

The Design, Development and Preliminary Evaluation of an Online Student-Generated Tests Learning System

Fu-Yun YU^{a*} & Chia-Ling SU^a

^a*Institute of Education, National Cheng Kung University, Taiwan*

*fuyun.ncku@gmail.com

Abstract: Currently, more than a dozen online learning systems to support student-generated questions are on the market. In view of the fact that constructing “tests” made of questions generated by students would promote further cognitive processing on the part of the students, but no systems supporting such activities have been developed, this study aimed at developing an online student-generated tests learning system. Anevaluation study was conducted to collect preliminary data with regard to the learning support of the developed system. Descriptive data analyzed highlighted two distinct aspects of the thought and learning process mobilized by student-generated tests. First, a global and macro view that highlights the integration and inter-connectedness of the entire study material. Second, technical issues associated with test construction skills. Suggestions for future study are provided.

Keywords: online learning system, student-generated questions, student-generated tests

1. Introduction

In light of contemporary educational theories including constructivism and metacognition, some limitations associated with current assessment practice have been noted. Particularly, questions contained in practice and testing are usually constructed by teachers around study content that they think are of relevance, importance and interest (English, 1997). As having been found that teachers and students may view “educational relevance” differently (Aikenhead, 2008), enabling and empowering students to find out what they view as relevant, important and interesting when engaged in learning, and to construct questions around those identified areas has attracted the attention of an increasing number of researchers and practitioners.

Student-generated questions (hereafter name SQG) is a notable comprehension-fostering and -monitoring cognitive strategy. By emphasizing understanding and personal knowledge construction, and creating learning environments that mobilize higher-order thinking on the part of the learners, SQG aligns closely with contemporary educational theories (Yu and Liu, 2008). Overall, the accumulated evidence from many studies since the 1960s provides a solid empirical basis to support the teaching and inclusion of SQG to enhance learning (Belanich, Wisher and Orvis, 2004; Brown and Walter, 2005; Chin, Brown and Bruce, 2002; Dori and Herscovitz, 1999; English, 1997; Perez, 1985; Silver and Cai, 1996; Yu and Liu, 2008).

With sound theoretical foundations and solid empirical bases supporting the learning effects of SQG, currently more than a dozen online learning systems have been developed to support SQG activities (Yu & Wu, 2012). However, current endeavors center on students constructing “individual items” over the study material. As having been pointed out by Chamoso and Ca’ceres (2009), constructing “tests” is different from constructing questions by directing learners’ attention to additional criteria (e.g., the distribution of course concepts to be learned). As no systems supporting

student-generated tests (SGT) are yet available on the market, this study aims at the development and evaluation of an online SGT learning system.

2. The Developed Online SGT Learning System

Adopting the framework of most existing SQG systems, the developed SGT consist of three main functions: test-construction, test-assessment, and test-viewing. Each of the functions is briefly introduced.

Test-Construction. To construct a test composed of questions generated by students, students determine the overall structure of a test first (including question types and the number of questions within each type with its weight), and then select questions to be included in by dragging from a pool of SGQ space to the SGT space. Considering that constructing new questions may be needed at this stage, such a design is in place.

Test-Assessment. To enable students to receive peer feedback with regard to their constructed test, a test-assessment function was built. Having decided which test to assess (from a list of tests in the test-assessment window) and reviewed the information related to the constructed test, the assessor give their quantitative and qualitative feedback using an online assessment form. A set of criteria deemed important considerations for test-construction are provided to enable objective and constructive feedback.

Test-Viewing. To promote learning by observing peers' work, a test-viewing function for viewing tests constructed by peers as well as assessment given by peers was built. Not only are different versions of generated tests made accessible to students via test-viewing, the interaction between test constructor and test assessors with regard to a SGT can be viewed.

3. Evaluation Study of SGT

As constructing questions and tests are essential skills expected of teachers, student-generated questions and tests activities are integrated carefully in one course offered at a secondary teacher preparation program of a national university in Taiwan. In total, fifty-four student teachers enrolled in the course (i.e., Instructional Principles). The course curriculum included a total of nine chapters related to the principles of effective instruction.

In the first class, the instructor explained the general arrangement, requirements, course format and the purpose for incorporating SGQ and SGT in this course. Students were directed to construct questions around the study content (per chapter) at the initial stage of this study, and then use SGQ as a basis for SGT at the final stage.

To equip students with essential skills associated with the engaged task, a training session was arranged. Information on the basic concepts related to SGQ with examples and the operational procedures to interact with the SGQ function of the developed system were explained and practiced. As a routine practice, following the instructor's explanation of each instructional principle, students were given twenty minutes to generate at least two multiple-choice questions pertaining to the delivered instruction and assigned text. They were then asked to assess four randomly assigned questions and to engage in peer-assessment sessions after class.

At the final stage of this study, students were instructed to construct a test covering all study content in this course, with reference to questions they have already generated, after a training session on SGT. To collect students' view toward SGT, they were asked to respond to a questionnaire at the last instructional session. The following question was analyzed and results reported in this study: what do you think of SGQ and SGT as a learning task in terms of learning behaviors, thought process, and learning effects?

4. Results and Conclusion

Students' response to the open-ended question was analyzed using the constant comparative method proposed by Lincoln and Guba (1985). Despite their similarity in terms of entailing various cognitive and metacognitive processes (including rehearsal, self-monitoring, -reflection and -adjustment on the student part), which led to solid memorization, enhanced understanding and overall better learning, SGT differed from SGQ in two distinct ways.

First, as compared to having students generate questions on individual chapters, a global and macro view that highlights the integration and inter-connectedness of the entire study material are the most salient feature associated with SGT. Specifically, nearly one-third of the respondents (17, to be exact) indicated that rather than treating concepts in individual chapters as capsulated parts, SGT provided an opportunity for the '*fusion, 'linkage,' and 'integration' of concepts in different chapters*' (some of which may '*appear at first to be seemingly unrelated*'), and rendered a more '*comprehensive, 'integrative' and 'holistic' view of learned concepts in the course, resulting from 'further review of all course materials' and 'evaluation of what have been learned as a whole,'* triggered by SGT.

The other critical feature of SGT involves test construction skills. Specifically, twelve students highlighted '*test structure*' as one important factor to consider when generating a test. In addition, factors, such as '*overall suitable difficulty level, 'adequate sequencing,' 'quality of individual question items,' 'balance and weighting of different chapters,' 'available test administration time,' 'scoring scheme,' or 'the total number of questions,'* have been pointed out by eleven participants to be taken into account when generating a test.

To sum up, test construction not only requires various capacities associated with SGQ, it further demands students to focus on building connections and integrating learned concepts scattered in different chapters, while making crucial decisions regarding various technical issues. As one student put it, '*I will pay attention more on the inter-relationships among all questions included in a test, for instance, the gradually increasing difficulty level as the test progresses, no redundancies on the main ideas tested, and so on. In short, I am more concerned about the whole rather than the parts, as to improve the overall quality of the generated test.*'

While this study rendered some preliminary data indicating some distinct features of SGT, as compared to SGQ, issues regarding whether such features are conducive to better learning gains and germane to individual cognitive development will warrant future studies.

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