

Formative assessment: the one-minute paper vs. the daily quiz

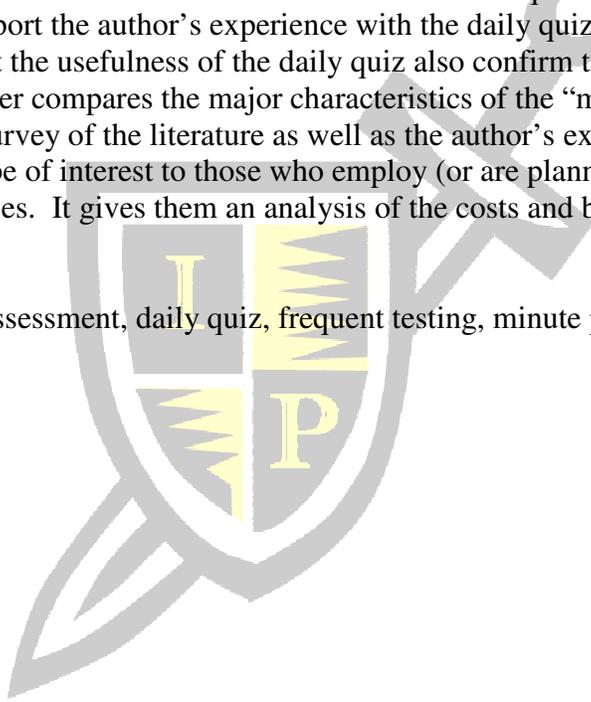
Felix Kwan
Maryville University in St. Louis

ABSTRACT

Regular assessment is a vital part of effective teaching and learning. For this, the “one-minute paper” has been popular among faculty. While many teachers who have used it find huge benefits from it, there are also several weaknesses of this tool that are commonly reported by its users. This paper suggests the “daily quiz” as a better tool for assessing and promoting students’ learning. The tool provides a better incentive setup that elicits a more sustained serious response-effort from the students, as well as a sharper focus in assessing cognitive learning. Furthermore, research results in the literature on the effects of frequent testing and the notion of “effortful retrieval” support the author’s experience with the daily quiz. End-of-term surveys of students’ opinions about the usefulness of the daily quiz also confirm the tremendous benefits from this tool. This paper compares the major characteristics of the “minute-paper” versus the daily quiz, based on a survey of the literature as well as the author’s experiences with these tools.

This paper will be of interest to those who employ (or are planning to employ) frequent assessment in their classes. It gives them an analysis of the costs and benefits of two common assessment tools.

Keywords: formative assessment, daily quiz, frequent testing, minute paper



INTRODUCTION

Much has been written about the benefits of the classroom assessment technique known as the “one-minute paper”. Popularized by Angelo and Cross (1993) in their widely used teachers’ handbook, this technique involves having students write brief responses to these two questions: “What is the most important thing you learned in class?” and “What is the muddiest point left unanswered?” Depending on the teacher’s goals, this technique may be varied in terms of the questions asked, when it is implemented (end, middle, or beginning of class), and whether students respond individually or in groups. Because of its tremendous ease of use, flexibility, and sizeable benefits deriving from a minimal resource-requirement (Light 2001), it has now “become rather ubiquitous in higher education” (Chizmar and Ostrosky 1998).

Nonetheless, the minute-paper does have its limitations, which are familiar to many of those who have tried it in their classes. One is the incentive problem: how does one ensure that students will turn in serious responses? Bressoud (2002) reports that students tended to view it as a mere tool for checking attendance. Angelo and Cross (1993) cite two other major caveats. First, if overused or poorly used, students will quickly find it pointless. And second, coming up with concise yet open-ended questions that can be quickly understood and answered may take more effort than anticipated. Stead (2005) confirms the first of these in his observation of quickly-declining response rates when it is excessively used.

Furthermore, the Field-Tested Learning Assessment Guide (FLAG) website (<http://www.flaguide.org/cat/cat.php>) offers this caveat for the minute-paper: “students may confuse minor details with major themes” in the day’s class discussion, devoting their minute-paper responses on the former without grasping the latter.

