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To cite this article: W Susilawati and I Nuraida 2021 *J. Phys.: Conf. Ser.* **1869** 012129

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# Mathematic connections through scientific prezi and lectora inspire

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**Abstract.** The low quality of students in mathematical connections requires learning processes using technology-based. The purpose of the study was to analyze the ability of mathematical connections between students learning scientific based on prezi, lectora-inspire and conventional learning. This study used a quasi-experimental method and a nonequivalent control group design. Involving a sample of 84 students from three senior high school classes which were divided into an experimental group and a control group as a test instrument for mathematical connection ability. The data analysis uses independent T-test, one way ANOVA, and post hoc least square differences test. The finding is that there are differences in the improvement and achievement of mathematical connection skills between students who carry out prezi-based scientific learning, better than students who have lectora-inspiration based learning and conventional learning. Prezi and lectora-inspire scientific learning facilitates students interaction processes to construct concepts, find problems, apply media, and reflect processes so that it can improve students mathematical connection abilities.

## 1. Introduction

Mathematic as structural knowledge ad systematic implies the fact, concepts, principles, and procedure are interrelated with another. Mathematics has a hierarchal relation that not portioned on a variety of separate topics. Mathematics as a structured and systematic science implies that facts, concepts, principles and procedures are interrelated with one another. Mathematics has a hierarchical relationship pattern that is not partitioned on a variety of separate topics, but mathematics is a unified whole. In learning mathematics Linto assert that one material may be a prerequisite for other material, or one concept is needed to explain another concept [1]. The ability of mathematical power that can be thrive to see the relation of these concepts including the criteria for the characteristics of mathematical connection ability [2].

Learning mathematics will be more meaningful if each student can connect all the knowledge he has. This is in line with opinion by Rohendi and Dulpaja mathematical connections or mathematical connections or connections in mathematics study the students' understanding of connecting the mathematical ideas that will facilitate the ability to formulate and verify conjectures deductively between topics [3]. The mathematical concept and procedure developed which are newly can be applied to solve the other problems in mathematics and other disciplines. in the good category. The research results state García-García J and Dolores-Flores that mathematical connection as a cognitive process that connects two or more ideas, concepts, definitions, theorems, procedures, representations and



meanings of mathematics with other disciplines or with real life [4]. The connections contained in the basic concepts of mathematics are differences in representation, procedural, features, reversibility, and meaning as connections. Moreover, the results stated García-García J and Dolores-Flores that mathematical connections play an important role in achieving students mathematical understanding abilities [5].

Mathematical connection skills are very important abilities be possessed by students. However, empirically the ability of students' mathematical connections is still low. The low of ability's mathematical connection is found in several research results, Danaryanti A and Tanaffasa who examined the mathematical connection ability, which resulted in an average achievement score mathematical connection ability of only 63.3% [6]. Same as research conducted by Saminanto also shows that the average mathematical connection ability of secondary school students is still low, which is only at a value of 34%, so the ability of the mathematical connection is not in the good category yet [7]. Anandita states that out of 37 students the level of mathematical connection ability was obtained by 18 students included in the very poor category, 10 students belonging to the poor category, 6 students in the moderate category, 2 students in the good category and 1 student in the excellent category [8]. The results of a preliminary study conducted at Senior High School in Bandung by providing tests in the form of a matter of mathematical connection ability obtained results that students' mathematical connection ability is still low and needs to be improved. This is in accordance with the research of Rawa et al which states that the ability of students' mathematical connections, especially in trigonometric material is still very low such as the difficulty of students connecting mathematical ideas to the material [9].

One of the factors that affect students' mathematical connection ability is the application of instructional media that supports students in visualizing or representing mathematical problems. This is consistent with the statement revealed by Susilawati that technology-based learning will facilitate the learning process so that it can improve the quality of students' mathematical abilities [10]. One of the mathematics learning media that can help connect mathematical problems is the application of Prezi and Lectora Inspira. Prezi is used as a tool to explore and share ideas on a virtual canvas. Through prezzi, students will review concept maps more interestingly because they have the advantage of being a zoomable canvas for the beginning of learning. Students are involved in examining the relevance of various topics in mathematics and their role in everyday life. Wirawan state that the application of scientific approaches using prezzi software can improve student learning outcomes [11]. The applicational of Prezi can improve the ability of mathematics learning outcomes [12]. The study revealed Akgün et al that the Prezi application became an alternative for the conceptual learning process and reduced the cognitive load of students [13].

