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The Effect of the Jigsaw Learning Model in Animal Tissue and Body Structure Courses on Student Problem Solving Ability

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Abstract: This study aims to find out how students' problem-solving skills in the subject of animal body tissue and structure use the Jigsaw learning model. This type of research is quantitative research with a sample size of 70 students of the biology education study program. The research sample was taken from students who were normally distributed, had the same characteristics (homogeneous), and had the same average value. The data analysis technique uses simple linear regression. The results showed that there was a significant influence between the Jigsaw cooperative learning model in the animal tissue and body structure course on the problem-solving abilities of students in the biology education study program with a significance value of $0.000 < 0.05$, so that the jigsaw learning model can help students improve problem-solving skills.

Keywords: Jigsaw method; Learning model; Problem solving ability

Introduction

Learning is a process of interaction between students and teachers and learning resources in a learning environment (Fahmi et al., 2021; Karakaya et al., 2020). According to Corey, learning is a process in which a person's environment is deliberately managed to allow him to participate in certain behaviors under special conditions or respond to certain situations, learning is a special subset of education (Sagala, 2011). Learning achievement can be successful if it is in accordance with the characteristics of the subjects taught by the teacher.

Biology as part of school subjects provides a variety of learning experiences (Greener et al., 2022) that are closely related to the discovery process in order to understand the natural surroundings. In essence, learning biology is learning that emphasizes giving direct experience (Walad et al., 2019). Biology learning ideally allows students to carry out a series of science process skills (Hugerat et al., 2021) starting from observing, classifying (classifying), measuring, calculating, predicting, communicating, asking

questions (asking), concluding, controlling variables, formulating problems, making hypotheses, designing investigations, conducting investigations/trial (Rusmini et al., 2021; Sudarisman, 2015; Widodo & Budijastuti, 2020).

Biology is a science that can develop along with the times. Biology is a science that is closely related to the natural surroundings (Neftci & Averbek, 2019). One object of student-level biology study with quite a lot of material is the subject of animal body tissue and structure. Biology is a very complex science, therefore it requires students to be active in studying biology material. One that can activate students in learning and in accordance with the material that students will receive is the variation in the use of learning models.

The learning model is a conceptual framework that describes a systematic procedure in organizing learning experiences to achieve certain learning goals, and serves as a guide for learning designers and teachers in planning and implementing teaching and learning activities (Indrawati, 2011). However, not all teachers carry out variations of the learning model when teaching

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in class due to limited time allotment. This is in line with the problems at the University of Muhammadiyah Surabaya. Biology learning that takes place at the University of Muhammadiyah Surabaya has actually been carried out well. However, there are still a number of things that need to be improved so that learning biology can take place optimally.

Based on the results of interviews, teaching biology at Muhammadiyah University in Surabaya, lecturers still use the Direct Instruction learning model. The use of this model does not involve students in teaching and learning activities because activities are still centered on the teacher, so students become passive. This is the cause that makes students' motivation to learn reduced. Student with a high level of motivation will be active in trying, appear persistent, and not give up easily and actively read books to increase his knowledge in solving problems (Erbas & Demirer, 2019; Prawita & Prayitno, 2019; Tokan & Imakulata, 2019). Based on daily test scores for animal body tissue and structure courses, students who have not met the graduation criteria. In addition, students' daily test scores did not achieve good results, even though the lesson was delivered clearly enough. This is because the breadth of the content of the material delivered with the Direct Instruction learning model makes students feel bored. In addition, students feel that this learning material is quite difficult because it is an abstract subject matter.

Learning in the 21st century has several principles, one of which is that learning must be learner-centered (Elkhidir, 2020; Kalu-Uche & Emeka, 2020). Students are placed as active learning subjects in their learning. Students are not required to memorize lecture material, but build their own knowledge according to the level and capacity of developing their thinking. Students are also required to be able to solve real problems that exist in society (Khoiri et al., 2021).

Students are required to be able to use their abilities to try to solve the problems they face independently, students must also have the ability to compile and express, analyze, and solve problems. The real conditions obtained from the results of research show that the problem-solving ability of graduates of higher education is still very low (Fitria et al., 2020).

The Jigsaw learning model is a type of cooperative and flexible learning strategy (C3e-Yan et al., 2022; Wati & Pustikaningsih, 2019). In Jigsaw learning, students are divided into groups whose members have heterogeneous characteristics (Bahri & Mustajab, 2020). Each student is responsible for studying the assigned topic and teaching it to their group members, so that they can interact and help each other (Fathurrohman, 2015). Some research results show the effectiveness of applying Jigsaw cooperative learning to motivation and learning outcomes in biology as carried out by (Huang et al., 2014; Manurung, 2010) that learning biology

oriented to the Jigsaw cooperative learning model can improve student learning outcomes which include increasing the average value and total students who achieve learning mastery, as well as improve the quality of student interaction with the learning environment so that student motivation becomes high and has strong will in solving problems presented in learning. Based on the background above, the researcher seeks to improve students' problem-solving skills by applying the jigsaw learning model.

Method

This study uses quantitative research. The variables in this study consist of independent and dependent variables. The independent variable is the jigsaw learning model, while the dependent variable is problem solving ability. The conceptual relationship between variables in this study is shown in Figure 1.