Because of these limitations, a few years ago the author shifted away from the minute paper and adopted the daily quiz as the regular formative-assessment tool instead. The Principles of Economics classes where this tool has been implemented have consisted of about 30 students each. The classes met twice a week; each meeting lasted for 1 hour 15 minutes. The quizzes are usually given in the final 5-10 minutes of each class period (though it could be done at the beginning or the middle of class as well). They are “open-notes”, and typically consist of 3-4 short questions (true-or-false-&-explain, or multiple-choice, or short-answer questions). When the topic merits it, the quiz may consist of 1 or 2 longer problems. The questions pertain to topics that were covered in the previous class. Quizzes, along with homework assignments, comprise 25% of the course grade. Each quiz is worth from 2 to 5 points.

The students are informed at the start of the semester that missing one or two of the daily quizzes because of absences will not significantly affect their grade, but those absences would certainly impair their learning. And this absence-caused gap in their learning would show up in their performance in the long exams (the author gives three of these over the semester).

The author’s experiences with both assessment tools have led to the conclusion that the daily quiz is the better one, particularly for assessing cognitive learning in content-based courses like economics. This paper now looks into the important characteristics of the “minute paper”, and compares it against the daily quiz.

TIME-&-EFFORT REQUIREMENTS

Preparation Time

While using the standard questions regarding the “most important point” and the “muddiest point” may not take up any preparation time for a minute-paper, designing an alternative set of more-honed open-ended questions would take up some time, as Angelo and Cross (1993) noted. On the other hand, preparing well-designed questions for the quiz would probably take up more time. It has been taking me about 10-15 minutes to construct my quizzes.

Delivery & Response Time

Despite its name, the one-minute paper really takes a few minutes for most students to accomplish. In the author’s experience, students took about 3-5 minutes – depending on how much thought they were putting into their responses, and how quick they are at reflective thinking.

The daily quiz, on the other hand, tends to elicit more attention from students, and thus they spend more time on it. Indeed, students sometimes complained about not having enough time to finish it, even though no strict time-limit was imposed (they were allowed to finish it beyond class time). One important thing to note, however, is that students must clearly understand the rationale for allowing them to open their notes during the quiz. They needed to be reminded about this in the first couple of weeks each semester, to impress upon them that the 5-10 minutes allotted for the quiz are not intended as study time, and that they may refer to their notes solely to check on some detail that they may have forgotten. They are expected to have done the studying before coming to class. While most students eventually get this idea, a few students who don’t pick up the habit of reviewing their notes regularly will have to be individually reminded to do so, when they complain about not having enough time.

Time to Review Responses

Given that the responses to the minute-paper could cover a wide open range, reviewing and summarizing them oftentimes took up more time than grading the quiz. Students are responding to more-focused questions in the quiz. And in many instances, it’s a lot quicker to discern a right answer from a wrong one in the quiz, than it is to evaluate students’ diverse perceptions and opinions of the various topics covered in class in the minute-paper. It took the author about 15 to 20 minutes to grade a quiz-set for a class of 30 students.

Feedback Time

To enhance the effectiveness of either the minute-paper or the daily quiz, some time at the start of the next class needs to be spent addressing the highlights of the students’ responses. One caveat that Angelo and Cross (1993, p.153) raise, regarding this phase of the activity for the minute-paper, is that it “often takes longer than planned, because questions lead to further questions.” Furthermore, they warn that given the probably wide range of students’ responses, some students might feel disappointed if the teacher does not comment on his/her individual responses.

For this phase therefore, the author finds that the quiz – which has a sharper focus than the minute-paper -- would take up less time. If most students got all the answers right, the class is given 2-3 minutes, after handing them back their graded quiz, to review whatever mistakes they had and to ask either the teacher or their classmate to explain the pertinent concept again. However, if there's a question in the quiz that several students analyzed wrongly, then the author would spend 5-10 minutes discussing the relevant concept again, and try to figure out what it is that's blocking the students' understanding of it. And this discussion serves as a great "bridge" to bring the students to focus on the class topic for the day. The narrower scope of the quiz, in this sense, is one of its major strengths. The quiz-questions direct the students' focus on specific concepts, unlike the minute paper where the students' attention could be free-ranging.

