THE MONTE CARLO QUIZ

ENCOURAGING PUNCTUAL COMPLETION AND DEEP PROCESSING OF ASSIGNED READINGS

Peter S. Fernald

Abstract. The Monte Carlo Quiz (MCQ), a single-item quiz, is so named because chance, with the roll of a die, determines (a) whether the quiz is administered; (b) the specific article, chapter, or section of the assigned reading that the quiz covers; and (c) the particular question that makes up the quiz. The MCQ encourages both punctual completion and deep processing of assigned readings and is easy to implement. It is readily designed to address a wide variety of learning objectives. Students’ quiz scores and evaluations suggest that the MCQ is effective.

When a student reads and studies is important. Common practice is to postpone assigned readings until the day or night before an exam (Burchfield and Sappington 2000). This loa-and-cram pattern, which runs counter to most instructors’ wishes and expectations, has increased at an alarming rate. At one university, reading compliance, as measured by passing a one-time surprise quiz, decreased from more than 80 percent in 1981 to approximately 20 percent in 1997 (Burchfield and Sappington 2000). However, the reading compliance rate is greatly enhanced when quizzes are administered randomly and periodically throughout the semester (Ruscio 2001).

How a student reads and studies also is important. Ideally, the student studies carefully and processes deeply the assigned reading. Such studying and processing enhances both understanding and retention. Superficial studying and shallow or rote processing, on the other hand, typically produce little, if any, significant learning. Organizing information hierarchically (Bower 1970), analyzing meanings (Craik and Tulving 1975), and applying concepts (Palmore et al. 1983) are processes known to enhance memory of subject matter. These findings suggest that instructors should encourage students to engage in such processing.

Monte Carlo Quiz

With these thoughts in mind, I developed the Monte Carlo Quiz (MCQ). The city of Monte Carlo is noted for its gambling casinos, and the MCQ is so named because chance (that is, the rolling of a die) is an important feature of the quiz. Before the semester begins, I prepare several quiz items such as the following:

1. Knowledge: Describe the major thesis, the central idea or set of ideas, in the reading. Make certain that the thesis you identify is primary. Also include one or two closely related ancillary or secondary ideas or theses, clearly identifying them as such.

2. Comparison: Identify two concepts or principles presented in the chapter or article and, when you first mention each, underline and define it. Then, show how the concepts or principles in some way(s) are both similar to and different from one another. If you wish, one of the concepts or principles may be selected from another reading, lecture, or discussion in this course.

3. Application: Select a concept or principle in the chapter or article, clearly define or describe it, and then indicate how it applies to you or someone you know. Provide sufficient details to justify convincingly that the concept or principle indeed applies as you suggest.

4. Critique: Write a critical perspective on some aspect of the chapter or arti-
After experimenting with several grading systems, I settled on the following four-category system:

E (excellent): Demonstrating sound understanding of the selected concept(s), the answer is clearly stated and accurate.

G (good): The answer is mostly or essentially correct but incomplete or unclearly stated, as illustrated by the following examples: a secondary thesis is not identified (question 1); a concept is not clearly defined or a similarity is either inaccurate or not identified (question 2); an example does not precisely fit the concept (question 3); type of evidence is not clearly identified (question 4); an emotional response is implicit but not clearly specified or the quotation is not verbatim or has no page reference (question 5).

S (satisfactory): The answer is incorrect, yet it demonstrates some familiarity and understanding of some portion of the assigned reading.

U (unsatisfactory): The answer is incorrect and demonstrates no familiarity with or understanding of the assigned reading.

A (absent): Student was absent from class.

The grades of E, C, S, and U are equivalent to respective percentile grades of 95, 85, 75, and 65. Intergrader reliability (agreement between two graders), based on fifty quiz answers (ten answers for each of the five questions), was 78 percent. In only one instance did the graders disagree by more than one grade level.

**Method**

During the fall 2001 and spring 2002 semesters, I evaluated the MCQ in two courses, Counseling and Externship. The two courses included upper-level psychology majors (70 percent women and 30 percent men) at the University of New Hampshire and met weekly for three hours. Performance on the quizzes counted for 25 percent of the final grade in Counseling and 10 percent in Externship. At the end of the spring semester, I administered a questionnaire in both courses (Counseling, N = 16; Externship, N = 11).

Punctual completion of reading and deep processing were assessed using student quiz grades. The statistical index for punctual completion was the percentage of quiz answers receiving grades of E, G, or S; the index for deep processing was the percentage receiving the grade of E.

The questionnaire included eight rating items (table 1). For each item, students circled one of six numbers (ratings) ranging from 1 (very strongly disagree) to 6 (very strongly agree).

