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**PBL supported by think-pair-share affecting the multiethnic student
concepts understanding about biology-subjects**

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Abstract

Ethnicity is one of the critical factors in achieving learning outcomes. A specific learning model is needed to overcome the learning process with multi-ethnic students. Quasi-experimental research was carried out with four majoring ethnicities, i.e., Javanese, Banjar, Kutai and Buginese, in senior high school with class XI majoring in natural science in Samarinda. This study aimed to determine the effect of applying PBL supported by Think-Pair-Share learning models in empowering the understanding of concepts about cells and tissues of the four ethnicities' students. The experimental design used a non-equivalent pretest-posttest control group. The instrument was a questionnaire for the survey and questions for the pretest-posttest. The data were analysed by Analysis of Co-Variance followed by the LSD test. The results showed that the application of PBL supported by Think-Pair-Share significantly affected ($p < 0.05$) the concepts understanding of multi-ethnic students about cells and tissues.

Keywords: Cells, Tissues, Concepts understanding, Ethnicity, Problem-Based Learning, Think-Pair-Share

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1. Introduction

One internal factor, which also an external factor, that affects student learning, is students' ethnicity. Ethnic history is a possible regulator of reciprocal effects in primary school age (Sewasew & Koester, 2019). Besides, students' cultural diversity has been demonstrated to impact groups processes (Cox et al., 1991). Nowadays, with the increase in our educational institutions' multicultural base, we need to look more closely at the impact that cultural factors have on how students function together (Watson et al., 2002).

Learning done in class is directed to achieve specific goals. The learning objectives are described as an ambitious effort to improve and enhance one's skills, increase one's capacity based on an intrapersonal norm, and optimise one's potential achievement (Hein et al., 2019). The purpose of learning in biology can be to understand biological concepts, critical and creative thinking skills in biology, and social attitudes in biology, and others. Biology teachers need to design the learning process by considering the factors that influence it, including students' ethnicity in a particular class, to achieve the desired learning goals.

It is necessary to apply suitable learning models to achieve learning objectives. The implementation of the syntax of specific learning models allows students to attain confident learning goal well. Related to concepts understanding, specifically in cell and tissue subjects, the application of Problem-Based Learning (PBL) supports by Think-Pair-Share (TPS) learning models, enabling students to work scientifically in small groups and to better understand cell and tissues subject.

PBL is a learning method that drives the learner under investigation to solve real-life problems. The steps of the PBL process are: (1) students first encounter a problem; (2) they identify the problem situation; (3) they generate hypotheses about possible or reasonable solutions to this problem situation; (4) they learn in collaboration with other students by searching for answers to real-world problems and (5) they collect the missing information on the issue by searching different sources (Fidan & Tuncel, 2019) to provide a discovery framework that helps them internalise their learning to contributes to greater understanding (Delisle, 1997). The recursive discussions underlined in the PBL activities facilitated critical thinking and increased the awareness of concepts regarding real settings (Compton et al., 2020). Therefore the quality of the problems is vital for optimising and maximising the effects of PBL (Vekli & Cimer, 2012). The effects of PBL can be stronger in empowering students' understanding of concepts. The results of students' investigations need to be discussed using co-operative learning models, especially in small groups.

TPS is a co-operative learning technique that gives group work structure and guidance (Kagan, 1990). The necessary steps for performing a Think-Pair-Sharing operation are:

1. Ask a question at the same point during the class session where you would typically ask that question or open a discussion topic.
2. Give people time to think independently. If the problem is more complicated, give students about 30 s or longer) to think about how they should answer the question.
3. The pairs type invites students to discuss their ideas with a classmate sitting nearby and encourages pairs to express their ideas for several minutes and maybe prepare a composite answer.
4. Invite pairs to share their experiences with the entire community. Ask for volunteers or any of the couples.

The number of pairs from which it is most beneficial to hear typically depends on the matter's complexity (Allen & Tanner, 2003): social engagement and conversation, enhancing comprehension of oneself and others (Lankester, 2013). Useful natural science research is closely related to the approaches used by teachers and students. Students work in small groups by debating, carefully studying, competing and sharing, designing framework, reasoning studying, project work, problem-solving, presentations, motives, and teacher assessment (Veselinovska, 2011). The Think-Pair-Share learning model support in applying of learning models is a combination of PBL syntax and TPS syntax, allowing students to better understand cells and tissues' concepts. The principle of combining PBL and TPS learning models' syntaxes is that the TPS learning model can strengthen PBL syntaxes' application to better understand cells and tissues' concepts. The TPS learning model's syntax can be specifically inserted when students discuss their findings from the investigation process. The strong emphasis on co-operative learning in co-operative allows students to learn with team members and the whole class (Yusof et al., 2012). Therefore, various teaching strategies are available in assisting lecturers in improving their teaching process and helping the students take more responsibilities in their learning (Idris et al., 2012).

Besides the learning model, students' ethnicity also influences the learning process in the classroom. The interaction of students with different backgrounds in applying PBL learning syntax is supported by the TPS learning model, enabling them to strengthen each other's understanding of concepts about cells and tissues. Ethnicity is a sociocultural construct with a very vague scientific definition. An ethnic group is a population of individuals organised around an assumption of common cultural origin and those with a common national or cultural tradition (Tan-Koi et al., 2019). Human beings universally mark their membership in cultural groupings, often using the linguistic variations described earlier. We refer, as ethnicity, to symbolically marked boundaries linked to cultural traits. Therefore, ethnicity is the result of individuals' social experiences despite their suite of cognitive mechanisms, e.g., cultural awareness, intergroup behaviour, categorisation, etc. (Moya & Henrich, 2016). Students' ethnicity forms the unique characteristics of the concerned students (Idris et al., 2012). Each ethnic group of a region is represented by an approximately equal number of members, all interested in their community's economic, educational, religious, and cultural development, preserving the tolerant attitude towards neighbouring communities (Ruthner, 2012). There are strong student characteristics, but there are also weak student characteristics in the learning process. Students' characteristics also determine the method of interaction between students and students, and students and teachers. Ethnic students in a particular area consist of local ethnicity and ethnic migrants.