While Lectora Inspire is an effective program in making learning media and is an electronic learning development software (e-learning) that is relatively easy to apply because it does not require an understanding of sophisticated programming languages. The learning process will be more fun and meaningful so it affects on the increase in student learning achievement [14]. Revealed that learning with the Lectora Inspire application makes it easy for students to understand the material and students are enthusiastic during the learning process [15]. Interactive learning assisted by lectora inspire software can improve student learning outcomes in mathematics.

Based on the problem above, an alternative improvement in mathematics learning is needed, through a scientific approach based on prezzi, and inspector lectora that provides opportunities and confidence for students to be actively involved on the process of learning mathematics in the classroom. The scientific approach to the learning process is designed so that students actively construct facts, concepts, principles and procedures through the stages of observing (to identify or find problems), formulate problems, propose or formulate hypotheses, collect data with various techniques, data analysis, draw conclusions and communicate the concepts found [16]. That the scientific approach is a learning approach that emphasizes the activities of students through observing, asking, reasoning, trying, and networking in learning activities in schools [17].

According to the research Yuliyanto et al shows that a scientific approach can develop the character of discipline and student responsibility and is better than conventional approaches [18], Gallego revealed that there are several learning models that can be implemented to accommodate scientific approaches such as problem problem based learning, project based learning, cooperative learning, discovery learning, inquiry learning [19]. According to Rusman the scientific learning approach is a golden bridge for the outgrowth and development of students' attitudes, skills and knowledge [17]. While Coe et al revealed that in scientific learning, each teacher must analyze the learning implementation plan to find out the effectiveness of the learning undertaken [20]. Opinion that further confirms that the scientific approach in learning oriented to the steps of scientific work revealed Sufairoh from the point of view of the process, the scientific approach is a learning approach oriented to the steps of scientific work [16]. Ryan expressed their opinions on a scientific approach, namely: The scientific method is a process used to validate observations while minimizing observer bias. Its goal is for research to be conducted in a fair, unbiased and repeatable manner [21]. Hosnan argues that the scientific approach is intended to provide understanding to students in knowing, understanding various materials using a scientific approach, to obtain information from various sources in finding out, both through observation and research [22]. The purpose of the paper is to analyze differences in the ability of mathematical connections between students who carry out Prezi-based scientific learning, inspector-based scientific learning and conventional learning

## 2. Methods

This study uses a quasi-experiment method with non-equivalent pretest-posttest control group design. Involving a sample of 84 students from three senior high school classes in Bandung. Class X IPA-2, as an experimental group I, was studied using Prezi-based scientific learning. Class X Science-5, as an experimental group II, studied using Lectora-Inspire-based scientific learning, and class X Science-1, as a control group, studied using conventional learning. The test instrument in this study was to use mathematical connection skills, Independent T-test data analysis, one way ANOVA, and post hoc least square differences test. The research step is divided into four stages; preparation phase, implementation phase, data analysis stage, and conclusion stage.

## 3. Results and discussion

Each student gets a pretest before learning to find out the difference in the ability of mathematical connections between Prezi classes, Lectora-Inspire classes, and conventional classes. The result of pretest from class Prezi, class Lectora-Inspire, and control class have average score on each class in consecutive are 12.18, 10.07, and 15.45. the higher average score of pretests is obtained by control class and the lowest score of pretest is gotten by class Lectora -Inspire. Data of pretest average score on each class; on experiment class Prezi, lowest score is class Lectora -Inspire and the higher is 26. On class Lectora-Inspire, the lowest score is class Lectora-Inspire and the higher is 23. Whereas the lowest score of control class the higher is 27.

In addition to pretest data, to knowing the differentiation mathematics connection students competence after carry out the learning process on each class, they take a post-test. Average score posttest highest owned class lectora - inspire with average 63,43 dan lowest average on control class with score 34,86. Posttest score every class, in experiment class Prezi lowest score student is 29 and highest score is 88. Then experiment class Lectora-Inspire, student with lowest score get score 22 and highest is 77. While control class getting lowest score 15 and highest is 53. While the data used ANOVA test provide data to increase in student's mathematical connection skill is the data normalized gain whose average work result are presented in the following table: Test one-way ANOVA data n-gain used SPSS. The decision criteria are  $H_0$  rejected if  $Sig < 0,05$  and  $H_0$  accepted if  $Sig > 0,05$ . By using SPSS software, this is summary one-way ANOVA data n-gain test presented on this table 1.