<table>
<thead>
<tr>
<th>Item</th>
<th>Externships</th>
<th>Counseling</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The MCQ motivated me to complete the assigned readings on time.</td>
<td>5.35</td>
<td>4.76</td>
</tr>
<tr>
<td>2. My ability to contribute to discussions of the assigned readings was enhanced by the MCQ.</td>
<td>4.69</td>
<td>4.19</td>
</tr>
<tr>
<td>3. If I had to choose between the MCQ and taking a quiz at every class meeting, I would choose the MCQ.</td>
<td>5.72</td>
<td>4.82</td>
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<tr>
<td>4. As employed in this questionnaire, the acronym MCQ refers to multiple-choice questionnaire.</td>
<td>2.02</td>
<td>1.33</td>
</tr>
<tr>
<td>5. I took notes on the assigned readings.</td>
<td>5.37</td>
<td>4.87</td>
</tr>
<tr>
<td>6. I recommend that the MCQ be used in future offerings of the course.</td>
<td>5.48</td>
<td>4.26</td>
</tr>
<tr>
<td>7. When I come to class prepared to take a quiz, I sometimes am disappointed when the roll of the die indicates there will be no quiz.</td>
<td>2.11</td>
<td>2.82</td>
</tr>
<tr>
<td>8. The possibility of being asked five different questions encouraged me to read carefully and take notes on the assigned chapters/papers.</td>
<td>4.62</td>
<td>3.96</td>
</tr>
</tbody>
</table>

*Note: Ratings were made on 6-point scales (1 = very strongly disagree, 6 = very strongly agree).*
(very strongly agree). Students indicated their reasons for their ratings in a space provided immediately below each item. Item 4 was included to detect possible positive response bias.

Results

Table 2 contains the frequencies for quiz answers receiving each grade and absence from class. The percentage of answers meeting the criteria for punctuality and deep processing were 95.8 and 59.8, respectively.

Table 1 shows means and standard deviations for students’ ratings of the MCQ. Ratings higher than the midpoint (3.5) suggest favorable attitudes. Except for item 4, the control item, and item 7, which concerns disappointment when no quiz was given, the average rating for each item was above 3.5. I examined ratings provided by students who did not give a rating of 1 for item 4, and I did not observe positive response bias for any of these students.

**Discussion**

I consider here five topics relevant to the MCQ: empirical findings, learning objectives and memory, implementation, adjustments in teaching and learning, and design and flexibility.

**Empirical Findings**

As indicated by the high percentage (95.8 percent) of quiz answers receiving a grade of S or higher, as well as the ratings on item 1, students completed most of the assigned readings for the prescribed dates. This outcome compares most favorably with the 20 percent compliance rate for completing assigned readings when no quizzes are administered (Burchfield and Sappington 2000). It also is consistent with the observation that students motivated by randomly administered quizzes complete assigned readings at impressive rates (Ruscio 2001).

I did not include a control group receiving no MCQ, and there are no relevant baseline data for deep processing of assigned reading in college courses. It is impossible, therefore, to determine the absolute level of the effects of the MCQ on deep processing. However, more than half (59.8 percent) of students’ quiz answers received a grade of E, a performance level suggestive of something more than rote or superficial processing. The students indicated that they took notes on (item 5) and carefully read (item 9) the assigned readings. By themselves, these activities do not constitute deep processing. However, one reasonably might expect that the task of preparing notes that adequately address the five quiz questions would foster some measure of deep processing. The data are suggestive, yet inconclusive, that the MCQ encourages information processing.

Students preferred the MCQ to quizzes administered at every class meeting (item 3); they were not disappointed when they prepared for a quiz and there was none (item 7); and they strongly recommended that I include the MCQ in future course offerings (item 6). Nearly all of the students’ written comments about the MCQ were positive. A selected sample of their comments is shown in Table 3.

**Learning Objectives and Memory**

Different types of processing known to enhance information retention are relevant for each quiz question included in the study. The knowledge question encourages students to identify primary and secondary ideas. Such hierarchical organization enhances memory (Bower 1970). The comparison question requires students to show how two concepts are both similar to and different from one another; it encourages students to grapple with precise meanings. Information processing that involves the analysis of meanings enhances memory (Craik and Tulving 1975). The application question promotes the use of examples that enhance memory (Palmere et al. 1983). Requiring students to elaborate conditions prompting them to agree or disagree with the author, the critique question involves some measure of each principle already mentioned: organization, analysis of meanings, self-referencing, and elaboration with examples. Elaboration improves both comprehension and memo-
ry (Bradshaw and Anderson 1982). The passion question requires self-referencing, and involves affect, both of which enhance memory (Rogers, Kuiper, and Kirker 1977). Preparing outlines of assigned readings, a practice required by the MCQ, can enhance retention (McDaniel, Waddill, and Shakeshy 1996). Finally, research on massed versus distributed practice suggests that knowledge acquired over many small regular study intervals (for example, weekly quizzes) is retained more readily than knowledge acquired in one study interval (such as for a final exam only) or a few very large intervals (Dempster 1988; Glenberg 1992; Leeming 2002; Payne and Wenger 1996).