Samarinda is one of the cities in East Kalimantan Province, Indonesia. This city is a destination for migrants from all regions in Indonesia, even from abroad and various ethnicities. Migrants aim to find work and other purposes. Thus, Samarinda has a population of multiple ethnic backgrounds. Ethnic diversity in Samarinda determines students' ethnicity in individual schools, including students' ethnicity in high schools in Samarinda. In two previous studies, it was reported that Javanese, Buginese, Kutai and Banjar are the dominant students ethnic with the distribution of about 38%, 13%, 7% and 13-16%, respectively (Tanah Boleng, 2014; Tanah Boleng et al., 2017).

Conceptual understanding and developing an in-depth conceptual knowledge of science requires effort, time, guidance, and repeated exposures. Many instructional methods have been developed to address students' conceptual learning (Farrokhnia et al., 2019) because there is still a lack of knowledge that emphasises those concepts. Students are deemed to have learned principles and may apply them to problem-solving (Docktor et al., 2015) and actively develop their understanding of

science by combining scientific knowledge with reasoning and thinking skills (Şimşek & Kabapınar, 2010).

Cell biology is a critical fundamental topic in modern life sciences, consisting of microscopic, submicroscopic, and molecular cell life activities. The cell is the basic unit of living things, with all life activities taking place in the cell, and diseases are also caused by abnormal cell changes (Veselinovska, 2011). Some species have a single cell, such as amoeba and most bacteria. Many species are multicellular, like plants and animals. A human body consists of billions of microscopic cells of various kinds, such as muscle cells and nerve cells, organised into specific specialised tissues (Buskirk & Gillen, 2008) as many students need to be able to conceptualise and comprehend abstract concepts in biology (Khan & Masood, 2015).

Understanding the biological concepts (cells and tissues) of students of various ethnic backgrounds in high schools in Samarinda is very poor (in an average of 13.43 from a total of 100 scores) (Tanah Boleng, 2018). The proposed background for this fact is the student ethnicities vary. However, data about students' ethnicity for the 2018/2019 academic year in Samarinda was not available yet. This study's objective is to determine the effect of the application of PBL, which is supported by the TPS learning model in empowering students' understanding of the concepts of various ethnicities about cells and tissues for class XI of senior high school. TPS is a cooperative learning model that allows students to work in small groups, think, and solve problems to understand biological concepts better. The study was conducted following a survey on the student ethnicities vary.

In previous studies, the application of learning based on a scientific approach, namely by using PBL supported by a co-operative learning model (Tanah Boleng, 2018), allows students to experience the learning process independently and in groups in finding alternative solutions to learning problems with biological material. The application of PBL, which is supported by co-operative learning, could empower students' understanding of biology concepts from various ethnic backgrounds because the learning model enables students to be more active independently (Servant-Miklos, 2019; Yamin, 2013).

2. Methods

This study was conducted in two steps, i.e., started with students' ethnicities vary survey using questionnaire by purposive sampling technique followed by a quasi-experiment study. The study of ethnic students of class XI majoring in natural sciences was carried out in all public and private high schools in Samarinda, Indonesia. The survey was conducted from May to June 2018 by promoting a questionnaire to students. Two high schools, i.e., Public Senior High School 2 and Public Senior High School 3 were chosen for the quasi-experimental studies based on having the class with the number of at least three students for each ethnic to fulfil the requirements of statistical analysis. The ethnicities studied in the quasi-experiment were Javanese, Buginese, Kutai, and Banjar. The study was conducted from July to October 2018. Figure 1 presents the study methodology.

This type of study is quasi-experimental, which does not randomly take students as sample studies. The study design was a non-equivalent pretest-posttest control group. The study used two groups of students: the treatment group (the class implementing PBL + TPS learning) and the control group (the class not implementing PBL + TPS learning). For the learning process, the control group used conventional learning. Both groups were declared equal based on the equality test based on statistical analysis, using the students' national junior high school test scores.

In a joint study, the PBL + TPS learning model was only applied to the treatment group. The PBL + TPS combination combines the initial learning steps (syntax) from PBL and TPS. Table 1 shows the combined syntax of PBL + TPS learning. Before being given treatment, the pretest was conducted in the treatment group and the control group. Furthermore, after being given treatment, the posttest was carried out in the treatment and control groups. The form and content of the test questions given during the pretest and posttest were the same. Test results about the students' understanding of biological concept were corrected using a scoring rubric developed by referring to Hard (1994) as presented in Table 2.

