Does Outlining the Main Points with Questions Help Students Learn Principles of Economics: A Comparison between Two Teaching Methods

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Abstract

PowerPoint is a popular tool used in lectures since it can incorporate questioning strategy to enhance learning in the classroom. This paper compares teaching method, key phrase outline format, and question outline format, in terms of student preference and learning achievements obtained. In the key phrase format, the main points were listed with key phrases. Each point was followed by the explanation of the point. In the questioning format the main points were rewritten from key phrases in the original PowerPoint slides into questions. The experimental results showed that learning achievement was improved in the questioning format. However, student preference was the same for both formats. In addition, other findings and discussions are also reported.

JEL Classifications: A20, C90

Keywords: PowerPoint, Slide, Questioning, Lecture, Key phrase outline

1. Introduction

PowerPoint is a useful tool for lectures. Outlines of key phrases followed by descriptions in several lines are the general format used for organizing lecture materials in PowerPoint slides. The outline presents the main points (i.e. definitions and examples, etc.) of the lecture as these key phrases give students an idea of what will be introduced (Noppe, 2007). Next to a key phrase, teachers always insert details of the main point to explain the statement and to give students time to read. Fig. 1 is an example that shows a slide consisting of two main points: demand curve and slope of demand curve.

Skillful teachers can use different teaching strategies to enhance instruction. The PowerPoint is treated as an auxiliary. However, none skillful teachers always heavily rely on PowerPoint. They may just read aloud the content in the slides without using any interactive strategies. In this situation, PowerPoint becomes the main body for their instruction. Students passively listen what the teachers say and this may bore students and induce rote learning.

In spite of the heavy reliance on PowerPoint lectures may bore students and induce rote learning. However, teachers can improve the use of PowerPoint by preparing well-organized slides. In this paper, we propose an approach called question outline. Instead of listing key phrases (Fig. 1), this approach lists the main points with questions (Fig. 2). When a teacher reads aloud a question in a slide and waits for several seconds, the question can remind the teacher to ask a question which becomes a stimulus to raise students' attention (question). The waiting time can force students to think for the answer (response). Later the teacher presses the page down button and then the slide shows the answer that is the explanation of the point (feedback). This approach implements the question-response-feedback model (e.g., Dickman, 2009; Myhill and Dunkin, 2005). We think it can raise students' interest and improve learning when teachers use the PowerPoint slides organized by this approach.
Furthermore an experiment was also conducted to understand the effect of question outline on students' learning performance and preferences.
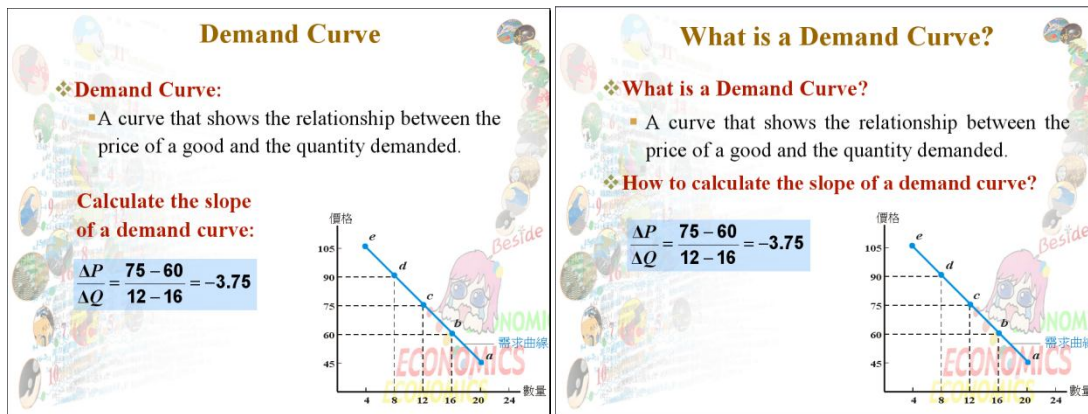
Figure 1. Listing Main Points with Key Phrases **Figure 2. Listing Main Points with Questions**

2. Related Works

2.1 PowerPoint

Previous studies have investigated the effects of PowerPoint on learning achievement and students' attitudes (e.g., Szabo and Hastings, 2000; Bartsch and Cobern, 2003; Susskind, 2008; Susskind et al., 2009). The results of these studies showed that students prefer PowerPoint over traditional lectures. However, learning achievements in the case of PowerPoint were not found to be different from traditional lectures. These results may indicate that the delivery styles (PowerPoint, overhead and blackboard) do not affect students' learning performance.

