

Assessing use of power point by teacher candidates in teaching mathematics

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Abstract. The use of PowerPoint technology in the classroom has become very popular today because it is considered to enhance teaching quality. However, its use is not free from criticism with the emergence of phrases such as 'PowerPoint is Evil' and 'Death by PowerPoint'. Mathematics and teaching-learning mathematics have certain characteristics. Hence, the creation and execution of presentation in the class with PowerPoint format requires certain handling as well. This study intends to explore students' perceptions and teachers' judgments on the use of PowerPoint in mathematics teaching by teacher candidates. Participants in this study were 14 math teacher candidates, 5 math teachers, and 421 students of two vocational high schools. The student questionnaire result shows that with PowerPoint presentations, in general, students are motivated and helped to learn math, value the management of slide shows quite well, but tend to only listen to the teacher during the learning process, and feel that sometimes lessons are easier with PowerPoint, sometimes not. Teachers' observation result shows that most of the teacher candidates are good enough in organizing subject matter and slides of presentations.

1. Introduction

Microsoft office PowerPoint as a part of computer technology is recognized as one of the important tools in knowledge transfer and has become the main technology used in various presentations, including in education. Harrison, for example, argues that PowerPoint enhances instruction and motivates students to learn [1]. It also can provide starting points for interactive processes that promote learning [1]. Although the recognition of the power of PowerPoint is very large, but not out of criticism. 'PowerPoint is Evil' and 'making us stupid' because PowerPoint has many limitations that reduce the quality of learning when in use [2]. Likewise, the phrase 'Death by PowerPoint' has been popular. It is not uncommon to hear students describe slide-intensive classes or lectures as 'Death by PowerPoint' [3]. Most people have experienced Death by PowerPoint, feeling bored, tired, annoyed, frustrated, and even angry at some point when attending meetings, conferences, or seminars [4]. This is an ironic thing, because PowerPoint is supposed to make a stronger presentation, even a communication barrier. Meanwhile, Masie called PowerPoint 'the single most dangerous tool invented on the planet' because PowerPoint replaces effective communication with presentations [5]. Furthermore, its current use is frequently limited to an information transmission mode, often with excessive content, a usage that obscures the wider potential for diverse professional and pedagogically-sound presentations [6].

There has been a moderate amount of research on the effectiveness of PowerPoint in the classroom. Numerous studies show that overuse of PowerPoint actually decreases student – teacher interaction in

the classroom [7]. In contrast to this, based on a review of a wide range of literature, Levasseur and Sawyer conclude that most researches show that students prefer PowerPoint to traditional teaching [5]. However, some studies, as summarized by Amare and by Bartsch and Cobern, have shown that students performed worst on test scores with PowerPoint lectures compared to traditional formats [5]. The results of the studies indicate that in terms of student' interest, learning by using PowerPoint has more satisfaction than traditional learning, but it did not lead to better mastery of subject matter.

Mathematics is a mental discipline with its own language and structure. It involves far more than computation, it is (1) a study of patterns and relationships, (2) a way of thinking, (3) an art, (4) a language, and (5) a tool [8]. In line with these characteristics of mathematics, teaching-learning mathematics in schools, should emphasize the activity for students to be skilful (1) understanding concepts and applying mathematical procedures, (2) making generalizations, (3) performing mathematical operations for simplification, and analysis of existing components, (4) doing mathematical reasoning, (5) solving problems and communicating ideas through symbols, tables, diagrams, or other media, and (6) cultivating a logical, critical, careful, and meticulous attitude, and not easily give up in solving problems [9]. For math teachers, the use of PowerPoint in order to function as a tool that helps achieving the above goals, rather than barrier, is a special challenge.

Many articles put forward suggestions on how to use PowerPoint to be effective. However, these suggestions are mostly not based on the research results and tend to be various greatly and even become contradictory [5]. In the study on PowerPoint use textbooks conducted by Kammeyer, it is known that only 35% of the recommendations were referenced and only 33% of these were based on research, most of which was quasi-experiment [5]. The above phenomena paying attention on evaluate the use of PowerPoint in teaching mathematics by mathematics teacher candidates of a department of mathematics education. The college students feel comfortable and incline to use PowerPoint in the classrooms, especially when presenting their college assignments. The result of this study will be useful to provide teacher candidates to have better competence when they graduate from the college.