Students need a few minutes at the beginning of each class to set aside other matters from their minds, and start focusing on this particular class. The process of providing feedback based on the last quiz is a very efficient way to capture their attention. The author often noticed that the buzz among the students (the one teachers often hear as they enter a roomful of students) quickly subsides as they started getting their graded quizzes back. The graded quizzes are great at grabbing and focusing the students' attention.

INCENTIVES TO RESPOND

The concern about incentives is the primary reason why the author decided to shift from the typical minute-paper to a daily-quiz format. True, one could grant points for the minute-paper, in order to stimulate student response. But without stratification of points, one still faces the problem of how to extract high-quality effort and response. The quiz precisely addresses this problem.

Both the minute-paper and the daily quiz encourage attendance, but the grade-stratification in the quiz pushes the students to do their best on it. However, this may unfortunately have an adverse side in that a student who gets a zero in the quiz might end up concluding that attendance in that class was all for naught. Thus, it may be prudent to always try to design the quiz so that a student will very rarely get a zero in it, and thereby distinguish an absent student from one who at least came to class. There are a couple of ways of accomplishing this: by being very lenient in accepting one answer in the quiz, or by discussing a question (that's very similar to one in the quiz) with the class before they take the quiz.

ASSESSMENT FOR THE STUDENT

Angelo and Cross (1993) cite several reasons why the minute-paper works for students. It allows the teacher to quickly discern if students are picking up on the major concepts discuss, and to clarify things when students are confusing trivial details with basic themes. It allows teachers to collect questions even from the shy students, and provide quick responses to those questions. It also allows the students to view their responses relative to the rest of the class. And it helps the teacher build rapport with the students; they get engaged in the class if they believe that the teacher is truly interested in their learning.

But the author believes that the incentive problem (discussed in the preceding section) could limit the effectiveness of the minute-paper as a formative assessment tool for students. If students begin to view it as a gimmick, they would not put their mind to it.

Furthermore, Stead (2005) cites some evidence suggesting that while there may be a significant impact of the minute-paper in improving students' performance in exams covering subjective material (as in essay questions), the impact is not quite conclusive in exams covering objective or content-based material (as in typical multiple-choice questions).

The author has often wondered why some students seem to learn concepts only if they are quizzed on them. Even after discussing a concept in class, illustrating it with a few examples, and having the class do ungraded exercises on it, the author still find that some students don't seem to truly learn it. But once those students see a red-marked correction on their quiz, most of them would seem to finally reach that "aha!" moment (or at least put serious effort to reach that moment).

An answer to this puzzling question may be found in the frequent-testing literature. One of the early studies published on this topic found that frequently-quizzed students perform better in class, and they do so because they become more motivated and hence put in greater effort to learn (Fitch, Drucker and Norton 1951).

But a recent article in the Chronicle of Higher Education reports on an updated study of this so-called "testing effect" done by a group of memory researchers at Washington University in St. Louis. The group's initial findings are aptly captured in the report's subtitle: "Researchers are dusting off an old insight: To maximize classroom learning, quiz early and often" (Glenn 2007). The researchers say that the benefits of increased motivation and heightened effort to study are merely the nice side-effects of quizzing. Its more potent effect lies in what the scholars call "effortful retrieval". Frequent quizzing triggers a process that enhances long-term retention of just-learned knowledge. Two of the researchers offer great analogies for this effect. Prof. Henry Roediger III says that quizzes may be somewhat like dipstick devices, but not exactly. They actually do more than a dipstick, because "every time you test someone, you change what they know." Similarly, Jeffrey Karpicke says people's memory may be like a storage space, or a library, except that the act of retrieving from it "is not neutral; it affects the system" (both quoted in Glenn 2007). There is something in the process of responding to a quiz that triggers learning. This insight alone is a strong argument for the daily quiz.

Furthermore, the author has found yet another benefit from the daily quiz. It is a powerful medicine for reducing test anxiety among students. The quiz can serve as a practice-test which guides students to focus on the vital course content, provides them with some assessment of their learning progress, and offers them a motivation to learn more (Snooks 2004).

