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Statistical Reasoning Learning Enviroment (SRLE) in Teaching Video Improved Statistical Reasoning Skills

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Abstract

The goal of Statistics Education now is to foster education statistics and developing statistical reasoning skills in the classroom (Delmass, 2004). Although learning of statistics begins from preschool to professional level but still many students do not master in statistical reasoning. The studies were done by Thomas Jaki and Melanie Autin (2009), Bilgin& Crowe. S (2008) and Arinah et al (2012) have shown that social science postgraduate students do not dominate the statistics with good reasoning skills.

Therefore Statistical Reasoning Learning Environment (SRLE) model was introduced. SRLE model was developed based on the six principles of instructional design described by Cobb and McClain (2004). Process-oriented teaching and learning will help improve understanding SRLE next statistic can develop statistical reasoning skills.

Statistical reasoning instructional video (VPPS) was produced to test the effectiveness of the student. The results showed student were improving their understanding of statistics and they can accept this video as teaching aids and reference when doing research. Teaching aids based on technology-oriented and using principles of SRLE will facilitate students preparing for exams and referrals without the boundaries of time and place.

Keywords: Statistical Reasoning, Statistics, SRLE, Teaching Videos

1.0 Introduction

Education statistics were upgraded when the pedagogical integration of literacy statistics suggest, statistical thinking and statistical reasoning. Statistical reasoning involves processes such as reasoning based on data or graphics available, combining the ideas of statistical conclusions and further interpret the decision. According to Jones et al (2000) and Mooney (2002) there are four general process of describing the data, sort data, delegate data and analyze and interpret data. Data describing the process involves an individual is able to describe the features found on the chart or data provided. Moreover, one can identify the units that are in the data table. The second, an individual can describe the distribution of data, summarizing data and making the data center. In short, the individual is know to manage the data and use the correct way to analyze and interpret data. The third process is graphically depicts data such as creating graphs, complete data on a given data set and evaluate the effectiveness of the data displayed. The fourth process discussed involves an individual can analyze and interpret data using either mathematical operations to combine, integrating or comparing data.

Therefore, the teaching and learning of statistics is becoming increasingly challenging due to the change in the perspective of the number of calculations and procedures emphasis on the development of statistical reasoning (Garfield and Ben Zvi, 2007). DelMass (2004) put statistical reasoning as an explicit goal when he nurtured and developed in the classroom. He urged that the experience while learning statistics can

have a big impact not only in understanding the statistical emphasis in the calculation process and the procedures to be followed (Garfield & Ben-Zvi, 2007). Therefore model Reasoning Learning Environment Statistics (SRLE) was introduced. The model is based on constructivist learning theory. Approach is used as an interactive learning environment due to a combination of print materials, activities in class, culture and life, discussion, technology, and evaluation of the use of technology.

SRLE model consists of six principles of instructional design described by Cobb and McClain (2004) could be summarized as follows;

i. Focuses on the development of ideas centered not only showed statistical procedures alone.
ii. Using actual data in encouraging students to make a hypothesis.
iii. Promote activities in the classroom to develop reasoning skills among students.
iv. Using technology tools that allow students to test hypotheses, explore and analyze data, and develop statistical reasoning skills.
v. Encourage students to make a statistical argument and explain reasoning done by focusing on the idea statistically significant.
vi. To use the assessments to evaluate teaching plans and progress in developing statistical reasoning.

Teaching and learning process-oriented SRLE can help increase the understanding of statistical reasoning skills. Combined use of printed materials, the activities in the classroom, discussion, use of technology, teaching and assessment approaches can make teaching and learning of statistics is no longer difficult. It supports Moore (1997) which states that teaching and curriculum statistics should always be updated in terms of learning content, pedagogy and technology used. Next Garfield and Ben-Zvi (2008) asserts that technology plays a very important role in improving student achievement and teacher professional development in statistics.

Statistical learning now, much aided by the use of technology in either the calculation or teaching in the classroom. Garfield et al (2007) argue that technology has changed the method to analyze the data. The findings of the study conducted by Pea (1987; Garfield & Ben-Zvi, 2008) on the statistical upper-class students, students who are using technology to create graphs quickly and easily. The emphasis is on the exploration of data. Students are able to assess the graphs and explore a variety of information on the graph. Calculation is wrong and inaccurate sketch graphs can be avoided by using technology. Phenomenon line has been said by Chervaney et al (1977), Chernaney et al (1980), Rossman and Chance (2001) and delMass (2002) that the statistics are sharpening the mind to reason and think about the content and concepts of statistics based on statistical ideas (Garfield, 2002a). However, the technology is now more emphasis on the use of software to solve statistical problems and use technology to develop statistical reasoning is still lacking (Garfield and Ben-Zvi, 2008).