**Table 1.** ANOVA test result data N-gain.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2,43	2	1,21	43,39	0,002
Within Groups	2,27	81	0,028		
Total	4,67	83			

Table 1 inform through sig score is  $0,02 < 0,05$  so  $H_0$ -rejected mean there is an increase ability of macthematic connection student used learning based Prezi better than learning based Lectora Inspire an conventional. Often of that on table 1 also seen if score F is  $43,39 > F$  table (3,11) is mean  $H_0$ -rejected. Based on calculating one way ANOVA test, it is know if  $H_0$  rejected or accepted, then carried out advance test post hoc namely LSD test, where the test is used for the assumption of data N-gain is normal data distributed and have variances homogeneous.

**Table 2.** Post Hoc Least Square Differences (LSD) test.

Class wich compared		Differen average	Sig.
Experiment I	Experiment II	0,1239	0,001
	Control	0,4061	0,069
Experiment II	Experiment I	0,1239	0,001
	Control	0,2821	0,078
Control	Experiment I	0,4061	0,069
	Experiment II	0,2821	0,078

Table 2 infrom the presented analysis post hoc test N-gain data obtained different upgrading connection mathematic ability student based on N-gain data between the three class that implement scientific learning based Prezi better than scientific learning based Lectora Inspire and conventional learning. The three class data is a basic assumption in advance the normality and homogeneity test, the resulting data obtained three class of N-gain is normal distribution and homogeneity variance.

After the basic assumption test is performed, then one way ANOVA test to find out there are in improvement between the three class, and the result is a different upgrading mathematic connection ability between there class. But the different upgrading not apply to experiment class prezi and control class as well as experimental class lectora-inspire after the LSD test, the result showed that not difference in upgrading mathematic connection ability student that used science learning based Prezi, science learning base Lecture Inspire, and conventional learning. But the different result indicated their difference in upgrading first student's ability of mactehmatic connection between student who get scientific learning based Prezi, Lectur Inspire and conventional.

Scientific learning based prezi and scientific learning based lecture-inspire. This is showing the influencece of the learning model to increase student test result. Because if we compare average of pretest and average of posttest it obvious difference. The sequence from the highest to the average pretest three classes, the control, the experiment class prezi, and the experiment class lectora- inspire. As for the order of the third posttest average grade of the highest, the experimental class prezi, class control and final experimental class lectora-inspire.

Application of prezi app, on macthematic learning process became very influential in lectora- inspire learning. But do not make lectora- inspire no effect at all. However based on the findings in the field of applications Prezi slipped on the steps of the scientific study be very helpful in improving the ability of student compared with the mathematical connection with the application lectora-inspire learning. So learning scientific based prezi better than scientific learning based lectora inspire and conventional learning.

In accordance with the findings presented by Rofiyarto and Sari that the existence of technology can be an interesting learning medium that can facilitate teachers in managing and delivering messages to students [23]. Wirawan research results state that the application of a scientific approach using prezi software can improve student learning outcomes [11]. Then the results of research by Zuhri and Rizaleni

show that Lectora Inspire learning media has an important role in helping the learning process because it is relatively easy to apply or apply by teachers who support the activities of educator interaction in learning activities [24]. So it is clear from the improvement data, students who get the prezi application scientific learning process provide increased mathematical connections for students who are higher than students who carry out the scientific learning process of the Lectora Inspire application and students who carry out the conventional learning process.

Based on the sequence of pretest and posttest of data can be compared to no change in position between the two experimental classes and control classes. This indicates a change before and after treatment usage. Implementation of scientific approach in mathematics proposed by Rusindrayanti and Santoso showed that the ability of teachers to manage the process of learning to be more creative and innovative in order to improve outcomes and student motivation [25]. Anisah et al reveal that the android scientific based learning can improve students' ability in solving mathematical problem solving [26]. In accordance with the results of the study Norton et al that computer applications are used by students to facilitate mathematical conceptualization. Examples of Prezi applications in learning mathematics, below the image there is a part of the media that contains learning videos [27].



**Figure 1.** The Prezi section that contains the video.



**Figure 2.** Display mathematical content on the Prezi screen.



**Figure 3.** Inspector lektora screen.

#### 4. Conclusion

There is an increase and achievement of students mathematical connection abilities that studied using Prezi-based scientific learning, better than Lectora-Inspire-based and conventional learning. The order based on the performance of the three classes are classes with Prezi-based scientific learning, Lectora Inspire-based scientific learning, conventional learning. The advantage of using Prezi is the varies interface and the ZUI animation technology make presenting far more interesting compared to power point, so it can improve the ability of mathematical connections compared to learning through Lectora-Inspire or conventional learning.

#### Acknowledgements

The authors acknowledge special to the Research and Publishing Center UIN Sunan Gunung Djati Bandung the financial support.

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