These are affirmed in the following comments from course-evaluation surveys collected by the author: "the quizzes...force students to constantly review their notes...", another student wrote, "the quizzes... were a good tool to help me remember the material covered", and a third one wrote, "...one thing I like about having a lot of quizzes is you can pull your grade up little by little if you're struggling in the class...".

ASSESSMENT FOR THE TEACHER

Chizmar and Ostrosky (1998) identified three major ways by which the minute-paper allows the teacher to facilitate student learning. First, it provides the teacher with details on what, and how well, the students are learning in class. Second, it does so on an immediate and regular basis. Thus, it allows a timely response or adjustment to any obstacles that may be hindering student learning. And third, it is one way for the teacher to illustrate a sincere interest in the students' learning, thereby inducing active engagement among students.

But the daily quiz can also accomplish all these. Based on the students' performance on the daily quizzes, the teacher can quickly and continually adjust the mode and pace of delivery, the instruction tools, or the class materials, in order to promote learning.

Furthermore, the effectiveness of the minute-paper to the teacher might be weakened if students retreat into generalities or vagueness in their responses. With the daily quiz, however, the focus points are always clear to the teacher. And this, the author finds, is one big advantage of the daily quiz over the minute-paper. Students' responses to the minute-paper may cover a broad range of points and, unless a clear pattern arises, it might be difficult to discern which specific points are clear to the class as a whole, and which points need reviewing.

OTHER BENEFITS FROM THE DAILY QUIZ

Giving students feedback as they get their previous quiz at the beginning of each class is a great "conceptual bridge" to bring the students' attention onto the day's topic. The focus of the quiz can be made sharp, and the students could find in it something concrete to look at. The author often allows students a couple of minutes, after distributing their quizzes back to them, to compare answers and learn from one another.

The author has also found the daily quiz to be an effective supplemental mode of communication with individual students; personal comments can be exchanged with a student through it. It is furthermore a quick way to know and remember the students' names. As they singly turn in their quizzes, and as one gives them back their quizzes the next day, one has a quick way to match students' names with their faces.

SOME CAVEATS AND RECOMMENDATIONS

Just like every other assessment tool, the daily quiz does present its own challenges for the teacher. First is the anxiety that it elicits among some students. As students strain to apply their newly-gained learning, they will naturally feel this anxiety. It is important therefore to provide supportive feedback to encourage them to persevere. Most students will eventually recognize the benefits of the daily quiz. One of them wrote on a recent course-evaluation survey, "...I had difficulty with having quizzes every day...because I just couldn't seem to get a perfect score on them...but [they] ended up challenging me in the end though, because they made me study constantly...". Another one wrote, "...the daily quiz challenged me to study more often so I can remember more...retaining more from the class for future use." And this sentiment was echoed by many other students. This is precisely the effect of the "effortful retrieval" process that the memory scholars mentioned earlier in this paper cite as the primary benefit of the daily quiz.

Another objection that some may have against the quiz concerns its narrow focus -- it deals with only a few isolated concepts. But the research group at Washington University also addresses this point. The researchers believe that in the process of retrieving some fact or concept, a person's mind will try to put it within the context of a broader theme (Glenn 2007). Thus, even though the quiz itself may have a limited focus, the learning that it triggers could nonetheless encompass a much broader scope.

The author does recognize, however, that the daily quiz and the minute-paper may be employed to assess two different aspects of learning. The minute-paper is an excellent tool for assessing students' perceptions. On the other hand, the focus of the author's assessment is on cognitive learning. And for this specific purpose, the daily quiz has been found to be a highly

effective tool. Thus, to the professors who would like to assess both perceptions and content-learning, it is recommended to try out both tools.

Some may also object to the fact that the daily quiz does not allow the shy student (who's scared to speak up in class) to ask a question on a point not covered by the quiz. To mitigate this problem, the teacher will have to use other tools that welcome such questions from the shy students. In the author's case, students are frequently reminded and encouraged to utilize office hours, or to email their questions, or to write down those questions/comments as addenda to their homework sheets (the author also gives frequent homework assignments).

One more challenge that the daily quiz poses to the teacher is the preparation time needed to come up with effective quiz-questions. Not to mention the time required for giving feedback to students' responses. Besides, grading the quiz may be more imperative than responding to the minute-paper regularly, because students are naturally more curious about how they did in the quiz. It is for this reason perhaps that some teachers may be just as anxious as their students about the daily quiz. But the author has found that the rewards are well worth the time commitment, at least in classes of up to about 30 students.

