In Search of Helpful Group Awareness Metrics in Closed-Type Formative Assessment Tools

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Abstract: For 4 weeks, a total of 91 sophomore students started their classes with a short multiple-choice quiz. The students had to answer the quiz individually, view feedback on class activity, revise their initial answers, and discuss the correct answers with the teacher. The percentage of students that selected each question choice and their self-reported confidence and preparation were the three metrics included in the feedback. Results showed that students were relying mainly on the percentage metric. However, statistical analysis also revealed a significant main effect for confidence and preparation metrics in questions where the percentage metric was ambiguous (i.e., several choices with high percentages).

Keywords: Group awareness, formative assessment, quiz, confidence, preparation.

Introduction

The study focuses on the multiple-choice quiz as a formative assessment tool. When supported by technology, formative assessment can include immediate, personalized, and customizable feedback (Sosa, Berger, Saw, & Mary, 2011) and provide additional opportunities to the learner for self-reflection and self-assessment (Bransford, Brown, & Cocking, 2000; Kleitman & Costa, 2014). Feedback could be based both on teacher's/designer's previously submitted input and on information on fellow students' activity. Bodemer (2011) suggested that comparability should be a crucial part of group awareness tools, noting that allowing students to compare their knowledge with that of peers' can significantly enhance learning. The literature abounds with studies on the benefits of supporting group awareness and the characteristics of group awareness tools (e.g., Lin, Mai, & Lai, 2015, for a review). Despite this, the feedback the student receives in quizzes stays on the surface, focusing only on the percentage of students under each choice in the quiz. Although useful, this metric lacks any additional qualitative information that could be useful for the students in self-assessment. The current study discusses the impact of two additional metrics, alongside the percentage, that could better depict the class knowledge, namely the level of preparation (i.e., study effort) and the level of confidence (i.e., how sure the students are that their answers are correct). The preparation metric is a self-reported, subjective metric showing how prepared the students feel, just *before* they take the quiz. Confidence, on the other hand, is a metric denoting how sure the student is *after* having answered a question/quiz.

Method

A total of 91 sophomore students enrolled in the undergraduate "Business Development with Information Systems" course volunteered to participate in the study and were randomly distributed by the system into 4 groups: *Control* (27), *Confidence* (22), *Preparation* (22), and *Both* (20). The lecture material is available online a week in advance and students are expected to read it before coming into the class.

The "Self-Assessment/Group Awareness – SAGA" online quiz system was developed for this study. After logging in, students have to answer a question regarding their level of preparation for today's lesson using a 1-5 Likert scale (5: Well-prepared). Next, there is a series of 8 multiple-choice questions created by the teacher, with 4 choices each. Each question is accompanied by a question on students' confidence, using once again a 1-5 Likert scale (5: Very confident). In the revision phase that follows, students can browse through the 8 questions and have the opportunity to change their initial answers. Depending on the study condition, the system provides information about the class, next to each question choice:

- Control: the percentage of student in the class that selected each option.
- Confidence: the percentage and the average confidence score of students that selected each option.
- Preparation: the percentage and the average preparation score of students that selected each option.
- Both: the percentage, the average confidence, and the average preparation scores of students that selected each option.

After the completion of the revision phase, the students are able to see their scores and the correct answers.

For 4 consecutive weeks, students started the class by going through the three phases of the SAGA system. Students were given 10 minutes to provide their initial answers, 5 minutes to revise them, and 5 minutes to discuss correct answers with the teacher. After the fourth week, students answered a survey that recorded their opinions towards different aspects of the activity. The whole activity was individual and anonymous.

For all statistical analyses, a level of significance at .05 was chosen. Performance analysis focused only on a sub-set of 13 out of the 32 questions the students answered during the first 4 weeks. These answers were selected after the fourth week, because it was not possible to identify during the design time of the study the questions in which students would need additional feedback. Thus, the impact of the confidence and preparation feedback was analyzed only when the percentage alone could not "clearly" point at the correct option. The definition used in the study to identify these "clear" cases included three conditions that had to be true at the same time: (a) the correct choice was also the most selected, (b) the correct choice was selected by at least 50% of the students, and (c) the correct choice had a least 20 points difference from the second most selected choice.

Results

Table 1 shows student performance in the initial and the revision phase in these 13 challenging questions. Paired-samples t-test results showed that Confidence ($t[21] = 2.324$, $p = 0.030$, $d = 0.720$), Preparation ($t[24] = 2.027$, $p = 0.046$, $d = 0.630$), and Both ($t[19] = 2.979$, $p = 0.008$, $d = 0.970$) groups scores improved significantly during the revision phase, while the Control group was the only one that did not improve. Students evaluated the usefulness of the different types of feedback as: percentage ($M = 3.62$, $SD = 1.01$), confidence ($M = 3.32$, $SD = 1.20$), and preparation ($M = 2.64$, $SD = 1.43$).

Table 1: Student performance in the 13 challenging questions.

	Control			Confidence			Preparation			Both		
	M	*SD*	n	M	*SD*	n	M	*SD*	n	M	*SD*	n
Initial	4.44	*(4.34)*	27	3.82	*(3.59)*	22	5.27	*(3.98)*	22	4.40	*(2.87)*	20
Revision	4.00	*(4.29)*	27	4.90	*(3.00)*	22	6.36	*(4.22)*	22	6.60	*(3.73)*	20

Discussion and Conclusions

The percentage metric is objective, easily understood, and adequately good in indicating the correct answer (19/32 in this study). However, it does not carry any information about the people that are behind the figures. Confidence and preparation, on the other hand, provide qualitative information on the participants, but they both rely on participants' metacognitive level and their ability to accurately assess their preparation and confidence levels. The study provided preliminary evidence on the reliability and helpfulness of different metrics that could better support cognitive group awareness in the confined context of individual multiple-choice quizzes. The findings for the designers of such tools are clear and suggest that metrics that would better describe the participants are easy to use and have a significant effect on students' performance.

Acknowledgments

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