PROC. INTERNAT. CONF. SCI. ENGIN.
Volume 3, April 2020 | Pages: 371-373

ISSN 2597-5250
E-ISSN 2598-232X

Teaching an Undergraduate Statistics Class in Digital Era

Siti Rohayati*, Asrifatun Agustini, Ahmad Anis Abdullah
Department of Mathematics Education, Universitas Alma Ata, Yogyakarta, Indonesia. Telp.+62- 274- 434 2288.
Email*: rohayati1610@gmail.com

Abstract. Nowadays technological developments are increasingly creative and tend to move towards digital. Technological developments have a major impact on the process of statistical learning at the University. In addition, many students lack understanding of statistical concepts and do not like statistical learning. In this paper, it is given a way of involving technology in the undergraduate class statistics teaching and what statistical concepts are needed in this digital age. Thus, it is hoped that the teaching of the undergraduate statistics class becomes something interesting and fun.

Keywords: digital Era, Teaching Statistics

INTRODUCTION

The era in which we live today is known as the digital age. In this era of technology, change happens very quickly. Given the rapid progress of this technology in the 21st century, universities have the responsibility of training "Digital citizens" in order to have skills, knowledge, the Internet and access to technology where they live now and in the future (Isman and Gungoren, 2014). As for the characteristics of digital citizens in Student Learning & Academic Performance is the process of teaching and learning about technology and the use of technology or better known as digital literacy (Ribble, 2011). So that the role of humans is irreplaceable by technology, in entering the digital age, a new paradigm is needed in the education system. Smart university as "a platform that acquires and delivers foundational data to drive the analysis and improvement of the teaching & learning environment," by retrieving sensor-data, and using linked (open) data and formalized teaching knowledge (Coccoli et al. 2014).

In the digital age. Statistics are so famous, this is because almost all aspects of life talk with data. Statistical data becomes a reference for various policy making both personal and public. In everyday life, so much data is found, but not much can read and use data (Abdullah, 2017). Therefore, statistical learning must adjust to the demands and development of technology. Learning statistics using traditional methods without involving the role of existing technology, will cause students to be trapped by the calculation process and have a negative perception of the statistics themselves. This paper describes some of the students' mistakes in working on statistical problems and provides statistical learning solutions in the digital age based on several existing studies.

(delMas, 2002) discusses several definitions from three areas of statistical development, which include statistical literacy, statistical reasoning, and statistical thinking and provides illustrations in combining these three parts in teaching, learning, and interpretation of statistics.

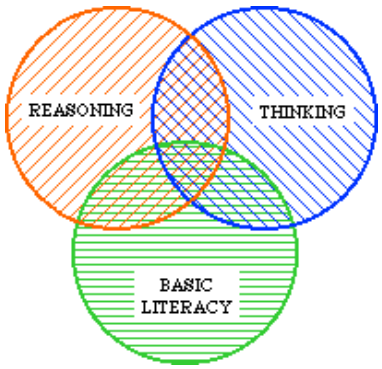

Figure 1. The relationship between statistical literacy, statistical reasoning, and statistical thinking (delMas (2002)).

Statistical literacy is the ability to translate and evaluate any statistical data circulating in society through various communication media. statistical reasoning (statistical reasoning) as a way of thinking statistics in producing statistical information. This includes the ability to interpret a set of data, graphics and a number of statistical information. Another understanding states that statistical reasoning is the ability of students to do statistical calculations and reasoning on statistical concepts. Statistical reasoning is widely used Statistics teachers, use it in teaching students to be able to work on statistical calculations and understand statistical concepts and understand presenting data. Therefore the use of statistical reasoning (statistical reasoning) is commonly found in education, especially in statistical learning.

MATERIALS AND METHODS

This research is a descriptive qualitative research to reveal mistakes made by students in solving educational statistics problems and find solutions to foster student motivation and interest in statistics in the digital age. Subjects were prospective students of Islamic Religious Education at Alma Ata University Yogyakarta in the 6th semester of the 2018-2019 academic year consisting of 44 students. The scope of the discussion of educational statistics material in this study adjusts the Semester Learning Plan (RPS) of the PAI UAA study program, namely descriptive statistics and inferential statistics. To obtain research data, data collection techniques are carried out as follows: (1) written test, this test consists of 2 midterm questions, a descriptive statistic used to diagnose the location and type of student error, the test is validated by two validators by 2 Education lecturers UAA Mathematics, (2) interviews with subjects using interviews to gather further information from the results of the test, the subject, and can find out the factors or causes of the problem, and find solutions to foster motivation and student assistance for statistics in the digital age. Data analysis in this study used data reduction, data presentation, and conclusions.