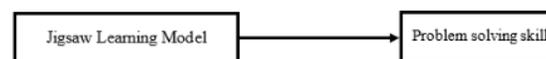


Figure 1. Relations Between Variables in Research

The research sample was taken from 70 students of the biology study program. The research sample was taken from students who were normally distributed, had the same characteristics (homogeneous), and had the same average value. The data analysis technique used to determine the effect of the jigsaw learning model on problem solving abilities is a simple linear regression analysis technique.

Regression analysis through the prerequisite test, namely the normality test (Alita et al., 2021). The normality test was carried out with the One Sample Kolmogrov-Sminrnov Test. The data obtained are normally distributed followed by a linearity test with the ANOVA test (Souza & Junqueira, 2005). The data was then tested by simple linear regression to find out the relationship between one dependent variable (Y) and one independent variable (X) linearly. This linear regression is not a curve or anything like that but is interpreted as an assumption to correlate between variables through straight line (linear) data point lines.

Result and Discussion

Normality Test

Based on the research that has been done, it shows that there is an influence of the Jigsaw learning model on the problem-solving abilities of students of the biology education study program in the subject of animal tissue and body structure. This is obtained from statistical tests using simple regression.

Table 1. Data Normality Test of Student Problem Solving Ability in the Animal Tissue and Body Structure course

Parameters	Problem solving skill
Test Statistic	1.41
Asymp. Sig. (2-tailed)	0.038 ^a

Table 2. Data Linearity Test by ANOVA Test

Problem solving ability * Jigsaw learning model		Sum of Squares	df	Mean Squares	F	Sig
Between Groups	(Combined)	594.121	6	99.020	36.490	0.000
	Linearity	114.940	1	574.446	211.689	0.000
	Deviation from Linearity	19.675	5	3.935	1.450	0.210
Within Groups		371.763	137	2.714		
Total		965.889	143			

Table 2 shows the deviation from linearity value of 0.210 > 0.05. So, it can be concluded that the data in this study has a linear relationship between the variables of the Jigsaw learning model (X) and the problem-solving abilities of Biology education study program students in the subject of animal tissue and body structure (Y).

Table 3. Simple Linear Regression Test

Parameters	Sum of Squares	df	Mean Square	F	Sig.
Regression	574.446	1	574.446	208.366	0.000 ^b
Residual	391.443	142	2.757		
Total	965.889	143			

The results of the Simple Linear Regression Test in table 3 above can be seen that the calculated F value is 208.386 with a significance value of 0.000 < 0.05, so it can be said that this regression model can be used to predict the variables of the jigsaw learning model that affect the problem-solving abilities of Biology education students on the subjects of tissue and body structure of animals.

Table 4. Correlation Coefficient

Model	R	R Squares	Adjusted R Square	Std. Error of the Estimate
1	0.771 [*]	0.593	1	1.66031

Based on table 4, the correlation coefficient or relationship (R) is 0.771 and the coefficient of determination (R Square) is 0.593. So it can be said that the independent variables affect the dependent variable by 59.3%.

Based on the results of the research and data analysis that has been carried out, it shows a significance value of the simple linear regression test of 0.000 < 0.05. It can be said that the jigsaw learning model in animal tissue and body structure courses can be used to determine the problem-solving abilities of students in biology education study programs. The value of the correlation coefficient R is 0.771 and the coefficient of

The results of the data normality test showed that the data were normally distributed with an Asymp. Sig value of 0.038 > 0.05 by One Sample Kolmogorov-Smirnov Test (Table 1). To find out the research data comes from linear data, it is continued with the linearity test presented in Table 2.

determination R Square is 0.593. This shows that the influence of the jigsaw learning model in the subject of animal tissue and body structure on the problem-solving abilities of students in the biology education study program was 59.3%, while students who scored 40.7% were influenced by other factors not examined in this study.

The Jigsaw type learning model that has been implemented can be used as a new learning experience for students. This learning model is carried out by forming groups of origin and then students are given the responsibility to look for material in expert groups. In learning like this, of course, the initial goal is to convey the material being taught. So that students don't just come, sit down, record the material then do the questions.

In using the Jigsaw learning model, students are also trained to be able to master the material quickly, communicate and cooperate well, for example when forming a group called the origin group, students will be given material by the lecturer where in this material students are required to be assigned to find information about that material. By forming expert groups, students will remember the material in question, so that when communicating with other friends' students can inform the material that has been obtained from the expert group to the home group. The use of the Jigsaw cooperative learning model in the learning process can increase enthusiasm for learning by applying a new learning model, students do not feel bored so they can motivate and be actively involved in the learning process.

The results of this study are also in line with Setiana et al. (2020) using a team-assisted individualization and jigsaw cooperative learning model on the math problem-solving abilities of MTs students showing an influence in increasing students' mathematical problem-solving abilities with an average value of 75.57. Student learning outcomes on the concept of the human digestive system with a significance value (Sig. 2-tailed) 0.000 < 0.05.

In general, it can be said that the learning process using the Jigsaw learning model increases the ability to solve problems in the animal tissue and body structure subject. In addition, it makes students more active, can respect the opinions of others, work together in solving problems. This can be formed because of cooperative or cooperation between students during the learning process.

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Conclusion

Based on the results of research and discussion, it can be concluded that a significant influence between the Jigsaw learning model in the subject of tissue and body structure of animals on the problem-solving abilities of students of the biology education study program.

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