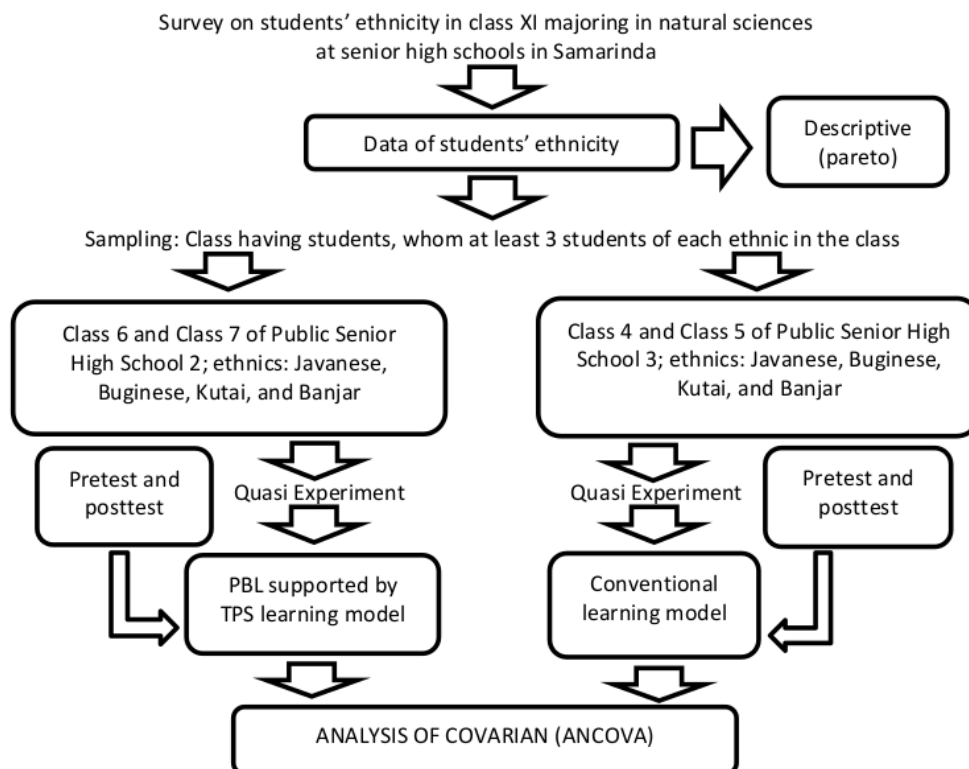


Figure 1. Flow chart of study methods

Table 1. PBL + TPS combined syntax applied in the study

Syntax	Student activity
Orientation (PBL and TPS)	Students read problem descriptions or view pictures/videos in Student Activity Sheets related to students' cells and tissues
Organisational into groups research (PBL)	Students, in groups, formulate problems related to cells and tissues; Students in groups formulate problems related to the concepts of cells and tissues in the description of problems, looking for ways to solve related problems through observation.

Syntax	Student activity
Free group investigation (PBL)	Students collect data to solve the problems they have formulated
Thinking independently (TPS)	Students use research data to think independently of solving the problems they have formulated
Pairing (TPS and PBL)	Students pairing with other students, having discussions by using the results of individual thinking to solve the problems that have been formulated
Presentations (TPS and PBL)	Students in pairs present the results of their partner's discussion separately for all other pairs of students in the class and make conclusions in problem-solving

This study's experimental instrument was a questionnaire for surveying ethnic students and test questions to measure the understanding of concepts about cells and tissues in the pretest and posttest. The number of students of a particular ethnic type was analysed descriptively using percentage. Meanwhile, the effect of PBL + TPS learning on students' understanding of cell and tissue concepts with varying ethnic backgrounds was investigated by ANCOVA, followed by the LSD test ($p < 0.05$). The data analysis process was carried out using SPSS version 23.

Table 2. Scoring rubric to correct students' understanding of cells and tissues concepts

Score	Category	Descriptors
4	Exemplary responses	<ul style="list-style-type: none"> All of the following characters must be present The answer is correct about cells and tissues The explanation is complete and clear according to the problem
3	Good Responses	<ul style="list-style-type: none"> One of the following characters must be present The answer is incorrect about cells and tissues, or The explanation is incomplete according to the problem
2	Inadequate response	<ul style="list-style-type: none"> All of the following characters must be present The answer is incorrect about cells and tissues Explanation only concerns in part of the problem
1	Poor response	<ul style="list-style-type: none"> All of the following characters must be present The answer is incorrect about cells and tissues The explanation only concerns a small part that is relevant to the problem
0	No response	<ul style="list-style-type: none"> The answer is not relevant to the problem or the blank answer sheet

3. Results

3.1. Students' ethnicities distribution

Students of class XI majoring in the natural sciences of the senior high schools in Samarinda were quite varied. In general, four ethnic groups had the highest number of ethnic students, namely Javanese, Buginese, Kutai, and Banjar. Figure 1 shows the distribution of class XI class students majoring in natural sciences based on their ethnic type. The information in Figure 2 also shows that although there are a small number of students, there are also other ethnic groups, totalling 18 ethnic groups. The number of students for each ethnic group varies. The Javanese is the largest ethnic, i.e., 36.55%, followed by Banjar, Kutai and Buginese of 15.02, 11.18 and 10.24%, respectively. Students with ethnic of Batak, Dayak, Chinese, Toraja and Madurese were 5.82, 3.49, 3.49, 2.91 and 2.33%, respectively. Manado, Ambon, Sundanese, Acehese and Padang are the ethnic with the number of students of 1.16-1.75%, respectively. Betawi, Buton, Nias and Balinese are the ethnic with the lowest students' number of 0.70, 0.58, 0.35 and 0.35%.

3.2. Empowerment of understanding biological concepts

The pretest and posttest results in understanding students 'biology concepts' show that students' understanding of biology concepts is quite varied. Table 3 summarises the results of ANCOVA about students' understanding of the concepts of cells and tissues. Application of PBL supported by TPS significantly affected ($p < 0.05$) in empowering students' understanding of concepts with varied ethnic backgrounds about cells and tissues (Table 3).

