Employing Collaborative Online Documents for Continuous Formative Assessments

Herr, Foley, Rivas, d'Alessio, Vandergon, Simila, Nguyen-Graff, Postma (2012). Employing Collaborative Online Documents for Continuous Formative Assessments. Proceedings of the Society for Information Technology and Teacher Education (SITE). Austin, TX. March 5-9.

Norman Herr, Mike Rivas, Brian Foley
Department of Secondary Education
California State University, Northridge

Virginia Vandergon
Department of Biology
California State University, Northridge

Gerry Simila, Matthew d'Alessio
Department of Geological Sciences
California State University, Northridge

Dorothy Nguyen-Graff
Department of Chemistry
California State University, Northridge

Henk Postma
Department of Physics
California State University, Northridge

Abstract: *Collaborative, synchronous, online document technology provides teachers the opportunity to perform continuous formative assessments to inform them of current student understanding so that they may reform their instruction to promote student learning. This workshop introduces a new model for performing formative assessments using these free online tools and provides an opportunity for participants to develop formative assessment instruments of their own.*

Schools and universities have been encouraged to develop a "culture of assessment" to provide evidence on the effectiveness of instructional programs (Weiner, 2009). Although our "culture of assessment" has produced a wealth of literature, legislation, initiatives, reforms, and professional development, the vast majority has focused on assessment ***of*** learning (summative assessment) rather than assessment ***for*** learning (formative assessment). Formative assessment has been defined as "a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes" (Popham, 2008). "What makes formative assessment formative is that it is

immediately used to make adjustments so as to form new learning" (Shepard 2005).

Formative assessment is not a new concept, and any teacher that adjusts his or her teaching during instruction on the basis of evidence of student understanding and performance is employing formative assessment. Most teachers would agree that formative assessment is very important, but how does one accurately assess student comprehension and performance during a class session? Over the years a variety of techniques have been employed, the most basic of which is "a show of hands". However, although an entire class may raise their hands in response to a teacher question, it is impossible to assess individual understandings because only one student speaks at a time.

Educators have adopted a variety of techniques to perform formative assessments. A group of physics educators introduced the modeling method for physics instruction in which students diagram physics problems on miniature whiteboards and hold them up for their teacher and peers to critique (Wells et. Al, 1995). Others advocate quick-writes (Rief, 2002; Clidas, 2010), science notebooks (Clidas, 2010; Roberson, 2010), and the use of audience response systems (Kay et. Al., 2009). All these techniques have their merits and provide opportunities for teachers to check for understanding and adjust their instruction accordingly, but all have significant limitations. The modeling technique is excellent, but once students erase their boards, the record of their understanding vanishes. Quick-writes and science notebooks provide a log of student understanding and performance, but it is not possible for teachers to see all quick-writes or notebooks as they are written, and therefore any adjustment to instruction is postponed until the subsequent day. Audience response systems have the advantage of providing immediate feedback, but student input is generally limited to true/false and multiple-choice responses. If teachers are to adjust instruction to meet student needs, they must collect and analyze student responses as they are made. Fortunately, synchronous collaborative documents provide opportunity to do just that.

The authors of this report have developed a teaching technique that employs synchronous collaborative web-based documents to perform continuous, real-time formative assessments of student understanding so that they can adjust their instruction to address the immediate needs of their students. This technique is part of a general strategy known as Computer Supported Collaborative Science (CSCS), but although the techniques were developed to teach and assess learning in science, they can be used to teach other disciplines as well. The technique described in this paper has the potential to engage *all* learners *all* of the time as they provide feedback, data, quick-writes and analyses in response to instructor prompts. Using the CSCS model, teachers have the opportunity to observe all student contributions as they are made.

The CSCS model has been made possible by the development of free collaborative web-based documents such as Google spreadsheets, documents, presentations, and drawings (Herr et. al., 2010a,b; 2011a,b). Using the CSCS model, teachers develop online documents and share editing privileges with their students. Teachers provide prompts to which students simultaneously respond on the same document. For example, using an online spreadsheet, teachers enter student names in column one and pose a question in the

header of column two. The cells in column two become highlighted when students start to enter their responses, providing the teacher with information regarding which students are composing answers and which need more time. Once the teacher has determined that there has been a sufficient response, he or she asks students to press the "enter" key, and instantly the cells are populated with student responses. Color-coding and roll-over names identify those who have made contributions and deters students from entering data in cells other than their own.

As the students enter their data, teachers scan the developing response table to assess student understanding and adjust instruction accordingly. For example, if few students provide an adequate written response, a teacher may pose a new question in a simpler format such as multiple-choice. By programming the spreadsheet appropriately, the teacher obtains statistical data to indicate the percentages of students that understand or have specific misconceptions. The teacher freezes the name column (row header) and the question row (column header) and opens a new column next to student names. This insures that each current response is adjacent to the student's name while simultaneously storing previous responses in columns to the right. The teacher opens a new worksheet for each day and tracks student performance and understanding by tabbing through worksheets from previous lessons. The following example may help clarify the process.

