Teaching and learning computer science courses in a small size class

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Abstract: Microsoft PowerPoint presentation is a well-known tool for delivering class lectures, and has been widely used by course instructors across universities around the world. This study sought to determine whether it is the best approach for a small class size for computer science courses. An Artificial Intelligence class, with the number of students is 17, has been taken as a case study. The class lectures had been delivered using 2 approaches; PowerPoint presentations and "guided-note" handouts with explanations on a board. Students' opinions, a researcher's observation, and students' scores in performance tests have been analyzed. The study has revealed that the students prefer the guided-note handouts with explanations on the board more than PowerPoint presentations, and their scores in the performance tests are better after taking classes without PowerPoint presentations. The finding of this study suggests that the guided-note handouts are a better approach for delivering lectures in a small class size.

Key words: Teaching and learning; Small size class; Handouts; PowerPoint

1. Introduction

Although Microsoft PowerPoint has not been around that entire long, many of us feel like we have always had PowerPoint because it has been used in various types of presentations for different kinds of purposes. The use of PowerPoint as a teaching tool is becoming more and more widespread among course instructors, especially with those who wish to integrate multimedia technology into their teaching and model technology use in the classroom (Rogers, 2001). The popularity of this presentation tool comes from the belief that representation of information using auditory and visual inputs improves teach (Mayer and Moreno, 2003)

Despite the frequent use of PowerPoint in the higher education context, little research exists on the students' perceptions of the use of PowerPoint as a teaching tool (Frey and Birnbaum, 2002), especially for a small class size. Research on PowerPoint in teacher education is even more limited. The class size refers to the number of students in a given course or classroom. The class size is considered small when the number of students is fewer than 20. The impact of class size on student achievement and non-cognitive outcomes is one of the most contentious areas of educational debate. Academic literatures on the impact of class size have consistently suggested that smaller class size is better (Urquiola, 2006).

For the context of Saudi Arabia, many computer sciences courses at universities in the kingdom have been offered in a small class size. For instance, at the Faculty of Computing and Information Technology

(Rafha Branch) of the Northern Border University, 46 courses have been offered in the first semester for the academic year 2015/2016. Out of 46 courses, 33 courses have a number of students fewer than 20.

The aim of this study is to investigate the effectiveness of using a PowerPoint presentation for giving lectures in a classroom when the class size is small, consequently to seek a better teaching approach for a small class size, especially for computer science courses. This paper is organized as follows. Section II presents a background of the study and related work; section III presents method and data analysis for this study. Section IV presents a conclusion of the study.

2. Literature review

Since 1990s, Microsoft PowerPoint has become a very popular teaching tool in academia. Learning PowerPoint does not require major technical skills and familiarity with high-tech technologies. PowerPoint allows course instructors to integrate multimedia components easily such as graphics, sound, video, animations, and charts into their presentations, which supposedly made the lessons more interesting, engaging and structured. As a result, many teachers or course instructors began using PowerPoint presentations in their teaching.

PowerPoint has several advantages. Just to name a few, PowerPoint presentations are easier to use, manage, store, modify, and reuse. They can be easily stored and reused in CDs, USB Flash drives, or cloud storages. PowerPoint may also provide faculty members who are not confident lecturing in class

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with a sense of confidence because it may cover up their deficiencies in speaking and presenting.

For better or worse, PowerPoint has become the standard lecturing tool in higher education. Markham, Jones, Hughes, and Suttcliffe (1998) had conducted a survey of teaching approaches used in pharmacology in U.K. Higher Education, which was followed by a follow-up survey by Hughes (2001) to determine the extent to which non-traditional teaching and learning methods were used. Hughes found that since the first survey by Markham and co-workers, there was a large drop (78% to 33%) in the utilization of chalk-and-talk lectures. Hughes (2001) also published that there was high use of PowerPoint presentations (60%) in the classrooms. Research on PowerPoint has focused on two areas: (a) PowerPoint vs. overhead transparencies or traditional lectures (Kask, 2000; Lowry, 1999; Mantei, 2000), and (b) students' attitudes and performance in classrooms in which PowerPoint is utilized (Urquiola, 2006; Kask, 2000; Lowry, 1999; Mantei, 2000; Szabo and Hastings; 2000). However, studies investigating the current use of PowerPoint presentations for small class size and the value of giving handouts with explanations on a board have been seriously lacking.

An extensive body of literature exits documenting the benefits of handouts for student learning. Handouts serve as the most efficient and effective way of providing students with information. To provide students with accurate information and avoid split attention between note-taking and listening, some instructors give complete lecture notes. However, studies also found that extensive lecture handouts seem to contribute to passive learning and lower student attendance (Brazea, 2006). Research in education also has suggested that there is a significant positive correlation between the quality of students' notes and students' academic performance (Kiewra, 1985). Thus, some researchers have suggested using "guided-note" handouts as an alternative to no notes and complete notes (Barbetta and Skaruppa, 1995; Vaz, 1999).

"Guided-note" handouts are presentation handouts that provide students with an outline and cues with blank lines on which students can record key points, and/or relationships between ideas during the presentation. These handouts minimize the split-attention problem, allow more opportunities for students to process and record the information (Barbetta and Skaruppa, 1995; Neef et al., 2005) guide students in their note-taking, and reduce the errors related to determining what to record.

Students' perceptions of the assessment methods have an impact on the learning approaches students follow to understand the materials. Therefore, design of a learning environment that fosters positive student perceptions towards learning is an important factor in creating a high quality teaching and learning for students (Lucas, 2001).