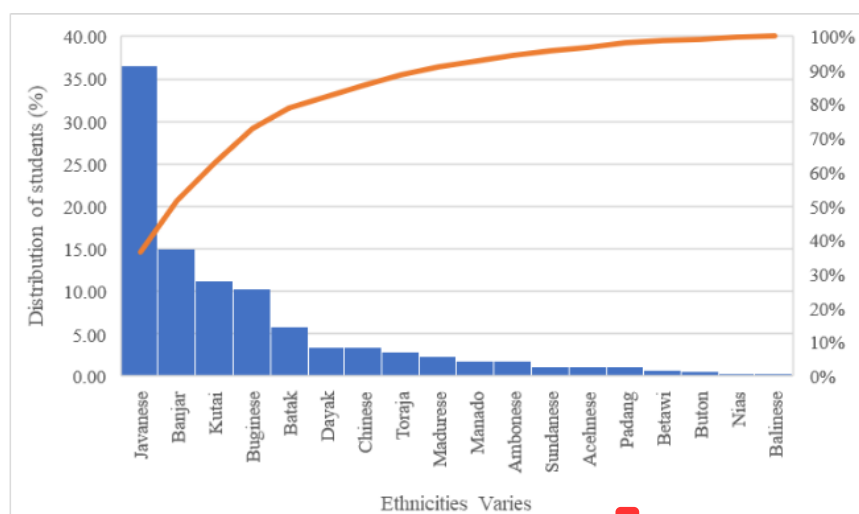


Figure 2. Pareto graph of students' ethnicity distribution of senior high school class XI majoring in natural sciences in Samarinda in the year 2018

Table 3. ANCOVA summary of students' understanding of cells and tissues concepts

Source	Type III Sum of Squares	Degree of Freedom	Mean Square	F	Sig.	p
Correlated Model	4748.50 ^a	8	593.56	7.77	0.00	< 0.05
Intercept	156200.40	1	156200.40	2044.56	0.00	< 0.05
Pretest	0.78	1	0.77	0.010	0.92	> 0.05
Model	2753.83	1	2753.83	36.05	0.00	< 0.05
Ethnics	218.85	3	72.95	0.96	0.42	> 0.05
Model * Ethnics	129.26	3	43.09	0.57	0.64	> 0.05
Error	8938.56	117	76.39			
Total	617563.73	126				
Corrected Total	13687.06	125				

a. R² = 0.35 (Adjusted R² = 0.30)

LSD test results for the learning model shows that the learning model (PBL+TPS) gives the average posttest score of students' understanding of cell and tissue concepts (74.77) higher and different compared to the learning in the control class (conventional) (63.45) (Table 4.). The application of PBL supported by the TPS learning model reinforces students' understanding of the ethnically diverse concepts of cells and tissues compared to learning in the control class (conventional).

Table 4. LSD test results on every level learning model to understand the cell and tissue concepts of student

Learning Model	XUC	YUC	Difference	PUC	LSD Notation
PBL+TPS	19.52	75.15	55.62	74.77	a
Conventional	9.03	63.31	54.29	63.45	b

Note: XUC = pretest mean score of concepts understanding; YUC = posttest mean score of concepts understanding; PUC = posttest corrected mean score of concepts understanding

4. Discussion

4.1. Effect of PBL supported by TPS on Understanding Concept of Biology

The application of a scientific approach-based learning model (PBL) supported by co-operative learning models (TPS) can empower students' understanding of ethnic concepts about cells and tissue ($p < 0.05$) (Table 3.). The PBL model's application can help students apply the present curriculum (2013 curriculum) in senior high schools in Indonesia. Students assigned the PBL model have a higher probability of conceptual improvement, outperforming those participating in the conceptual test after a lesson from two other learning models (lecture-based and independent study groups) (Yew & Goh, 2016). Gorghiu et al. (2015) added that teachers must pay more attention to the students' feedback to control and adjust the training process properly.

The 2013 curriculum gives students experience in (1) observing real phenomena in their environment, (2) formulating problems related to observed phenomena, (3) collecting data to solve the developed issues, (4) associating (discussing) data obtained, and (5) concludes the results of the discussion for other presentations (communicating) to all other students. Student work patterns like this are scientific work patterns. Skills in data recording, reporting, and interpreting can also be effectively developed through a process of assignments and virtual events improved by students (Ince et al., 2015). On the other hand, learning through a philosophical approach means knowing and

interpreting truth, making generalisations for new situations, and acquiring abstract thought (Dikmenli & Cardak, 2010).

However, at the stage in which students associate (discuss) the data obtained, students need to be facilitated in a small group discussion pattern. The TPS learning model allows students to discuss tiered practices. First, students think individually (Think) to solve biological problems (in studies, the biological material discussed is about cells and tissues). Second, with the capital of individual thinking results, when students pair up with other students, students can do (in pairs) with students (students with different ethnic backgrounds) who sit next to students in the class to discuss to strengthen understanding of concepts biology (Pairing). Third, in the final stage, students present the discussion results in pairs to all other students in the class (Share). The discussion pattern in small groups is gradually more useful in understanding the concept of cells and tissues. Also, in the pairing stage, students no longer need to look for other friends to sit next to ethnic students who sit far apart in class. For students to pair up with other students from different ethnic backgrounds, the teacher needs to adjust their sitting position in the classroom. Thus, the student's sitting position is always alternating between various ethnic groups. Palennari (2011) states that the combination of PBL and Jigsaw-type co-operative learning models can encourage discussion of biological issues among students. Thus, students will understand the idea of biology (the cells and tissues discussed) more thoroughly.

