true. This opens precedent for seeking the best use of Moodle, adjusting it for students and teachers. The early visualization of online student effort by teachers provide additional student learning assistance and intervention [2].

As future work, we intend to expand the forms of mapping students' effort through interactions and increase the level of task analysis, also checking the deadline.

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