PowerPoint allows teachers to use text, image, sound and video, etc. It also can provide some dynamic visual effects, such as transition effects. If the features can be well-arranged, PowerPoint should be able to enhance lectures. Therefore, scholars have tried to understand the effects of different features of PowerPoint on learning performance, such as content style and structure. For example, Larson (2009) examined the effect of font types on recall. The results did not show any significant difference between a typeface with serifs and without serifs and between positive type and reverse type. In addition, Bartsch and Cobern (2003) investigated how the relevance of items in slides affects learning. They found that unrelated graphics have a negative effect on learning of the material. Savoy, Proctor and Salvendy (2009) further found that what students retain is related with the delivery style. When students are expected to retain graphics or animation, PowerPoint presentations may be better. When students are expected to retain information that is best conveyed through dialogue, traditional presentations are effective.

Kinchin and Cabot (2007) proposed a concept mapping approach to organize materials in PowerPoint. The approach organized materials in a concept map structure rather than a linear and bullet-point manner. A questionnaire survey and focus group discussions revealed that a bullet-point list is more useful to support lower levels of cognitive skills (i.e. memorizing facts) than concept mapping. But concept mapping is more useful to support higher level of cognitive skills (i.e. making links between ideas).

Besides the effect of PowerPoint features on learning performance, Apperson et al.(2008) and Clark (2008) also examined student preferences regarding different PowerPoint features. Apperson et al.(2008) found several interesting phenomena. For example, students prefer PowerPoint slides organized with key phrase outlines revealed line by line, the use of sounds congruent with the slide content and the use of (any) color background. Furthermore, Clark (2008) found that students prefer the transition effect such as transition between slides and between main points.

2.2 Questioning

Questioning is a cognitive scaffolding that stimulates and guides learning (e.g., Moll, 1990). It explicitly requests a linguistic and cognitive response and promotes generative effects by selecting, organizing and integrating the text for answering questions (e.g., Wittrock, 1990; Mayer, 2001; Campbel and Mayer, 2009).

Previous studies have reported that questioning promotes learning in the case of reading (e.g., Davila and Talanquer, 2010), discussion (e.g., Dickman, 2009) and lecture (e.g., Narloch et al. 2006).

In the classroom, questioning can support teachers' lectures. It helps teachers gain students' attention, scaffold students' thinking and check students' understanding (e.g., Chin and Osborne, 2008; Chin, 2007). Many questioning strategies have been used in the classroom. For example, Chin (2007) use questions in classroom discourse to scaffold student thinking and help students construct scientific knowledge and then summarized four questioning approaches, Socratic questioning, verbal jigsaw, semantic tapestry and framing. These strategies were used by teachers to stimulate students' productive thinking.

Information Computer Technology (ICT) has been used to support classroom questioning strategies such as electronic response systems (clickers) and PowerPoint. Studies have examined the effect of clicker on classroom learning. For example, Yourstone et al. (2006) measured the difference between learning achievements of classes taught by using clicker and classes taught by using traditional paper quizzes. The results showed that the use of clicker can have a positive impact on student learning.

In addition, questioning techniques have also been incorporated in PowerPoint slides to enhance lectures. Campbell and Mayer (2009) conducted an experiment to examine the learning outcomes of inserting questions within PowerPoint slides in a lecture, as compared to inserting the corresponding statements. The result showed that the questioning group outperformed the statement group on a retention and transfer test. Furthermore, Gier and Kreiner (2009) developed a content-based questions method in which the instructor presents questions to the class based on PowerPoint slides several times during a lecture. An experiment showed that students taught by content-based questions method had higher quiz and examination scores than students taught by the traditional PowerPoint lecture.