YouTube is a popular medium in the era of modern information and communication technologies now. YouTube, Podcasting, Blogs, Wikis, and RSS is the buzzword associated with the term Web 2.0 and a source of new learning in education. (Duffy, 2008). YouTube has grown very rapidly and has become the medium of very popular video sharing thus showing the importance of YouTube in education (Snelson, 2011). Snelson (2009) shows that YouTube has a potentialto become a medium of education for the YouTube video provides a free online video big in size on a broad spectrum. In

2009, YouTube has launched YouTube EDU are collections managed by the YouTube channel. YouTube channel is the founder of YouTube Edu consisting of partners from universities and colleges that are responsible for sharing educational videos. There is a video that covers all levels, from pre-school to postgraduate level. Situation allows students to make learning video on YouTube as a reference and a personal tutor in the future. However, according to Garfield and Ben-Zvi (2008), the existing video emphasizes the use of statistical software to solve problems and use technology to develop statistical reasoning is still lacking.

This study is to develop a learning videos will be effective teaching aids and accessible to assist students in interpreting and understanding the statistical data further strengthen statistical reasoning skills. The video can be accessed through YouTube makes the students can surf regardless of time and place. Design that is easy to understand the content and learning objectives are clearly making learning resources to guide students to learn and explore statistical reasoning skills. Feenberg (1999) pointed out that the video can not replace the teacher, but the video can be a facilitator in statistical learning and teachers should also be prepared to serve as a reference and supervising students during the learning process through video.

2.0 Problem Statements

Gravetter and Wallnau (2011) discusses the social science studentsis difficult to select the right statistical techniques. According to Garfield, (2002), there are four constructs, namely, explain the data, sort data, describe data, analyze and interpret the data. Studies conducted by Garfield (1998a, 1998b; Garfield, 2002) showed that graduate students can earn a good grade in a course but they are still weak in interpreting the data. Nowdays, the changes allow the students learning to solve problems and give a reason for the answer obtained. Thus, one step to change the paradigm of student is to use teaching aids that attract the students' attention as an instructional video.

The studies were done by Thomas Jaki and Melanie Autin (2009), Bilgin and Crowe. S (2008) and Arinah et al (2012) have shown that social science postgraduate students have not mastered the skill of statistical reasoning well as teaching and learning approaches are oriented procedures and calculation. The study was done by Arnold et al (2011) has suggested that the learning trajectory should carefully designed to stimulate students to have access to the reasoning process. It is caused by the signal-verbal, visual, and sensory role in developing students' thinking. Therefore, an instructional video is seen as an effective computerized technology in the medium to enhance students' understanding of statistical reasoning skills learned.

3.0 Objectives

This study was undertaken to meet the following objectives:

i. Produce two sets of instructional videos statistical reasoning (Video Pengajaran PenaakulanStatistik, VPPS) in the title of the correlation and regression and hypothesis testing based on the principles SRLE.

ii.Evaluate the effectiveness of instructional videos statistical reasoning (VPPS) among postgraduate students pursuing subjects Statistics in Educational Research

in context:

a. comparative differences in statistical reasoning before and after the use of VPPS.

4.0 Methodology

Detail design is a reference to the ADDIE model, the sample is selected based on fixed criteria and not taken randomly and used instruments built on constructs that have been set.Table 4.1 shows a brief description of each phase of the ADDIE model

