An experiment to measure learning in a collaborative assessment environment.

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Abstract. The SIETTE collaborative environment allows students to take tests together in small groups. Individuals can communicate and hold discussions to solve test questions. This paper describes the summative evaluation of the SIETTE collaborative environment and the relationship between the collaboration and the actual improvement which occurs in the student knowledge level. We conclude that under certain conditions improvement occurs and can be measured.

Keywords. Collaborative testing, Collaborative assessment, Collaborative learning

Introduction

A collaborative assessment environment has been implemented using SIETTE [2]. The collaborative learning phase has been designed as a synchronous workspace to share the responses and a chat-based tool is adopted for students to exchange their ideas. This type of communication model has been increasingly used to implement collaborative learning using a free conversation tool [6] or sentence openers [5], or typed messages, which represent conversations [4] or explicit references to a shared document [3]. Their validity for constructivist learning has been demonstrated with different criteria.

Previous experiments have shown that in almost all cases tests scores increase when using the collaborative environment from the initial to the final response. That is, the average score of a student according to the responses given before communicating with their colleague(s), is almost always higher than the average score obtained considering the responses after student communication.[1].

A new experiment has been designed to measure the average improvement in learning in a collaborative assessment. We can conclude that learning occurs, that it is clearly related to the collaboration activity and that it is relatively independent of the prior knowledge of students and group composition.

1. The experiment

The evaluation was carried out using a test containing 25 questions about the LEX tool, used to build a Lexical Analyzer in the context of Compiler Construction. In particular,

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we focus on an example of a LEX code where some mistakes were introduced and asked the students to debug the code by true/false questions (such as *"Code in line 7 is incorrect, it should be replaced by..."* or *"Swapping lines 11 and 12 has no effect.."*, etc.). Questions were independent of each other and they were presented randomly in each test. For each question the score was +1 or -1 if the right or wrong option was selected respectively. Alternatively, students could leave the question unanswered, without being penalized.

The evaluation involved a total of 48 students, in two different sessions of 18 and 30 students each. Students were randomly divided into 9 groups of 2 people and 10 groups of 3 people, one for each session. Students were informed that the test scores (both the initial and the final score) would be considered part of their course marks..

Figure 1 shows the mean of the prior moving average score of 10 questions. The two curves represent the groups A and B, where collaborative groups have 2 and 3 students respectively. As can be seen, both curves have a positive slope, meaning that the knowledge level increases during the test in both cases. The average mean for all students of the score of the first ten questions was $SMA(10,10) = 0{,}379\pm0{,}084$ ($p=0.05$) and the average of the last ten questions was $SMA(10,25) = 0{,}525\pm0{,}074$ ($p=0.05$), which is significantly higher. We shall call this extreme difference **Dq**.
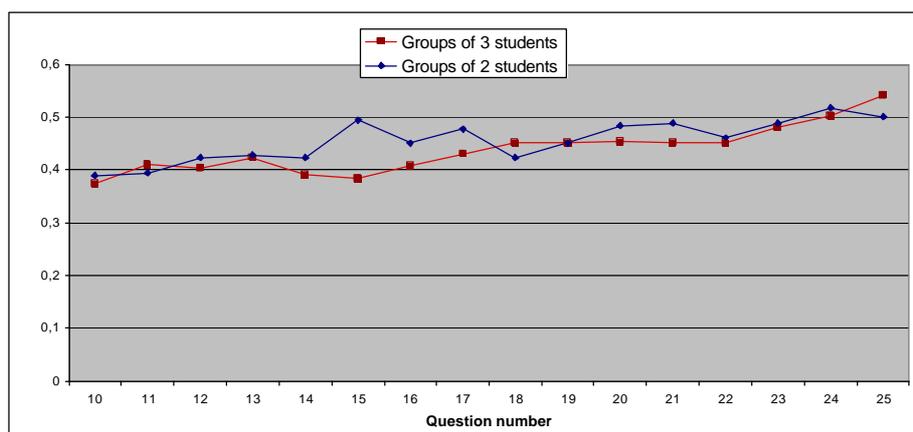

Figure 1. Average score of the previous 10 questions in the test for groups of 2 and 3 students.

We have investigated whether this increment in the knowledge level is related to the collaboration among students. All the students requested taking the test collaboratively because they felt (correctly) that the final score would be higher if collaboration was available. The amount of collaboration can also be qualitatively measured. There are many indicators that can be used to measure collaboration.

There were strong correlations between individual and group indicators. For instance the total number of messages written by a student and the total number of messages in the group was 0.87, which is normal in a conversation. Most of the students use the "View answer" button for almost all questions, so it is not surprising that this indicator could not be used (in this case) to measure the collaboration. The number of messages and the total length of messages in the group were the best indicators of learning.

The average length of messages in a group was 5540 characters. According to this, students can be classified as being either more or less collaborative, if they belong to a group in which the total message length is higher or lower than the average. Figure 2 shows the results clearly indicating that students in the group of higher collaborative students increase their knowledge while those in the other group almost do not.
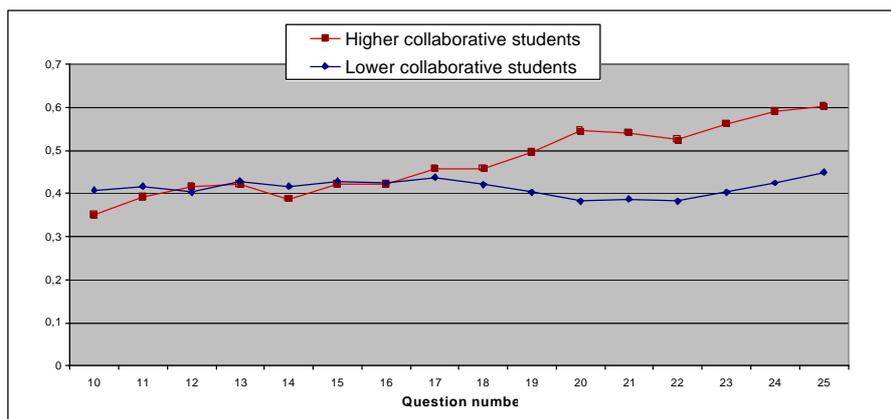

Figure 2. Average score of the previous 10 questions in the test according to student collaboration.

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SIETTE is available at http://www.siette.org

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