The questions in this research are formulated as follows: (1) what are the students' perceptions on the use of PowerPoint in teaching mathematics conducted by mathematics teacher candidates?; (2) what are the teachers' assessments on the use of PowerPoint in teaching mathematics conducted by mathematics teacher candidates?; and (3) how are teaching preparations made, and what constraints are felt by teacher candidates in implementing teaching mathematics using PowerPoint?

2. Experimental Method

This research is a descriptive research, aimed at exploring the opinion of vocational high school students, the assessment of school teachers, and the teacher candidates' efforts related to the implementation of teaching mathematics using PowerPoint. Participants in the study were 5 male and 9 female of the seventh semester students of Department of Mathematics Education, STKIP Sebelas April Sumedang; 1 male and 4 female math teachers; and 421 students of class X and XI of two vocational high school.

The data collection was done when teacher candidates undertook the Program of Field Experience of Education in two vocational high schools. Each teacher candidate was observed twice. Thus there were 28 PowerPoint presentations. Each of presentation was held in one classroom and was observed by one teacher. There were 16 classes that got the presentation. After completion of learning, students were given a questionnaire to express their opinions. The presented subject matters were various, including matrices, statistics, linear equations and inequalities, two-variable linear equations system, and trigonometry. The interview was conducted to find out how teacher candidates prepare for teaching, as well as were obstacles are encountered. There were 650 questionnaire sheets and 28 observation sheets collected.

Student questionnaire contains 14 items of statements, consisting of 7 items of positive statements, 5 items of negative statements, and 2 items of neutral statements with answer choice SA = strongly agree, A = agree, D = disagree, SD = strongly disagree. Against positive statements, SA, A, D, SD were given a score of 4, 3, 2, 1, respectively, while the negative statements were given a score of 1, 2, 3, and 4. The teacher observation sheet contained 15 aspects of the assessment and the teacher was asked to score 1 (poor), 2 (fair), 3 (good), or 4 (excellent). Furthermore, the average was calculated

and interpretation was determined for each questionnaire statement and assessment aspect. The criteria for students' perceptions is: $1 \leq \bar{x} < 1.6$ very negative, $1.6 \leq \bar{x} < 2.4$ negative, $2.4 \leq \bar{x} < 3.2$ positive, $3.2 \leq \bar{x} \leq 4$ very positive [10]. The criteria for teachers' assessments is: 1.00-1.50 poor, 1.51-2.50 fair, 2.51-3.50 good, 3.51-4.00 very good [11].

3. Result and Discussion

3.1 Research Question 1: What are the students' perceptions of the use of PowerPoint?

Table 1. Students' perception on the aspect of learning activities

			1	2	3	4	$\bar{x}$	Interp.
1.	The PowerPoint presentation makes me motivated to learn math. (+)	f	2	61	493	94	3.04	Positive
		%	0.3	9.4	75.8	14.5		
2.	PowerPoint presentation is helpful in my learning process. (+)	f	3	19	444	184	3.24	Positive
		%	0.5	2.9	68.3	28.3		
3.	PowerPoint presentation makes students only listen to teacher during the learning process. (-)	f	102	252	259	37	2.36	Negative
		%	15.7	38.8	39.8	5.7		

Table 1 shows that during learning mathematics using PowerPoint, students generally feel motivated ($\bar{x} = 3.04$) and assisted ($\bar{x} = 3.24$) in learning. However, student activeness is negative ($\bar{x} = 2.36$) because they tend to only listen to the teacher.

