Analysis of Effectiveness of Optional Versus Mandatory Quizzes on Final Comprehensive Examinations Performance

Max North and Ronny Richardson
Information Systems Department
Management and Entrepreneurship Department
Coles College of Business
Kennesaw State University, Kennesaw, GA 30144, USA

[Abstract] The main objective of this investigation is to analyze the effectiveness of two distinct methods of quiz offerings (optional and mandatory) on learning specific concepts in college courses, specifically analyzing how each method contributes to the final comprehensive examination performance. Quiz and examination scores were collected from several courses. Unexpectedly, analysis of the data demonstrated that both optional and mandatory quiz methods had a similar, weak correlation with the performance level of final comprehensive examinations.

[Keywords] quizzes, examinations, online courses

Introduction
Common sense indicates that quizzes naturally should improve examination performance and, eventually, learners’ overall performance. Many educators believe that quizzes have beneficial effect on examination performance (Tapaswi et al., 2016; Kovacs, 2016; Freitas et al, 2016; Murai, 2016; Ramazanzadeh, Khodabandehloo & Noushak, 2013; Bontchev & Vassileva, 2010; Shirvani, 2009; Daniel & Broida, 2004; Brothen & Wambach, 2004; Anderson, 1984: Bangert-Drowns, Kulik & Kulik, 1991; Wilkins, 1979; Mawhinney et al., 1971). On the contrary, as early as 1984, Anderson revealed that announced quizzes had no positive effect on learners’ examination performance using a limited and small sample. However, based on a broad literature search, there are different theories and inferences about the impact of quiz methods on performance.

Considering the optional method of quizzing, Grimstad and Grahe (2004) showed that learners who completed voluntary concept quizzes significantly improved their examination performances. They asserted that when learners received no credit for answering practice questions and were not obligated to perform the quizzes, students scored higher on course examinations when compared with students who had completed mandatory quizzes. On the other hand, Brothen and Wambach (2001) stated that required quizzes might only improve examination performance if learners use an efficient strategy of using the quizzes to assess their knowledge of the material.

In this brief article, authors investigated and analyzed the effect of optional and mandatory quizzes on learners’ final examination performance. Quiz and examination data were collected and analyzed from a broader selection of learners and courses over several years to determine any statistical correlation between them.
Method

Hypothesis and Objectives

The primary hypothesis (Alternative Hypothesis - $H_1$-1) of this investigation is that learners’ performance on either optional or mandatory quizzes positively correlates with learners’ performance on final comprehensive examinations. The secondary hypothesis (Alternative Hypothesis - $H_1$-2) is that learners who take mandatory quizzes will perform higher than learners who take optional quizzes on final comprehensive examinations. The main objective is to perform an analysis of the effectiveness of optional versus required quizzes on final comprehensive examinations performance.

Participants

Learners’ quizzes and final comprehensive examinations data were collected for two junior courses spanning over semesters of five years period. The sample did not include any identifiable data about the learners. Also, for simplicity, the sample did not focus on any other variables, such as gender, age, majors, classifications, or Grade Point Average.

Apparatus

There were ten quizzes in each course with ten points each. Each quiz consisted of ten multiple-choice and true-or-false questions. Quizzes were related to chapters covered in the learning modules within the course. Final comprehensive examinations had one hundred points covering all of the chapters that were covered in the quizzes. Similar to the quizzes, examinations consisted of one hundred multiple-choice and true-or-false questions. All questions for quizzes and examinations were extracted from the same question bank.

Design and Procedure

Two junior-level courses that were taught for a five-year period (consisting of three semesters per year with multiple section offerings) were identified for this investigation. One of the courses contained ten optional quizzes with the same number of questions. Learners were allowed to take the quizzes twice, and the systems kept the highest scores. However, scores were only displayed for learners’ information and were not computed in their overall grade (that is, they were “no credit” quizzes). The other course had exactly ten quizzes with ten questions, and as before, learners were allowed to take each quiz twice, retaining the highest score. However, all quizzes were required, and their scores were computed in learners’ final grades. Both courses under investigation had one hundred multiple-choice and true-or-false for the final comprehensive examinations. Quizzes and final comprehensive examinations offered in both courses had the same structure, meaning that a number of questions and time to complete (20 minutes for quizzes and 200 minutes for examinations) were the same. It is important to reiterate that all the questions were extracted from the same question banks for each category. Collected data were subjected to a variety of statistical procedures, such as correlation coefficient procedures, followed by presenting conclusions and recommendations.