Learning that applies TPS learning patterns allows students to understand material about cells and tissues better. Data about cells and tissues obtained from the investigation stage (data collection), discussed in discussions preceded by individual thinking (Think), strengthened in conversations with other students in the pairing step (Pairing), and finally, the results of group discussions, shared with other students on stage to share (Share). Patterns of meeting in small groups involving students with different ethnic backgrounds enable students to complete their understanding of cells and tissues. Students' characters from certain ethnic groups who are weak can be reinforced by students' strong character from other ethnic groups in the learning process with material about cells and tissues and vice versa. Thus, overall, all students from various ethnic backgrounds can understand the cell and tissue material discussed.

Cells are the smallest structures of an organism. Because of their small size (microscopic), students must use a microscope in their observations. Cells consist of cell walls, cell membranes, and cell nuclei. Ultra-structures are contained in cells, such as mitochondria, lysosomes, ribosomes, endoplasmic reticulum, Golgi equipment, etc. Cell ultra-structures carry out their respective functions for overall cell life. Viruses are not cells because the particles' structure does not have a basic system like other organisms' cells. Collection of cells that have the same shape and function, forming body tissue. Multicellular organisms, like humans, animals, and plants, have various tissues, while unicellular organisms, such as bacteria, protozoa, algae, and fungi, do not.

The TPS learning model supports the application of PBL in classrooms with students of varying ethnicity, higher than the learning application of learning in the control class (conventional), in empowering students' conditions of understanding with varied ethnic backgrounds, about the material of cells and tissues. The combined syntax is PBL supported by the TPS learning model, enabling students to work optimally and individually and in small groups. Each student does every stage of the learning model. Students try to understand the concepts of cells and tissues individually, and their understanding is strengthened in small group discussions, which involve students from other ethnicities. This learning atmosphere allows each student to understand the concepts of cells and tissues better. Gurses et al. (2015) state that, according to the students, group studies analysed the

behaviour and attitudes of students towards groups, including increased adherence to positive communication development and a positive commitment to learning to increase and the group formation process, made significant contributions.

Conventional learning gives a lower score than applying learning models (PBL + TPS) to the treatment class in understanding the concepts of cells and tissues. Conditions in conventional learning are teacher-oriented learning processes so that student activities are less developed. Thus, students lack an understanding of the concept of cells and body tissues of organisms. Barış and Kirbaşlar (2015) state that one of the critical reasons for this erroneous belief is that most classes have an instructor orientation. Conventional learning that is applied in the control class does not allow students to make problem-solving efforts. Also, students do not conduct discussions in groups, either small groups or large groups. The teacher is more dominant in providing information about the cell and tissue material to students in the class. Students listening more, take notes and ask the teacher about the cell and tissue material that is not yet understood. Low interaction between students of various ethnicities to strengthen students' understanding of cells and tissue material. The result is a lack of knowledge of student concepts about cell and tissue material.

The learning process that involves all students individually and in small groups allows students to be directly involved in learning. Learning outcomes in the form of concepts understanding require work effort separately and by helping each other by working together in small groups involving characteristics strength from other ethnic groups. The process of collaboration in small groups involving students from various ethnic groups enables the development of positive student attitudes in regard to aspects like tolerance, equality, mutual trust, and mutual assistance. Thus, all students can understand the concepts of cells and tissues in greater depth.

Students' concepts of cells and tissues are learned not only through theoretical learning in the classroom. However, because cells and tissues' size are tiny (microscopic), students need to continue practicum activities in the laboratory. Practical exercises (observation) in the laboratory allow students to understand better cell shapes, complex cell structures and various types of tissue. Thus, practicum activities in the laboratory clarify students' understanding of concepts about cells and tissues. Oztas (2014) states that many believe hypotheses have to be 'proven' to be valid and generally accepted.

4.2. Effect of Students' Ethnicities Varies on Understanding Concept of Biology

The distribution of students' ethnicities of senior high school in Samarinda in the year 2018 is similar to the data previously reported in 2014 and 2017 (Tanah Boleng, 2014; Tanah Boleng et al., 2017), which shows that four ethnic groups, i.e., Javanese, Buginese, Kutai and Banjar are the dominant ethnic groups (74.55%). This data emphasises that study of the four ethnics is necessary to build instruction models that fit the students to increase the learning outcomes, e.g., the concepts understanding of cells and tissue subject.

In addition to the learning model, ethnicity is also a factor influencing the learning process in the classroom with material cells and organism tissues. Ethnic groups involved in the study (Javanese, Buginese, Kutai, and Banjar) have different characteristics. Strong ethnic characters in implementing each stage in applying learning models (TPS supports PBL) help the characters of other ethnic-groups' weak in the learning process, and vice versa. Learning efforts like this allow all students to experience learning processes that help each other, strengthen each other, be tolerant, to understand learning material with the material of cells and tissue organisms.

With regard to the Buginese's ethnic character, Koentjaraningrat (2002) explains that the Buginese and Makassarese's reactions to modernisation are generally good, and they understand that they have to work forward have to be economical and so on. Sonhaji (2012) added that the Buginese's philosophy is that they have to be brave. With regard to the philosophy of Javanese's ethnic life, Sonhaji (2012) states that the Javanese ethnic philosophy is to honour others' goodness and immerse others' errors. With regard to the philosophy of Banjar's ethnic life, Sonhaji (2012) states that 'Going on a pilgrimage will boost a family's social standing'. With regard to Kutai's ethnic culture, Murjani (2012) explains that The Kutai community is a Muslim religious group with a high degree of reverence and tradition.