Finally, there's also the potential that some students will get obsessive about their quiz scores. It is important therefore to always help the students appreciate the balance between the quiz and the other evaluation-tools used in the course. It is also vital to remind the students about the true purpose of the daily quiz as a formative assessment tool – a learning tool for them. In the author's experience, students' scores in the daily quiz have almost always ended up raising their final course grades.

CONCLUSIONS

This paper set out to compare two formative-assessment tools: the widely-used minute-paper and the daily quiz. While the minute paper is very quick and flexible, it has some weaknesses that may be mitigated by adopting the daily quiz in its stead. The daily quiz provides a more-focused review of class topics; it provides a sharper focus in terms of assessing cognitive learning. It also provides a better incentive setup; it is able to elicit a more sustained serious response-effort from the students. And while researchers have very early on recognized the benefits of the daily quiz, a new study conducted by researchers of memory is finding new insights into those benefits. Frequent quizzing, those researchers have found, facilitates an "effort retrieval" process which aids learning. Responding to a quiz involves a process not merely of recalling, but rather something that triggers actual learning.

The author's experience with this tool has shown that frequent quizzing does promote learning. This fact has been confirmed by many students in their course evaluations. Students admit in end-of-term surveys that the quizzes made them frequently study or review class materials, and made them less likely to cram for the exams. The quizzes induce regular attendance in classes. Through the quizzes, students get specific feedback about their learning progress early, right from the start of the semester, and this helps establish a rapport with the teacher. Students get feedback frequently also, which allows them to adjust their study behaviors promptly. The teacher, too, gets a frequent reading of where individual students are in terms of their understanding of the topics. This allows necessary adjustments and corrections to be made from the teacher's end, to promote learning. Furthermore, repeated experience taking the quizzes reduces the anxiety factor among students, and increases their feelings of competence and confidence, and this in turn increases their motivation to study and do well. The "effortful

retrieval” process that the students are made to go through in the quizzes is found to indeed be a big factor of learning.

In implementing the daily quiz as a formative-assessment tool, however, there are several caveats that the teacher has to be cognizant of, as described in this paper. But despite the potential problems with it, the advantages that are discussed here constitute a strong case for the daily quiz. If designed properly, the daily quiz is indeed a powerful and effective assessment tool.

REFERENCES

- Angelo, Thomas A. and K. Patricia Cross. (1993). *Classroom Assessment Techniques: A Handbook for College Teachers, Second Edition*. San Francisco: Jossey-Bass Publishers.
- Bressoud, David M. (2002). “The One-Minute Paper,” *MAANotes#49: Assessment Practices, Supporting Assessment in Undergraduate Mathematics (SAUM)*. (<http://www.maa.org/SAUM/maanotes49/toc.html>, retrieved on December 18, 2008).
- Chizmar, John F. and Anthony L. Ostrosky. (1998). “The One-Minute Paper: Some Empirical Findings,” *Journal of Economic Education*, Vol.29 No.1, Winter 1998, pp.3-10.
- Fitch, Mildred L., A.J. Drucker, and J.A. Norton, Jr. (1951). “Frequent Testing as a Motivating Factor in Large Lecture Classes,” *Journal of Educational Psychology*, Vol. 42 No.1 (January), pp.1-20.
- Glenn, David. (2007). “You Will Be Tested On This,” *Chronicle of Higher Education*, June 8, Vol. 53 Issue 40, pp.A15-A17.
- Light, Richard J. (2001). *Making the Most of College: Students Speak Their Minds*. Harvard University Press.
- Snooks, Margaret K. (2004) “Using Practice Tests on a Regular Basis to Improve Student Learning,” *Alternative Strategies for Evaluating Student Learning* (Achacoso and Svinicki, editors),. San Francisco: Jossey-Bass. Winter 2004.
- Stead, David R. (2005). “A Review of the One-Minute Paper.” *Active Learning in Higher Education: The Journal of the Institute for Learning and Teaching*, vol.6 no.2 pp.118-131.