Table4.1 : ADDIE Model

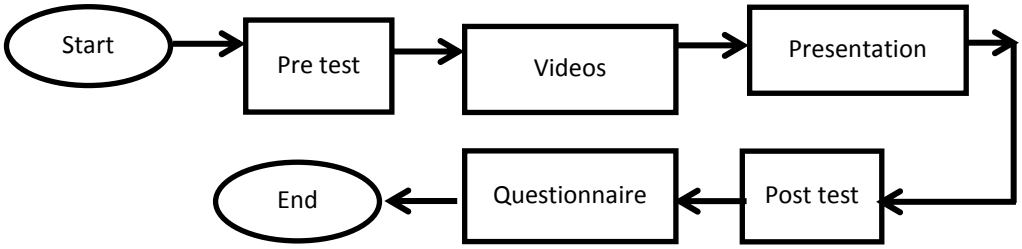
Phase	Job Duties	Results
Analysis	i. Analysis of user requirements ii. Analysis of Statistical Teaching Video on Youtube iii. Analysis features SRLE	i. Statement of the problems ii. Learning Contents iii. Objectives of videos development
Design.	i. Framework learning objectives ii. Teaching strategies iii. Development of contents of learning	i. Learning Objectives ii. Specifications of design iii. Storyboard and flowchart iv. Scripts, media and learning materials
Development	i. Production of media and video ii. Strategies of video management	i. Video Development
Implementation	i. Planning and management of video lessons	i. Upload the videos on YouTube ii. The videos can be accessed by students
Evaluation	i. Formative assessment ii. Summative evaluation	i. The Video fulfill the principles of SRLE ii. Video meets the criteria for technology tools inlearning statistics.

Table 4.2 shows the way to translate the principles of SRLE in developing the videos.

Table4.2:List of Key Principles SRLE

No	Keys	Principlesof SRLE	Descriptions
1	SRLE1	Focuses on the development of ideas centered not only showed statistical procedures alone.	Emphasis on the use and interpretation of data from the use of the software.
2	SRLE2	Using actual data in encouraging students to make conjectures.	The data are discussed from an authentic source is not fictitious. Data is relevant to reality.
3	SRLE3	Promote activities in the classroom to develop reasoning skills among students.	Activities provided by involving students directly.
4	SRLE4	Using technology tools that allow students to test hypotheses, explore and analyze data, and develop statistical reasoning skills.	Demonstrating the use of appropriate software to analyze the data.
5	SRLE5	Encourage students to make a statistical argument, explaining reasoning done by focusing on the idea statistically significant.	Prepare questions why and to stimulate students to interpreting the data.

Picture 4.1 shows the processes of evaluation in study the effectiveness of VPPS in learning statistical reasoning.



Picture4.1 : Flowchart for the process evaluation conducted

5.0 Data Analysis

Overall, the VPPS 1 has helped students understand the statistical requirements. SRLE applied in VPPS 1 deeply affects the development of statistical reasoning, based on repeated measurements ANOVA p value was 0.00. Overall construct of mutual significance to each other except for the constructs describing data constructs and constructs delegate compiling data to construct data analysis. Table 5.1 below shows the results of analyzes using Tukey's HSD test (Honestly Significant Difference) through the use of on-line calculator.

Table5.1 : Table cross each construct for VPPS 1

	Organizing Data	Organizing Data	Analyzing Data
Describing Data	No significant	Significant	Significant
Organizing Data		Significant	Significant
Data Representing			No significant

Overall, the VPPS 2 also has helped students understand the need for statistical hypothesis testing. The analysis of repeated measurements, ANOVA showed a significant level of 0:00. However, based on table 5.2 shows the result of analysis for each constructsthat using Turkey's HSD test. SRLE applied in VPPS 2this deeply affects the development of statistical reasoning.

Table 5.2 : Table cross each construct for VPPS 2

	Organizing Data	Organizing Data	Analyzing Data
Describing Data	Significant	No significant	No significant
Organizing Data		Significant	Significant
Data Representing			No significant

The conclusion of VPPS 1 and VPPS 2 have been helping students in statistical reasoning as a whole because of repeated measurement ANOVA showed p for both post-test was 0.00.

Table 5.3 shows the measurement constructs of statistical reasoning for VPPS 1 and VPPS 2. All analytical results for the constructs show a significant level of greater than 0.05. It showed no difference between the constructs except for the constructs describing data. However, based on the analysis of the T test for overall score is the significant level 0.34 >0.05. The findings reinforce that there is no statistical difference in the mean of the reasoning for the post-test and post-test for VPPS 1 and VPPS 2.Figure 5.1 shows a comparison of conduction VPPS 1 and VPPS 2 according to statistical reasoning constructs derived from the pretest and posttest. The score by increasing constructs for posttest of VPPS 2 except for constructs delegate data. The results of both analyzes were similar.