Previous studies have showed that students like PowerPoint lectures. When a well-designed PowerPoint is collocated with instruction strategies, it can improve learning. Questioning is a general and useful strategy for lectures. Studies have showed that inserting questions in PowerPoint slides can enhance learning (e.g., Campbell, and Mayer, 2009; Gierand Kreiner, 2009). In this paper, we propose an idea called question outline that rewrites all key phrases in PowerPoint slides into questions. It is an innovative approach and, therefore, there are two hypotheses we want to test:

1. Whether students taught by question outline have better learning performance than students taught by key phrase outline?
2. Whether students have more positive attitude toward question outline than toward key phrase outline?

3. Method

3.1 Participants

Eighty-eight second and third grade undergraduate students from two classes taught by the same teacher participated in the experiment. The course taught in the two classes was economics. In Class A, there were 53 students (28 males, 25 females) attending the course on Wednesdays, from 2pm to 5pm, weekly, while 59 students (25 males, 34 females) were there in Class B attending the course on Fridays, from 2pm to 5pm.

3.2 Materials

(1) Lecture slide

In this experiment, the teacher planned to teach two units. Each unit lasted a week. The topic of unit one was Demand and consisted of two 18-slide PowerPoint presentations (a key phrase version and a questioning version); the other was Supply and consisted of two 15-slide PowerPoint presentations. In the key phrase version, the main points were listed with key phrases. Each point was followed by explanation of the point (Fig. 1). The presentation of the main points in the lecture is controlled by the teacher. After moving to a new slide, the PowerPoint first shows a main point along with its explanation. After the teacher has completely explained this point, he/she clicks the page down button and then the PowerPoint shows the next point with its explanation. For the questioning version, the teacher rewrote the main points in the original PowerPoint slides from key phrases to questions. How to rewrite is based on the explanation of the key phrase. For example, if the explanation of a key phrase is the definition of a term "Demand Curve," the teacher rewrites the key phrase "Demand Curve" into the question "What is a Demand Curve?" (Fig. 1). The main points are then converted into questions followed by answers.
The answers are the same as the explanations in the key phrase version (Fig. 2). There were 42 questions (27 what questions, 14 how questions and 1 why question) in the slides for topic Demand and 23 questions (10 what

questions and 13 how questions) for topic Supply. After moving to a new slide by clicking the page down button, the PowerPoint first shows a main point. Then the teacher waits for three to five seconds in order to let students think. If students do not have any response, later he/she clicks the page down button to present the answer. After the teacher finishes this point, he/she clicks the page down button and then the PowerPoint shows the next point or next slide.

(2) Preference questionnaire

A questionnaire was designed to assess preferences of the participants between the key phrase version and the questioning version. It consisted of thirteen items regarding students' preferences for different aspects of the lectures and slides and used a subjective 7-point rating scale that ranged from strongly agree (7) to strongly disagree (1). In addition, an extra open-ended question was also included to let students comment on the day's course.

(3) Testing questionnaire for evaluating students' learning performance

In order to understand the effect of the two slide formats on learning performance, this paper prepared two paper-based questionnaires, one for topic Demand and the other for Supply. In each topic, there are ten multiple choice questions, each with four alternatives.

3.3 Procedure

The topic in the first week was Demand. The teacher used slides of the questioning version in Class A and key phrase version in Class B. In the second week, the topic was Supply. Class A was taught with key phrase version and Class B with questioning version. Each topic consisted of two 50 min lectures. After the lectures, the teacher explained how to answer the preference and testing questionnaire; any questions regarding the questionnaire were answered. Finally, the students had to finish the preference and learning test questionnaire.

4. Results

4.1 Learning Achievement

One student in Class A did not finish the testing questionnaire for topic Demand. So he was excluded from the analysis for topic Demand. Two paired t-tests were conducted to compare the learning performances (Table 1). For topic Demand, the results showed that scores of students (mean=78.64) in the questioning outline group were significantly higher than students (mean=56.27) in the key phrase outline group. For topic Supply, scores of students (mean=72.37) were only marginally higher than (mean=64.35) in the key phrase outline group.

4.2 Students' Preferences

Table 2 shows scores on items in the preference questionnaire. If the score of an item is higher than 4, it means students' attitude toward the question is positive. The results showed that the score of each item in both versions was higher than 4, implying that students' attitudes were positive toward the two versions. To compare the level of preference of key phrase outline and questioning outline version, the paired *t*-test was used. The result showed that the scores of key phrase outline and questioning outline version, for each item, were not significantly different. This indicated that the level of preference of the two versions was the same.