3. Method and analysis

For the purpose of this study, a class of an artificial intelligence course has been used as a case study. This class consists of 17 female students, who are in the third year of their program. The course was taught in English language, which is the language is not their mother tongue language. The students had not been informed that they are subjects of a case study. Two teaching approaches had been used; first by using PowerPoint presentation and second, by using "guided-note" handouts. The teaching period for each approach was 7 weeks; first half and the second half of the semester.

3.1. Class observation

In the first half of the semester, class lectures had been delivered using PowerPoint presentation, where data projector is turn on in each lecture. The instructor of the course explained each topic of the course by using PowerPoint slides. The slides for the topic were given to the students through e- mails. The students were expected to view, print and take them to the classroom as their own handouts. However, very few students made an effort for bringing the materials to the classroom. Although students were asked to take notes during lecture times, but very few students making an effort to write down important points. All students just "watching" to the projection screen while listening to the course instructor talk. A classroom had become a conference room.

In the second half of the semester, the data projector is turn off. Before starting any new topic, the instructor would give hardcopies "guided-note" handouts to students. Students were asked to bring the given handout to the classroom. They were advised to write down important points. When there was no projection screen, students started to look down at their desks. Their handouts were opened. They started to write down important points of the given lecture. If there was any student who was not sure, at what point, the instructor was talking about, she would ask for a clarification. When one student asked a question, another student was encouraged to ask also. The classroom started to become active. They tend to enjoy and focus more. Since the course instructor was not engaged in clicking the mouse to move a slide, she could move around in a classroom and came near to the students.

3.2. Performance tests

Two mid-term examinations and two quizzes had been used for performance tests throughout the semester. The first exam and the first quiz were tested in the first half of the semester, where the students learned through the PowerPoint presentations. The second exam and the second quiz were tested in the second half of the semester, where the students learned through the given handouts with explanation on the board.

Table 1 shows students' scores for the first and the second exam. The total mark for each exam is 15. Results show that students have performed better in the second exam, after taking classes which were given using "guided-note" handouts. For example, in the first exam the score mode is 14.3, while in the second exam the score mode is 15. The standard deviation for the test scores is decreased from 1.71 to 0.77.

Table 1: Test score for the first and second exam

Test Score	First Exam	Second Exam
Mean	13.02	14.41
Median	13.6	14.5
Mode	14.3	15
Standard Deviation	1.71	0.77

Table 2 shows students' scores for the first and the second quiz. The total mark for each quiz is 4. Results show that students have performed better in the second quiz, after taking classes which were given using "guided-note" handouts. Overall, the mean, median and mode scores for all of the second tests increase, while the standard deviations decrease. The findings suggest that students were able to learn more without PowerPoint presentation. This also suggests that the PowerPoint presentation is not an effective tool for delivering lectures in a small size class while "guided-note" is a better option.

Table 2: Test score for the first and second quiz

Test Score	First Quiz	Second Quiz
Mean	3	3.82
Median	3.5	4
Mode	3.5	4
Standard Deviation	1.15	0.43

3.3. Student opinions

Students' opinions had been collected at the end of the semester in order to get feedback for the used methods, as well as to review both approaches. Students are asked to write their opinions/reviews. All students said that they like the second approach more, but only 12 students have wrote their opinions as shown in the Table 3.

Table 3: Student opinion

Student No	Opinion
1	I feel comfortable with guided-note handouts
2	I can write important notes on the guided-note
3	I like guided-note handouts because I can focus more
4	The guided-note handouts help me to learn more, and facilitate me in note-taking
5	I can have a better interaction with my teacher
6	My English language is not good. Using guided-handouts motivate me to write my understanding in my language
7	I feel that I am forced to learn and to understand. This is a good for a person like me
8	Without PowerPoint presentation, I must bring each handout to the classroom.
9	When I do not understand anything, I just make a note on my handouts
10.	I am still in an old fashion style, I like to read on the paper, not on digital media, this is type of teaching and learning is good for me.
11	It is very difficult for me to understand everything in English. By having handouts, I will translate each word into my language. This helps me.
12	When my instructor turned on the project she was stick to the slides display, and stood in front of the classroom. The distance between me and my instructor did not motivate me to interact with her. But when she gave me handouts, and she detached herself from the slides display and come near to me, I am feeling motivated to ask any questions.

4. Discussion

This study has been conducted in Saudi Arabia, a non-speaking English country, where all computer sciences courses at university level are taught in English language. Studying in a foreign language is always has been difficult to any students. Some of them have to make extra efforts such as finding a meaning in a dictionary in order to understand the course contents. All subjects in this study have favored for guided-handouts more than PowerPoint presentations. Their attitude of learning was improved when the teaching style has been changed to guided-handouts. By using guided-handouts, students have an opportunity to engage themselves with the course instructor, ask more explanations and examples in Arabic language, write down the notes, and are not framed to the slides display. This method of teaching has also encouraged students to be active in the classroom. The results of their performance tests, and their opinions on using guided-handouts, have proved that PowerPoint presentations cannot be the best tool for teaching and learning, whenever, the size of the class is small and courses are not taught in students ' mother tongue language.

5. Conclusion

This paper has presented a case study on seeking a better approach for teaching and learning in a small class size. In this study, two approaches have been used for a comparison. The first one is the well-

known method namely Microsoft PowerPoint presentations, and the second one is by using "guided-note" handouts with explanations on a board. Results of the study indicate that students preferred the second approach, and this has been proven with their better scores in the performance tests. This finding suggests that the guided-note handouts are a better approach for delivering lectures in a small class size

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