Regarding the possible negative aspects that arise in the interaction between ethnic groups, Yaqin (2007) explains that there is no denying that Indonesia is a multiethnic country. This situation must be realised and has great potential for the emergence of conflict between one ethnic group and another. Furthermore, he explained that there might be some disappointment with the situation, which does not favour the local community, giving rise to a prejudiced attitude towards migrants. The presumptions and stereotypes that emerge from the local population against migrants can gradually ignite hostility towards them. Therefore, efforts to apply the learning model in the classroom, with biological materials, are directed to involve students from different ethnic backgrounds. Thus, when students live in the community later, they can respect each other, communicate well, live in harmony and build mutual tolerance, even though they are from different ethnic groups.

With regard to interpersonal communication, Sihabudin (2013) states that interpersonal contact requires not just one person who forms a conversation with himself. Interpersonal communication needs two or more people to be participants, which generally happens spontaneously. Cultural transmission is also communication between people, but the emphasis is on cultural characteristics different from their participation, including differences in language (verbal and nonverbal aspects), perceptions, attitudes, values, and thinking patterns. Naim and Sauqi (2008) added that love-building education should enable students who perceive human beings in human terms. Love, which is the spirit of education, will give rise to mutual respect, tolerance, mutual love and make human relationships something that must be maintained and developed. Idrus (2012) added that People must be able to compromise to avoid confrontation, and they must also be able not to receive their rights altogether.

4.3. Effect of Interaction between PBL supported by TPS and Students' Ethnicities Varies on Understanding Concept of Biology

The interaction between the learning model (TPS and conventional support PBL) and students' ethnicity (Javanese, Buginese, Kutai, and Banjar) showed no significant effect on students' understanding of the concept cells and body tissues of organisms. This information indicates that all ethnic students' characters show similarities in implementing the learning model syntaxes (TPS and conventional support PBL).

The four ethnics students in this study tend to have similar character¹³ which may cause by the intense interaction among them inside and outside the classroom. The multicultural society exists when the different parts of living community habitats together yet differ in a similar political unit (Ahmad & Yusof, 2010). Besides, individuals construct new identities based on a combination of characteristics from their dual cultures (Stuart & Ward, 2011). Conditions like this make it possible to accept and give each other the character of one student to another.

In addition to the character factor of the students' ethnicities who are similar, the implementation factor of learning models syntax also affects the non-significant effect of the interaction of the learning model and students' ethnicity on students' understanding of the concept of cells and tissues of the organism. According to Boa et al. (2018), the model presented in its syntax (instruction process), which is considered the essence of the model, chronological steps for using the model to be easily used by any teacher interested in the model. Therefore, if a learning model syntax is not implemented correctly, it can have similarities. Thus, if the ethnic characters are similar and the implementation of syntax also tends to be equal, then an interaction between students' ethnicity and the learning model in this study shows results that are not real. There are different essential components of a teaching model.

5. Conclusion

The syntax of PBL supported by an influential TPS learning model significantly empowers concepts understanding about cells and tissues of students with varied ethnic backgrounds. The Javanese, Buginese, Kutai, and Banjar students in this study may have a similar experience implementing PBL syntax supported by TPS and implementing conventional learning. Students' experiences in implementing learning model syntaxes (TPS and conventional support PBL) influence the effort to understand the concept of orgasmic body cells and tissues. The TPS learning model syntax's application strengthens the discussion about the findings at the free group investigation stage of the PBL process to understand the concepts about cells and tissues. Also, similar studies in the future need to add to the number of ethnic groups and the number of students to get more in-depth information.

6. Recommendation

PBL supported by the TPS learning model is recommended to empower concepts understanding about cells and tissues, especially in students with various ethnicities.

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References

- Ahmad, Y., & Yusof, N. M. (2010). Ethnic boundary among students in Malaysian primary schools and social interaction: A conceptual framework. *Procedia - Social and Behavioral Sciences*, 7(2), 82–91. <https://doi.org/10.1016/j.sbspro.2010.10.013>
- Allen, D., & Tanner, K. (2003). Approaches to cell biology teaching: Learning content in context -Problem-based learning. *Cell Biology Education*, 2(2), 73–81. <https://doi.org/10.1187/cbe.03-04-0019>
- Barış, Ç. Ç., & Kırbaşlar, F. G. (2015). A Study of certain biology and biotechnology concepts in secondary school and high school course books in terms of scientific competency. *Procedia - Social and Behavioral Sciences*, 174, 420–426. <https://doi.org/10.1016/j.sbspro.2015.01.684>
- Boa, E. A., Wattanatorn, A., & Tagong, K. (2018). The development and validation of the Blended Socratic Method of Teaching (BSMT): An instructional model to enhance critical thinking skills of undergraduate business students. *Kasetsart Journal of Social Sciences*, 39(1), 81–89.