4.3 Free Responses from Students

Most students' comments were general in nature. These comments and the number of responses are listed as follows.

    It is better if the text is larger.
    The lecture was fast.
    The picture is better for understanding, than text.
    The background picture is too fancy.
    Too much transition effect is not good.
    It is better if the PPT uses key phrase outline.
    The questions in slides give me more chance to think.

5. Discussion

The results of testing for topic Demand showed that the mean score in the questioning version was significantly higher than in the key phrase version. However, the result for topic Supply, mean scorein the questioning version was only marginally higher than in the key phrase version. These results indicate that the questioning PowerPoint format is more helpful for learning than the PowerPoint format of key phrase. Therefore, the first hypothesis is supported.

The mean score of each item in preference questionnaire in both versions was higher than 4. The results show that students have positive attitudes toward questioning outline and key phrase outline. This also represents that students have positive attitudes toward the PowerPoint lecture style. The result is the same as reported in previous studies (e.q., Bartsch and Cobern, 2003; Susskind, 2008; Apperson et al., 2008; Apperson et al., 2006; Susskind, 2005).

Comparing student preference for key phrase and questioning versions, we did not find any item that showed significant difference. The score on each item in key phrase version was higher than the score in questioning version, except two items. However the score on every item in the versions is slightly different. We can say that students' preferences for both versions are the same. Therefore, the second hypothesis is not supported.

For the questioning version, the teacher just rewrote the key phrases in original PowerPoint slides into questions. The explanations following the key phrases and questions are the same. The slight change is not easy to be clearly perceived by the students. One comment from the teacher can prove this. After the teacher finished the two topics, she told the students the fact that the styles of both PowerPoints were different. Most of the students suddenly realized what had happened. This provides evidence to the effect that students thought slides in both topics were the same, although this is not supported by empirical data.

6. Conclusions

In the past recent two decades, PowerPoint has become a popular tool in classrooms. It can support teachers' lectures in different ways. Questioning is a useful strategy for lecture as it can improve students' motivation and learning achievement. Therefore, incorporating questioning strategies with PowerPoint may enhance learning.

This paper compares student preference for and learning achievements of PowerPoint slides presented in the general format, key phrases and PowerPoint slides that present key phrases in original slides with questions. The results showed that learning achievement is improved in the questioning version. However, student preference is the same. From the results, we can conclude that students subjectively perceive that the two formats of PowerPoint slides are the same. However, their learning performance objectively reflects that lectures with questioning slides are better than lectures with key phrase slides.

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Table 1: Comparison of Mean Scores per Group, Topic and Cognitive Skill on Significance

Variable	Key phrase outline version			Questioning outline version				
	N	Mean	SD	N	Mean	SD	t-value	p-value
Topic Demand	59	56.27	19.11	53	78.64	13.2	-5.049	0.000 **
Topic Supply	53	64.35	16.19	59	72.37	16.95	-1.95	0.055

*$p<0.05$; ** $p<.01$.

Table 2: Mean (and Standard Deviations) of Ratings Made after Classes as a Function of Lecture Type

Items in the preference questionnaire	Key Phrase Version	Questioning Version
The slides were well-organized.	5.65(1.14)	5.59(1.24)
I am satisfied with the teacher's slides.	5.59(1.04)	5.45(1.25)
I spent more time thinking what the teacher teaches.	5.53(1.29)	5.49(1.46)
We had more discussion in today's lecture.	4.03(1.65)	4.13(1.77)
I can understand what the teacher teaches.	5.70(1.15)	5.59(1.44)
I was more confident for the exams.	4.71(1.33)	4.58(1.46)
The teacher kept my attention focused in today's lecture.	5.36(1.21)	5.24(1.50)
The teacher sustained my interest in today's lecture.	5.23(1.23)	5.16(1.38)
It was easier to take notes.	4.75(1.27)	4.74(1.60)
My notes were more organized.	4.98(1.14)	4.95(1.47)
I learned better from today's lecture	5.18(1.16)	5.31(1.37)
I felt this lecture was interesting.	5.34(1.33)	5.30(1.50)
I liked today's lecture.	5.51(1.25)	5.51(1.53)