Table 2. Students' perception on the aspect of mathematics understanding

			1	2	3	4	$\bar{x}$	Interp.
1.	PowerPoint presentation helps me connect math concepts with everyday life. (+)	f	2	177	392	79	2.84	Positive
		%	0.3	27.2	60.3	12.2		
2.	I am sure that my math score can be higher because of PowerPoint presentation. (+)	f	20	181	326	123	2.85	Positive
		%	3.1	27.8	50.2	18.9		
3.	The complete answer of problem already exists in PowerPoint is more helpful compared to if the teacher does step-by-step. (-)	f	1	37	345	267	3.35	Very Positive
		%	0.2	5.7	53.1	41.1		
4.	The presentation of the exercises in PowerPoint challenges me to do it. (+)	f	3	153	393	101	2.91	Positive
		%	0.5	23.5	60.5	15.5		

Table 3. Students' perception of the organizing slides and presentation

			1	2	3	4	$\bar{x}$	Interp.
1.	Too many slides. (-)	f	27	305	302	16	2.47	Negative
		%	4.2	46.9	46.5	2.5		
2.	The images/graphs support the subject matter covered. (+)	f	3	84	436	127	3.06	Positive
		%	0.5	12.9	67.1	19.5		
3.	The animation used is redundant and annoying. (-)	f	46	130	442	32	2.71	Positive

		%	7.1	20.0	68.0	4.9	
4.	The presentation is overall boring. (-)	f	43	192	375	40	2.63 Positive
		%	6.6	29.5	57.7	6.2	
5.	Too much text is put on the slide. (-)	f	33	157	434	26	2.70 Positive
		%	5.1	24.2	66.8	4.0	

From Table 2 it is known that with regards to material understanding, students positively view learning with PowerPoint as it helps to associate mathematical concepts ($\bar{x} = 2.84$) and are challenged to answer the questions ($\bar{x} = 2.91$), and tend to feel confident that their mathematics grades will be higher ($\bar{x} = 2.86$). Meanwhile, the students very positively view at the solving questions step-by-step ($\bar{x} = 3.35$).

Based on Table 3, it can be said that the use of images/graphics, animation, and text in slides are sufficient, which are proved by the fact that the students' opinions are categorized as positive (average 3.06, 2.71, and 2.70). In relation to the number of slides used, students' opinions tend to be negative ($\bar{x} = 2.47$), here the number of students who answer agree and who disagree almost the same.

Table 4. Students' perception about the flexibility of using PowerPoint

		SA	A	D	SD	
1.	Sometimes lessons are easier with PowerPoint, sometimes not.	f	106	454	88	2
		%	16.3	69.8	13.5	0.3
2.	Writing a question on one slide and the solution in the next slide confuses me.	f	25	266	349	10
		%	3.8	40.9	53.7	1.5

Both statements above are neutral statements, therefore each alternative answer is not scored. Most students state that sometimes lessons are easier with PowerPoint, sometimes not (16.3% strongly agree and 69.8% agree). Meanwhile, the number of students who feel confused and who do not feel confused when the problems and solutions written on a separate slide is not too different.

3.2 Research Question 2: What are the teachers' assessments on the use of PowerPoint?

Table 5. Teachers' assessment on the organizing the subject matter

	$\bar{x}$	$\bar{x}$ Total
1. The PowerPoint material matches the learning objectives	3.4	
2. PowerPoint presentation is coherent and systematic.	3.4	3.27
3. PowerPoint presentation helps instilling material understanding.	3.1	Good
4. Materials are sorted from easy to difficult.	3.1	

Seeing Table 5, it can be said that teacher candidates are able to organize the subject matters in terms of conformity with the objectives of learning, systematics, and the flow of delivery with $\bar{x} = 2.47$ and good category.

Table 6. Teachers' assessment on the learning activity and interaction

	$\bar{x}$	$\bar{x}$ Total
5. PowerPoint presentation generates students' interest in the lesson.	2.9	
6. PowerPoint presentation cultivates students' active participation.	2.5	2.69
7. PowerPoint presentation supports a scientific approach (students	2.7	Good

observe, ask, gather information, associate information, and communicate).	
8. PowerPoint presentation gives students the opportunity to solve problems in various ways.	2.6

Table 6 shows that the lessons learned are sufficient to cause student's enthusiasm to interact during the learning process. Although included in the good category, but the average on this aspect is not too high ($\bar{x}$ Total = 2.69).