Prior to the class session the teacher prepares an online collaborative spreadsheet and copies the names of his or her students into the first column. A header row is established to record questions posed to students. The first row and the first column are frozen so that they will always appear on the screen no matter how much student data is inputted. This insures that viewers can always associate contributions with authors and questions. The column to the right of student names is kept blank for student input, and all other blank columns and rows are eliminated, thereby clarifying the location where student responses must be made. The teacher may then ask students to input the numbers of homework questions with which they had difficulty. A quick scan of the table will indicate the problems that need most attention and inform the teacher regarding concepts that must be reviewed. As the teacher reviews these concepts, he or she asks for student responses to similar questions in a new column that has been opened to the right of the name column. A quick scan of the responses informs the teacher of the level of progress that has been made in student understanding and highlights those students who need more help. The teacher can then sort the spreadsheet on the basis of student responses and pair those who understand with those who do not for subsequent group re-teaching activities. Following these activities, the teacher poses additional questions to assess student understanding and compares the data with the original column of inputs to determine the amount of progress that has been made. Prior to the conclusion of the class period, the teacher opens another column to receive student questions that may arise while students are at home engaged in their homework. These questions indicate areas of concern and allow the teacher to adjust the next lesson to meet student needs. Each day the teacher opens a new worksheet and freezes previous worksheets to maintain a permanent record of student progress and understanding.

Although online collaborative spreadsheets are perhaps the best way to perform

formative assessments, they are not the only tools. Collaborative drawings, documents and presentations provide similar capabilities in different arenas. For example, study groups may collaborate synchronously to create concept maps using the drawing tool, lab reports using the document tool, or demonstrations using the presentation or photo album tool. The teacher can monitor student progress on all of these collaborative documents from their wireless tablet as they move around the classroom addressing student needs the moment they arise.

Preliminary data suggests that the CSCS model using collaborative documents to make formative assessments significantly enhances student engagement and understanding. Professors who have used this model in teacher preparation programs report greater student engagement in lessons and greater personal satisfaction with assessments of student progress. Bandura (1997) and Zimmerman (2002) suggest that formative assessments permit students to express themselves and develop a sense of self-efficacy, a key requirement for the development of autonomous learning strategies. Polanyi (1967), Schön (1987), and Rogoff (2001) emphasize the formative and reflective purpose of student discourse and encourage an open community of learners where ideas and opinions are exchanged so that students can co-construct their understanding. The CSCS model provides an environment where such discourse can take place, but unlike a traditional classroom where certain students dominate, all students are on an equal footing since all have access to the same document for their contributions. In this session we provide hands-on experience with the CSCS approach to using collaborative online documents to enable continuous formative assessment.

References

Bandura, A. (1997). Self-efficacy: The exercise of control. NY: Freeman.

Black, Paul and William Dylan (2009). Developing the theory of formative assessment. Educational Assessment, Evaluation and Accountability (formerly the Journal of Personnel Evaluation in Education), 1(1).

Clark, Ian (2011). Formative Assessment: Policy, Perspectives and Practice (EJ931151). Florida Journal of Educational Administration & Policy, v4 n2 p158-180 Spr.

Clidas, Jeanne (2010). A Laboratory of Words. Science and Children, v48 n3 p60-63 Nov.

Herr, Norman, Mike Rivas, Brian Foley, Virginia Vandergon,and Gerry Simila (2011). Using Collaborative Web-based documents to Instantly Collect and Analyze Whole Class Data. Proceedings of the 9th Annual Hawaii International Conference on Education, January 3-7, Honolulu, Hawaii.

Herr, Norman, Mike Rivas, Brian Foley, Virginia Vandergon, Gerry Simil, Matthew d'Alessio, and Henk Potsma (2011). Computer Supported Collaborative Education - Strategies for Using Collaborative Web-Based Technologies to Engage All Learners. Proceedings of the 9th Annual Hawaii International Conference on Education, January 3-

7, Honolulu, Hawaii.

Herr, Norman and Mike Rivas (2010). Teaching the Nature of Scientific Research by Collecting and Analyzing Whole-Class Data Using Collaborative Web-Based Documents. Proceedings of the Association for the Advancement of Computing in Education, October 18-22, 2010, Orlando, Florida.

Herr, Norman and Mike Rivas (2010). The use of collaborative web-based documents and websites to build scientific research communities in science classrooms. Proceedings of the 8th Annual Hawaii International Conference on Education, January 7-10, Honolulu, Hawaii.

Kay, Robin H.; LeSage, Ann (2009). A Strategic Assessment of Audience Response Systems Used in Higher Education. Australasian Journal of Educational Technology, v25 n2 p235-249.

Olofsson, Anders D.; Lindberg, J. Ola; Hauge, Trond Eiliv (2011). Blogs and the Design of Reflective Peer-to-Peer Technology-Enhanced Learning and Formative Assessment (EJ930914). Campus-Wide Information Systems, v28 n3 p183-194 2011

Polanyi, M. (1967). The tacit dimension. NY: Anchor Books.

Popham, W. J. (2008). Transformative assessment. VA: Association for Supervision and Curriculum Development.

Rief, Linda (2002). Quick-Writes Lead to Literacy. Voices from the Middle, v10 n1 p50-51 Sep.

Roberson, Christine; Lankford, Deanna. (2010). Laboratory Notebooks in the Science Classroom (EJ876136)Science Teacher, v77 n1 p38-42 Jan.

Shepard, L.A. (2005). Formative assessment: Caveat emptor. ETS Invitational Conference. The Future of Assessment: Shaping Teaching and Learning, New York.

Schön, D. (1987). Educating the reflective practitioner. San Francisco: Jossey-Bass

Weiner, Wendy. (2009). Establishing a Culture of Assessment. Academe Online. July-August 2009.

Wells, M., Hestenes, D. & Swackhamer, G. (1995). A modeling method for high school physics instruction. American Journal of Physics, 64, 114-119.

Wilson, Kathi; Boyd, Cleo; Chen, Liwen; Jamal, Sarosh (2011). Improving Student Performance in a First-Year Geography Course: Examining the Importance of Computer-Assisted Formative Assessment (EJ925838)Computers & Education, v57 n2 p1493-1500 Sep.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory into

Practice, 41(2), 64-70.