Results

Optional Quiz Method: The value of $r$ is -0.1811 ($n=440$). Although technically a negative correlation, the relationship between the variables (Optional Quizzes and Final Comprehensive Examinations) is weak
(the nearer the value is to zero, the weaker the relationship). The value of $r^2$, the coefficient of determination, is 0.0598. Both primary and secondary hypotheses ($H_{1-1}$ and $H_{1-2}$) were rejected. Figure 1 depicts the graph of the correlation between Optional Quizzes and Final Comprehensive Examinations. Furthermore, Table 1 shows details of the statistical analysis of the two categories.

Table 1

*Detailed statistical analysis of Optional and Mandatory Quizzes verses Final comprehensive Examinations*

<table>
<thead>
<tr>
<th>Category of the Correlation</th>
<th>$n$</th>
<th>Mean</th>
<th>$r$</th>
<th>Analysis/Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional Quizzes</td>
<td>440</td>
<td>63.681</td>
<td>-0.1811</td>
<td>A weak relationship* Reject $H_{1-1}$ and $H_{1-2}$</td>
</tr>
<tr>
<td>Final Comprehendives Exams</td>
<td>440</td>
<td>89.762</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandatory Quizzes</td>
<td>369</td>
<td>77.366</td>
<td>0.2866</td>
<td>A weak relationship* Reject $H_{1-1}$ and $H_{1-2}$</td>
</tr>
<tr>
<td>Final Comprehendives Exams</td>
<td>369</td>
<td>77.542</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The nearer the $r$ value is to zero, the weaker the relationship.*

In all likelihood, students performing poorly in the course were more likely to have taken the optional quizzes, both to increase their understanding of the material and to improve their exam performance. As such, it makes sense that there is a negative correlation between the quiz scores and exam performance.

*Figure 1. Graph of correlation between Optional Quizzes (X-Axis) and Final Comprehensive Examinations (Y-Axis)*
**Required Quiz Method:** The value of $r$ is 0.2866 ($n=369$). Although technically a positive correlation, the relationship between the variables (Required Quizzes and Final Comprehensive Examinations) is weak (the nearer the value is to zero, the weaker the relationship). The value of $r^2$, the coefficient of determination, is 0.0821. Both primary and secondary hypotheses (H$_{-1}$ and H$_{-2}$) were rejected. Figure 2 depicts a graph of the correlation between Optional Quizzes and Final Comprehensive Examinations. As an iterative note, Table 1 illustrates details of the statistical analysis of two categories.

![Mandatory Quizzes Versus Final Comprehensive Examinations](image)

*Figure 2. Graph of correlation between Mandatory Quizzes (X-Axis) and Final Comprehensive Examinations (Y-Axis)*

**Conclusions and Recommendations**

In this article, authors investigated and analyzed the effect of two types of quizzes (optional versus mandatory) on the learners’ performance. Quizzes and examinations data were collected and analyzed from a broader selection of learners and courses over several years, and statistical correlation method was applied to the data. Results showed weak relationships between quizzes and final comprehensive examination for both quiz methods. These results are in line with Anderson’s research, as early as 1984, that revealed quizzes had no positive effect on the learners’ examination performance. Since then, many more researchers have attested to Anderson’s conclusions (please see Introduction section for a detailed list of researchers).

For the courses under investigation, neither requiring quizzes nor making them optional had much of an impact on final examination performance at all. This is especially surprising given that most educators believe that quizzes reinforce learning and therefore should significantly improve performance. The courses under study did not consider the quantitative content related to the performance. More research is required to see whether quizzes improve students’ performance in quantitative components of the courses. Furthermore, in general, quizzes might have been good practice tools to improve psychological aspects (such as test-taking familiarity and confidence), rather than improving the content knowledge. Finally, authors strongly recommend that educators to review their courses to verify that quizzes are accomplishing their purpose in their courses.
References