Table 7. Teachers' assessment on the organizing slides and presentation

	$\bar{x}$	$\bar{x}$ Total
9. Use of correct written language.	3.3	
10. Correct writing of mathematical terms, formulas, and symbols.	3.2	
11. Correct reading of mathematical terms, formulas, and symbols.	3.4	
12. The images/graphics displays match the subject matter	3.2	3.13
13. The images/graphics display match the characteristics of the students.	2.9	Good
14. The number of slides is appropriate with the time allocation.	3.0	
15. Proper presentation speed.	3.0	

Based on Table 7 it can be seen that the ability of teacher candidates in the aspect of organizing slides including how to write terms, formulas, mathematical symbols; drawings; and setting the presentation duration is good ($\bar{x}$ Total = 3.13).

3.3 Research Questions 3: How are teaching preparations made, and what constraints are felt by teacher candidates?

Here are the results of interviews with the math teacher candidates.

- (1) In preparing PowerPoint for teaching mathematics, the teacher candidates do the steps: preparing the material, entering the core of the material, and editing the material to make it look interesting.
- (2) They do not use any other software in a PowerPoint presentation.
- (3) All teacher candidates think that the main menu view on PowerPoint media makes it easy for them to use PowerPoint media.
- (4) In general, the way that is done to create an interesting image display on PowerPoint media is to choose backgrounds and animations that are interesting, simple, and in accordance with the characteristics of students.
- (5) In schools where the teacher candidates practiced to teach, the projector is not permanently installed in each classroom, so for its usage it must be pre-installed. It is perceived as an obstacle for four teacher candidates, but not for the others.
- (6) Six teacher candidates do not experience the problems in the implementation of teaching mathematics using PowerPoint. The other nine of them experienced, among other things, they found that some students only saw the PowerPoint display, and there were students who did not understand the lessons because the teacher candidates only included the important material. The solution taken to solve the problem is to more clearly explain the material of each slide, more thoroughly create slides for interaction, and balance between paying attention to the material with the PowerPoint slide show.

4. Conclusion

Based on the findings and discussion, it can be concluded as follows: (1) Students' perceptions on the use of PowerPoint in mathematics learning conducted by mathematics teacher candidate is positive, on learning activity aspect, lesson comprehension aspect, and organizing slides design and presentation; (2) The teachers' assessments of the use of PowerPoint in teaching mathematics conducted by

mathematics teacher candidates is in good category on the organizing aspects of the subject matter, good category on the aspect of activity and learning interaction, and good category on the aspect of slides organizing and presentation; (3) Teacher candidate designed teaching using PowerPoint as good as possible by trying to optimize the organization of materials, effective communication, and flexibility of the images/animation by considering the characteristics of students and the characteristics of subject matter.

It can be concluded that the use of PowerPoint helps students to learn and understand the subject matter. Although generally the students perceptions are positive and teacher appraisals are good, but the perceptions and assessments on the aspect of activity and interaction in the learning process is moderate. This means that agreement and disagreement on the points of statements related to this aspect tend to be the same. Statements with scores between 2.5 – 2.7 are PowerPoint presentations (1) foster students' active participation, (2) overall boring, (3) support scientific approach (students observing, asking, gathering information, associating information, communicating), and (4) provide opportunities for students to solve problems in various ways.

The percentages that respond strongly agree and agree outweigh the disagree and strongly disagree on the statement that PowerPoint presentations (1) make the student listen only to the teacher during the learning process, and (2) contain too many slides. So these two statements get a negative response. Meanwhile, 94.2% of students stated disagree and strongly disagree on the statement "The complete answer to the problem solving in PowerPoint is more helpful than when the teacher completes step-by-step". Note also that 86.1% of students stated that sometimes lessons are easier with PowerPoint, sometimes not.

From this fact, the researcher suggests if teachers use PowerPoint in mathematics learning, teachers should show math process step-by-step; not writing down as well as solving math problems in slides; create varied and interactive slide designs to avoid student boredom and enhance interaction; if necessary, integrate suitable software applications; and is not fixated on PowerPoint throughout the learning process.

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