RESULTS AND DISCUSSION

Next is the analysis of statistical skills based on the answers of 44 subjects on the midterm, with the first question.

1. Known data values of students from 2 classes, with the results of descriptive statistics as follows:

Data	Class A	Class B
total students	10	10
Mean	72	72,5
Median	75	60
Mode	75	60
Standard Deviation	6,75	18,14
Variance	45,55	329,17
maximum score	80	100
minimum score	60	55

Based on the table above, make a comparative analysis between the 2 classes!Berikut merupakan hasil uji normalitas dengan kolmogorov-smirnow dengan spss !

Figure 2. Results of descriptive statistics.

In this question, some students still answer that the grades of students in class B are better than students in class A. This is because the average class B is higher than class A, as well as the maximsmum value of class B is also higher than in class A whereas the value of variance in class B is higher than in A. In this case it can be analyzed that students lack understanding of the meaning of centralizing data and spreading data. In learning practice students are often trapped in memorizing formulas and calculation processes manually. Though the development of existing technology can replace the two activities. Likewise in the case of the answer to the second question.

2. Following is the correlation between disciplinary and achievement research data.

Correlations

			Prestasi	Kedisiplinan
Spearman's rho	Prestasi	Correlation Coefficient	1,000	,630**
		Sig. (2-tailed)	.	,003
		N	20	20
	Kedisiplinan	Correlation Coefficient	,630**	1,000
		Sig. (2-tailed)	,003	.
		N	20	20

make conclusions based on the results put out above spss!

Fiqure 3. Correlation result..

In this second question, there are still many students who have difficulty in making this decision because of the existing learning, students are trapped in the process of inputting data into spss and not understanding the results of output from the spss program. This shows the ability of students in reading the results out of the SSP is still weak.

Based on the mistakes above, it can be concluded that the students' literacy skills are still weak, especially their ability to read data. Many statistics educators agree that any introductory statistics course must improve students awareness of data in their daily lives and prepare them for a career in the current "information age" (Rumsey, 2002). Therefore, the ability of statistical literacy with data literacy must be combined because of the large role of data in today's life. This is in line with definitions of statistical literacy with that of data literacy allows for the development of citizens who can access and analyze data from government or from their own personal sensors in order to answer their own questions, giving them a powerful voice in a democratic society (Gould, 2017).

As for students' statistical reasoning abilities, the use of existing information technology such as SSS, geogebra, R, etc. helps students develop statistical reasoning. According to (Fitzallen, 2007), there are six fundamental criteria of Tinker Plots that made it a popular teaching and learning software. First of all, it has user-friendly and easy to use interface. Secondly, it allows data to be represented in a variety of forms. Thirdly, it aids in translating between mathematical expression and natural language. Fourthly, it expands the memory when organizing or reorganizing data. Fifthly, it offers multiple entry points for abstract concepts, and finally it provides visual representations of activities.

In addition, (Chan and Ismail, 2012) say that some students consider statistics not relevant to their daily lives and future careers. Therefore, instructors must deploy real-world data in teaching and learning statistics like recent world populations, the number of internet users in the world, the death rate of cancer patients, and so on. Students must be given real-world data to analyze, interpret, and explore using technological tools. Moreover, research shows that instructors and students have technology anxiety, especially new technology. Because of this, the instructor should given sufficient training on the use of new technological tools for statistics to be prepared in advance transfer knowledge to their students. In addition, to reduce technology anxiety among students, the instructor must give them enough

time to familiarize themselves with the new technological tools. In technological environment, the instructor acts as a facilitator to help students when they face problems in learning.