The MCQ clearly incorporates proven principles of cognitive processing. Empirical support for MCQ-prompted deep processing, however, has yet to be demonstrated. Future studies should directly assess the types and levels of processing.

Implementation

Students initially are quite anxious about the MCQ. To ease them into the procedure, at the second class meeting I announce that I will administer a quiz, that the quiz will consist of question 5 (passion), and that the die will be rolled only to determine the reading on which the quiz is based. Once the students have completed their answers, I inform them that the quiz was only for practice. I then invite them to read their answers to the class. Most students do so. Sharing answers seems to enhance their ease with both the MCQ and one another.

At the third class meeting, I repeat the procedure, except that I have students answer question 2 (comparison), which I believe is the most challenging of the five questions. With some assistance from me, students are able to grade accurately their quiz performance and both identify and understand any difficulties they experienced in answering the question. Implementing the MCQ with the two practice quizzes, I discovered, gets most students off to a favorable start with the MCQ.

Even after two practice quizzes, however, some students experience difficulty with the MCQ. Below her quiz answer, one student wrote, "I spent a lot of time reading and taking notes. I still do poorly. I hate the MCQ." Covering ten entire large-size lined pages, the student's notes were comprehensive and detailed. However, her note-taking was rote. When it was time to write an answer to the chance-determined question, she did not know where to begin, and she complained about not having enough time. I encouraged her to take fewer notes and to direct her note-taking toward answering the five questions. I pointed out that questions 2 through 5 permitted (and even encouraged) her to direct her reading, studying, and note-taking efforts toward concepts and principles of particular interest to her, and I suggested that she take full advantage of this opportunity. Lastly, I suggested that for some readings she might take notes (for example, verbatim quotations) that would assist her in answering not only question 5 (passion) but also one or more of the other questions. Her reaction to my suggestions seemed to be one of surprise and relief. The surprise, I imagine, had to do with her belief that I was telling her to be less thorough in her note-taking. I believe, of course, that my suggestions encouraged deeper information processing. Whatever the case, she followed my suggestions. Thereafter, spending less time and effort reading and taking only two pages of notes, she performed well on the quizzes. Coaching of this sort is helpful for many students.

Adjustments in Teaching and Learning

With continued use of the MCQ, I experienced a gradual and profound evolution in my teaching from transmitting information to encouraging information processing or, stated otherwise, from lecturing to designing and implementing classroom activities that promote reflective thinking and problem solving. Designing such activities requires teaching ingenuity unlike that required to prepare and deliver a lecture (Giordano and Hammer 1999; Myers 1997; Zachry 1985).

With problem-solving activities replacing lectures, students take fewer notes. However, they engage in more discussions and reflective thinking, ask more questions, and demonstrate a greater willingness to struggle with the complexity of the material. The classroom has a more interactive and collegial atmosphere. Students are more engaged with both the subject matter and one another. Some students require support, encouragement, and guidance in adjusting to this new learning environment (Harton et al. 2002). Informing them about the different types and levels of information processing helps them understand the rationale for the MCQ and take full advantage of the various classroom activities that replace the lecture.

Design and Flexibility

The MCQ is not a singular technique. Rather, it is a set of principles taken from psychology's two major learning paradigms, behavioral analysis and cognitive psychology. From behavioral analysis, the MCQ borrows the principle of reinforcement (Skinner 1953). A high quiz grade is contingent on students' punctual reading, careful studying, question-driven note-taking, and other learning activities. As outlined in the section on memory and learning objectives, principles from cognitive psychology are useful for promoting particular types of information processing. The five questions presented are but one set of questions. Other learning and information processing objectives can be addressed through other questions.

An instructor willing to take the time and effort can create a question designed to elicit a particular form of reflective thinking relevant to each assigned reading. One of my colleagues moves information processing beyond note-taking to formal writing in her child development course. Students type answers for all five questions. On the day of the quiz, the roll of the die determines which answer students will submit for evaluation. Whatever form the MCQ takes, it provides students with an ongoing structure and guidelines for thinking about and reflecting on the assigned readings. The advantages of such guidelines are well documented (Ausubel 1960; Corkill 1992).

The MCQ also can be used with assignments unrelated to reading. Another of my colleagues, who requires his students to attend a public lecture every week, includes an MCQ question that asks students to report on the lecture. Although I have not yet included such a question, for my Externship course I have considered including a question that addresses the externs' experiences at their respective agencies. With the decree
option, when other instructional activities take priority, the instructor can elect not to roll the die, that is, not to administer a quiz. Or, if students’ learning is better served otherwise, the instructor can decree a quiz without the roll of the die. A flexible procedure, the MCQ is readily designed to address a wide variety of teaching and learning objectives.

Key words: quiz, evaluation, learning objectives

NOTE
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REFERENCES