- Boleng, D.T. & Maasawet, E.T. (2021). PBL supported by think-pair-share affecting the multiethnic student concepts understanding about biology-subjects. *Cypriot Journal of Educational Science*. 16(2), 532-546. <https://doi.org/10.18844/cjes.v16i2.5632>
- <https://doi.org/10.1016/j.kjss.2018.01.001>
- Buskirk, R., & Gillen, C. M. (2008). *Inquiry in action : interpreting scientific papers for Campbell-Reece Biology, eighth edition*. Pearson.
- Compton, R. M., Owilli, A. O., Norlin, E. E., & Hubbard Murdoch, N. L. (2020). Does problem-based learning in nursing education empower learning? *Nurse Education in Practice*, 44(July 2018), 102752. <https://doi.org/10.1016/j.nepr.2020.102752>
- Cox, T. H., Lobel, S. A., & McLeod, P. L. (1991). Effects of ethnic group cultural differences on cooperative and competitive behavior on a group task. *Academy of Management Journal*, 34(4), 827–847. <https://doi.org/10.5465/256391>
- Delisle, R. (1997). *How to Use Problem-Based Learning in the Classroom*. Association for Supervision and Curriculum Development.
- Dikmenli, M., & Cardak, O. (2010). A study on biology student teachers' conceptions of learning. *Procedia - Social and Behavioral Sciences*, 2(2), 933–937. <https://doi.org/10.1016/j.sbspro.2010.03.129>
- Docktor, J. L., Strand, N. E., Mestre, J. P., & Ross, B. H. (2015). Conceptual problem solving in high school physics. *Physical Review Special Topics - Physics Education Research*, 11(2), 1–13. <https://doi.org/10.1103/PhysRevSTPER.11.020106>
- Farrokhnia, M., Pijera-Díaz, H. J., Noroozi, O., & Hatami, J. (2019). Computer-supported collaborative concept mapping: The effects of different instructional designs on conceptual understanding and knowledge co-construction. *Computers and Education*, 142(September 2020), 103640. <https://doi.org/10.1016/j.compedu.2019.103640>
- Fidan, M., & Tuncel, M. (2019). Integrating augmented reality into problem based learning: The effects on learning achievement and attitude in physics education. In *Computers and Education* (Vol. 142). Elsevier Ltd. <https://doi.org/10.1016/j.compedu.2019.103635>
- Gorghiu, G., Drăghicescu, L. M., Cristea, S., Petrescu, A.-M., & Gorghiu, L. M. (2015). Problem-Based Learning - An efficient learning strategy in the science lessons context. *Procedia - Social and Behavioral Sciences*, 191, 1865–1870. <https://doi.org/10.1016/j.sbspro.2015.04.570>
- Gurses, A., Dogar, C., & Geyik, E. (2015). Teaching of the concept of enthalpy using Problem Based Learning approach. *Procedia - Social and Behavioral Sciences*, 197(February), 2390–2394. <https://doi.org/10.1016/j.sbspro.2015.07.298>
- Hard, D. (1994). *Authentic Assessment, A Handbook for Educators*. Dale Seymour Publications.
- Hein, J., Daumiller, M., Janke, S., Dresel, M., & Dickhäuser, O. (2019). How learning time mediates the impact of university Scholars' learning goals on professional learning in research and teaching. *Learning and Individual Differences*, 72(April), 15–25. <https://doi.org/10.1016/j.lindif.2019.04.002>
- Idris, F., Yaacob, M., & Taha, M. (2012). Teaching and learning methods of ethnic relations course: Interactive or destructive? *Procedia - Social and Behavioral Sciences*, 59, 105–109. <https://doi.org/10.1016/j.sbspro.2012.09.252>
- Idrus, M. (2012). Pendidikan karakter pada keluarga Jawa [Character education at Javanese family]. *Jurnal Pendidikan Karakter*, 2(2), 118–130. <https://doi.org/10.21831/jpk.v0i2.1297>
- İnce, E., Güneş, Z. Ö., Yaman, Y., Kirbaşlar, F. G., Yolcu, Ö., & Yolcu, E. (2015). The effectiveness of the IUVIRLAB on undergraduate students' understanding of some physics concepts. *Procedia - Social and Behavioral Sciences*, 195, 1785–1792. <https://doi.org/10.1016/j.sbspro.2015.06.382>
- Kagan, S. (1990). The Structural Approach to Cooperative Learning. *Educational Leadership*, 47(4), 12–15. <http://www.ascd.org/publications/educational-leadership/dec89/vol47/num04/toc.aspx>