Basic principles Statistical thinking has not changed, but its implementation has changed. This has become a need to respond to technological developments. The process of data collection is developing rapidly, thanks to technological advancements, or better known as the term "Big Data". Statisticians respond more flexibly and broadly method of analysis. This depends, of course, not only on strength modern computation but also on the strong extension of classical theory, which shifts the burden of mathematical analysis to the computer algorithm but demands careful discussion for the formulation of principles (Cox and Efron, 2017). (David and Brown, 2010) say that one of the methods that succeed in improving statistical thinking skills is to encourage students to think 'Why? not 'How?'. (Ben-Zvi, 2011) describe comprehensively learning environment designed to develop teacher statistical thinking and conceptual understanding around five main themes: development understanding key statistical concepts; develop the ability to explore and learn from data; developing statistical arguments; using formative assessment and learn to understand students' reasons.

Based on the above discussion it can be concluded that statistical learning in the digital age must involve the role of existing technology. This is due to the learning style characteristics of students in the digital age. Nevertheless lecturers must be able to base students with basic concepts and basic principles of statistics. In addition to students being able to use technology to process data, students must also be able to read the outputs of data processing. As well as being able to choose the right method for the decision making process based on available data.

CONCLUSION

Based on the mistakes above, it can be concluded that the students' literacy skills are still weak, especially their ability to read data. As for students' statistical reasoning abilities, the use of existing information technology such as SSS, geogebra, R, etc. helps students develop statistical reasoning. Based on the above discussion it can be concluded that statistical learning in the digital age must involve the role of existing technology. This is due to the learning style characteristics of students in the digital age.

REFERENCES

Abdullah, Ahmad Anis. 2017. "Statistical Literacy For Beginner Voter." *Proceedings of 1 st Ahmad Dahlan International Conference on Mathematics and Mathematics Education* (8): 13–14.

Ben-Zvi, Maxine Pfannkuch and Dani. 2011. "Developing Teachers' Statistical Thinking." *Teaching Statistics in School Mathematics - Challenges for Teaching and Teacher Education A Joint ICMIIASE Study* 14(January): 41–45. http://www.springerlink.com/index/10.1007/978-94-007-1131-0.

Chan, Shiau Wei, and Zaleha Ismail. 2012. "The Role of Information Technology in Developing Students' Statistical Reasoning." *Procedia - Social and Behavioral Sciences* 46: 3660–64. http://dx.doi.org/10.1016/j.sbspro.2012.06.123.

Coccoli, Mauro, Angela Guercio, Paolo Maresca, and Lidia Stanganelli. 2014. "Smarter Universities: A Vision for the Fast Changing Digital Era." *Journal of Visual Languages and Computing* 25(6): 1003–11.

Cox, D. R., and Bradley Efron. 2017. "Statistical Thinking for 21st Century Scientists." *Science Advances* 3(6): 1–6.

David, Irene, and Jennifer Brown. 2010. "ICOTS8 (2010) Contributed Paper Refereed David & Brown." *Teaching Statistics* 8.

delMas, Robert C. 2002. "Statistical Literacy, Reasoning and Learning: A Commentary." *Journal of Statistics Education* 10(3).

Fitzallen, Noleine. 2007. "Evaluating Data Analysis Software: The Case of TinkerPlots." *Australian Primary Mathematics Classroom* 12(1): 23–28. http://link.springer.com/10.1007/s11575-008-0104-y%5Cnhttp://www.palgrave-journals.com/doifinder/10.1057/jibs.2009.24%5Cnhttp://linkinghub.elsevier.com/retrieve/pii/S0925527313002028%5Cnhttp://www.palgrave-journals.com/doifinder/10.1057/palgrave.jibs.8400.

Gould, Robert. 2017. "Data Literacy Is Statistical Literacy." *Statistics Education Research Journal* 16(1): 22–25.

Isman, Aytekin, and Ozlem Canan Gungoren. 2014. "Digital Citizenship." 13(1): 73–77.

Ribble, Mike. 2011. "The Nine Elements of Digital Citizenship." *Digital Citizenship in Schools* 3777: 15–44. http://www.iste.org/docs/excerpts/DIGCI2-excerpt.pdf.

Rumsey, Deborah J. 2002. "Statistical Literacy as a Goal for Introductory Statistics Courses." *Journal of Statistics Education* 10(3).

THIS PAGE INTENTIONALLY LEFT BLANK