Table5.3 : The measurement of statistical reasoning constructsfor VPPS 1 and VPPS 2

Constructs	Level of Significant
Describing data	0.00
Organizing data	0.33
Data Representing	1.00
AnalyzingData	0.30

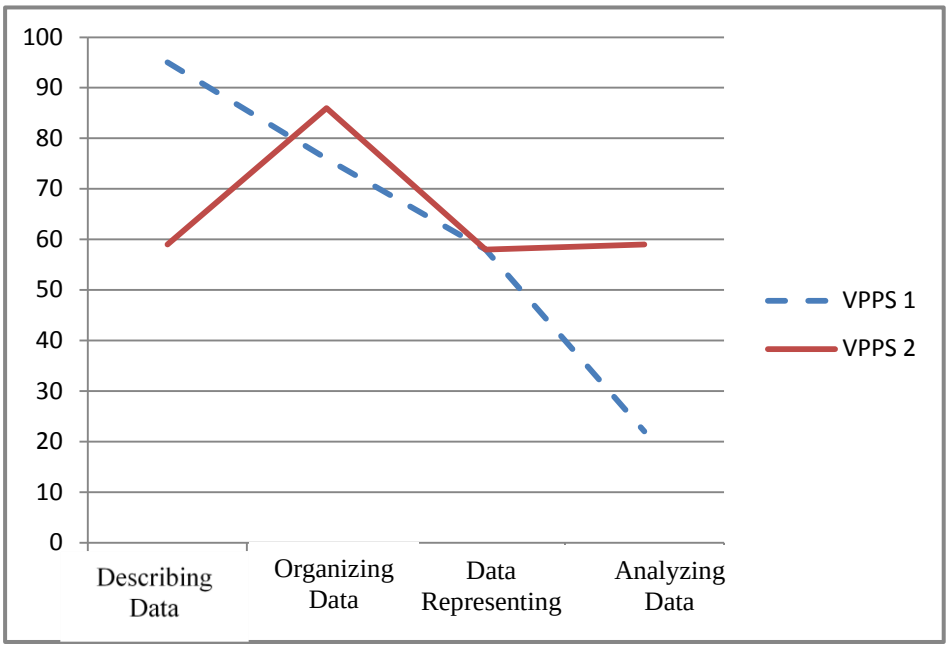


Figure 5.1 : Comparison of conduction VPPS 1 and VPPS 2 according to statistical reasoning constructs

6.0 Discussion

Two sets of video lessons that apply SRLE help respondents improve statistical reasoning. VPPS 1 is the title of the correlation and regression while VPPS 2 for the title of hypothesis testing. VPPS 1 very helpful respondents understand the needs of correlation and regression in testing hypotheses. VPPS 2 help respondents selecting statistical techniques to use in their research. As the findings of the study that conducted by Everson and Garfiled (2008) showed the availability of technology can help to understand the next statistics to analyze data during teaching and learning. VPPS can be accessed on YouTube by URL: http://www.youtube.com/watch?v=E-dRc6z91CUand http://www.youtube.com/watch?v=yvxEPHiJx0cfor VPPs 1. While the URL http://www.youtube.com/watch?v=5eNkH-jay2Eand http://www.youtube.com/watch?v=hH5c1NF8ZmY for VPPs 2.

The respondents among postgraduates who have followed the concept of learning through instructional videos SRLE showed an increase in the share of statistical reasoning for each construct. The results showed, the statistical reasoning of respondents increased in all constructs after using VPPS 1 and VPPS 2 during the teaching and learning at postgraduate level is a good approach for developing statistical reasoning. Even the use of a variety of software to test hypotheses and analyze the data to provide the user a bit more friendly to the respondents in the study of statistics and not only from the point of view of statistical calculations. Statistical reasoning should be

used during the review process to undergo. The findings of previous studies focused on the perception and acceptance of these instructional videos.

7.0 Conclusion

Implications for postgraduates show that VPPSare very helpful for respondents in learning statistical reasoning. Respondents showed a good performance after using VPPS. Respondents are most understanding in describing data, organizing data, data representing and analyzing data after followingthe VPPS. Respondents knew more clearly the use of software as well as to analyze the data properly. Respondents present reasoning skills based on questions that provoke arguments and build statistical ideas. Moreover, VPPS help the respondents to interpret the findings in more detail. Respondent did not just learn about statistical concepts and ideas can enrich the use of statistics. Respondents saw very widespread use of statistical various fields such as video examples of culture.

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