- Boleng, D.T. & Maasawet, E.T. (2021). PBL supported by think-pair-share affecting the multiethnic student concepts understanding about biology-subjects. *Cypriot Journal of Educational Science*, 16(2), 532-546. <https://doi.org/10.18844/cjes.v16i2.5632>
- Khan, F. M. A., & Masood, M. (2015). The Effectiveness of an interactive multimedia courseware with cooperative mastery approach in enhancing higher order thinking skills in learning cellular respiration. *Procedia - Social and Behavioral Sciences*, 176, 977–984. <https://doi.org/10.1016/j.sbspro.2015.01.567>
- Koentjaraningrat. (2002). *Manusia dan Kebudayaan di Indonesia [Humans and Culture in Indonesia]*. Djambatan.
- Lankester, A. J. (2013). Conceptual and operational understanding of learning for sustainability: A case study of the beef industry in north-eastern Australia. *Journal of Environmental Management*, 119, 182–193. <https://doi.org/10.1016/j.jenvman.2013.02.002>
- Moya, C., & Henrich, J. (2016). Culture-gene coevolutionary psychology: Cultural learning, language, and ethnic psychology. *Current Opinion in Psychology*, 8(1), 112–118. <https://doi.org/10.1016/j.copsyc.2015.10.001>
- Murjani. (2012). Interaction of religion and politic law of Kutai Kartanegara Empire: Ethnic religious study of Dayak-Kutai ethnic. *Mazahib: Jurnal Pemikiran Hukum Islam*, 10(1), 15–26.
- Naim, N., & Sauqi, A. (2008). *Pendidikan Multikultur: Konsep dan Aplikasi [Multiculture Education: Concepts and Application]*. Ar-Ruzz Media.
- Oztas, F. (2014). How do high school students know diffusion and osmosis? High school students' difficulties in understanding diffusion & osmosis. *Procedia - Social and Behavioral Sciences*, 116, 3679–3682. <https://doi.org/10.1016/j.sbspro.2014.01.822>
- Palennari, M. (2011). The potency of the integration strategy of PBL with cooperative learning jigsaw in improving the students' understanding of concept. *Jurnal Biologi Edukasi*, 3(2), 26–33.
- Ruthner, A. R. (2012). The Status of the German Minority Within the Multi-Ethnic Educational System of the Banat Region – a Historical Overview Focusing on the Multicultural Character of the Region. *Procedia - Social and Behavioral Sciences*, 46, 1435–1439. <https://doi.org/10.1016/j.sbspro.2012.05.316>
- Servant-Miklos, V. F. C. (2019). Fifty years on: A retrospective on the world's first Problem-based Learning programme at McMaster University Medical School. *Health Professions Education*, 5(1), 3–12. <https://doi.org/10.1016/j.hpe.2018.04.002>
- Sewasew, D., & Koester, L. S. (2019). The developmental dynamics of students' reading self-concept and reading competence: Examining reciprocal relations and ethnic-background patterns. *Learning and Individual Differences*, 73(September 2018), 102–111. <https://doi.org/10.1016/j.lindif.2019.05.010>
- Sihabudin, A. (2013). *Komunikasi Antarbudaya [Intercultural communication]*. Earth Literacy.
- Şimşek, P., & Kabapınar, F. (2010). The effects of inquiry-based learning on elementary students' conceptual understanding of matter, scientific process skills and science attitudes. *Procedia - Social and Behavioral Sciences*, 2(2), 1190–1194. <https://doi.org/10.1016/j.sbspro.2010.03.170>
- Sonhaji, A. (2012). *Manusia, Teknologi, dan Pendidikan [Human, Technology, And Education]*. UM Press.
- Stuart, J., & Ward, C. (2011). A question of balance: Exploring the acculturation, integration and adaptation of Muslim immigrant youth. *Psychosocial Intervention*, 20(3), 255–267. <https://doi.org/10.5093/in2011v20n3a3>
- Tan-Koi, W. C., Limenta, M., Mohamed, H. E. M., & Lee, E. J. D. (2019). The Importance of Ethnicity Definitions and Pharmacogenomics in Ethnobridging and Pharmacovigilance. In Y. W. F. Lam & S. A. Scott (Eds.), *Pharmacogenomics: Challenges and Opportunities in Therapeutic Implementation* (Second Edi, pp. 289–327). Academic Press. <https://doi.org/10.1016/C2016-0-03878-0>
- Tanah Boleng, D. (2014). Pengaruh Model Pembelajaran Cooperative Script dan Think- Pair-Share terhadap Keterampilan Berpikir Kritis, Sikap Sosial, dan Hasil Belajar Kognitif Biologi Siswa SMA Multietnis Didimus. *Jurnal Pendi Dikan Sains*, 2(2), 76–84.
- Tanah Boleng, D. (2018). Perpaduan Pembelajaran Berbasis Masalah dan Cooperstive Script Mampu

Boleng, D.T. & Maasawet, E.T. (2021). PBL supported by think-pair-share affecting the multiethnic student concepts understanding about biology-subjects. *Cypriot Journal of Educational Science*. 16(2), 532-546. <https://doi.org/10.18844/cjes.v16i2.5632>

Memberdayakan Pemahaman Konsep Biologi Siswa Combined of Problem Based Learning and Cooperative Script Able to Empower Understanding of Student Biology Concept. *Proceeding Biology Education Conference, 15*, 329–334.

Tanah Boleng, D., Lumowa, S. V. T., Palenewen, E., & Corebima, A. D. (2017). The effect of learning models on biology critical thinking skills of multiethnic students at senior high school in Indonesia. *Problems of Education in the 21st Century*, 75(2), 136–143.

Vekli, G. S., & Cimer, A. (2012). Designing computer assisted Problem Based Learning environment in the subject of endocrine system in human beings for high school biology. *Procedia - Social and Behavioral Sciences*, 47, 303–310. <https://doi.org/10.1016/j.sbspro.2012.06.655>

Veselinovska, S. S. (2011). Cypriot Journal of Educational. *Cypriot Journal of Education*, 4, 175–185.

Watson, W. E., Johnson, L., & Zgourides, G. D. (2002). The influence of ethnic diversity on leadership, group process, and performance: An examination of learning teams. *International Journal of Intercultural Relations*, 26(1), 1–16. [https://doi.org/10.1016/S0147-1767\(01\)00032-3](https://doi.org/10.1016/S0147-1767(01)00032-3)

Yamin, M. (2013). *Strategi dan Metode dalam Model Pembelajaran [Strategies And Methods In The Learning Model]*. GP Press Group.

Yaqin, M. (2007). *Pendidikan Multikultural [Multicultural Education]*. Media Pillar.

Yew, E. H. J., & Goh, K. (2016). Problem-Based Learning: An overview of its process and impact on learning. *Health Professions Education*, 2(2), 75–79. <https://doi.org/10.1016/j.hpe.2016.01.004>

Yusof, K. M., Hassan, S. A. H. S., Jamaludin, M. Z., & Harun, N. F. (2012). Cooperative Problem-based Learning (CPBL): Framework for integrating cooperative learning and Problem-based Learning. *Procedia - Social and Behavioral Sciences*, 56(1ct1he), 223–232. <https://doi.org/10.1016/j.sbspro.2012.09.649>

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