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INCREASING SCIENCE PROCESS SKILLS USING INQUIRY LEARNING MODEL

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Abstract: The teacher is a facilitator in determining learning objectives to improve the learning process, and students can actively conduct discussions andseek their own experiences. However, teachers must still implement learning models and science process skills in biology lessons so that learning becomes monotonous. Before carrying out science process skills in learning at school, the teacher must first know the profile of students' science process skills (SPS) so that they can support science process skills following the conditions of students. This study aimed to improve students' science process skills by applying inquiry learning models to biotechnology material in class XII IPA 1 MA Aisyiyah Palembang. The research method used was classroom action research by applying an inquiry learning model consisting of 2 cycles with six meetings, with three in each cycle. The subjects of this study were students of class XII IPA 1 MA Aisyiyah Palembang, with a total of 18 students. The results of the study found an increase in students' SPS scores. Cycle 1 basic skills (89.96%) increased in cycle 2 (96.29%), cycle one process skills (90.43%) increased in cycle 2 (94.13%), and investigative skills in cycle 1 (46.29%) also increased in cycle 2 (86.10%). The findings prove that applying the inquiry learning model can increase students' science process skills.

Keywords: *Classroom Action* Research *(CAR), Inquiry Models, Science Process Skills, The Value Increase*

INTRODUCTION

Learning the 2013 curriculum demands the activeness of students. Students must actively conduct discussions and seek their experiences through the teacher's systems, techniques, and learning methods. [1] revealed that the teacher's role as manager of the teaching and learning process seeks to create teaching and learning conditions, develop suitable learning materials, improve students' ability to listento lessons, and master the learning objectives they mustachieve.

Learning using the inquiry model places students as learning subjects [2]. Learners play a role in finding the core of the subject matter itself. The teacher's role is to guide and act to bring change, facilitator, and motivator for their students. The inquiry learning model is an educational strategy [3] in which students follow methods and practices similar to professional scientists to build knowledge and as a process of finding relationships, formulating hypotheses, and testing them by conducting experiments [4]. The inquiry learning model can facilitate students to improve science process skills [5].

SPS involves allabilities possessed by students, including intellectual, social, and manual skills based on scientific methods that the students can build. Therefore, science process skills are essential for students to learn science [6]. The science process skills divide into three, namely basic skills, process skills, and investigative skills [7] stated thatscience process skills are very important for every student as a provision to use scientific models in developing science andare expected to gain new knowledge or develop the knowledge they have [8].

Different conditions can be seen in biology learning at MA Aisyiyah Palembang. The teacher needs to implement the learning model properly, even though it has been seen in the planned lesson plans. Teachers generally apply the lecture, question and answer, and discussion methods to make learning monotonous. The results of other findings in class XII IPA 1 students at MA Aisyiyah Palembang teachers still need to apply science process skills to biology learning. One of the skills that can be developed to prepare 21st-century teachers is science process skills [9]. Science process skills can be applied to understand the phenomenon of events [10]. Learning must involve the active participation of students to create a learning environment that facilitates science process skills [11]. However, the first step before practicing science process skills in learning at school, the teacher must first know the profile of students' science process skills [12] so that efforts in developing a learning environment that can support science process skills are in accordance withthe conditions of students. Teachers will better understand aspects of students' science process skills still need to beimproved or raised during learning.

Based on the analysis stated previously, it is necessary to have a learning model to facilitate implementing learning activities that can develop SPS. Thus, this research aims to improve students' science process skills by applying inquiry learning models to biotechnology material in class XII IPA 1 MA Aisyiyah Palembang.

RESEARCH METHODS

This research is a classroom action research (CAR) byapplying the inquiry learning model, which consists of 2cycles with six meetings, with three meetings in each cycle. The subjects of this study were students of class XII IPA 1 MA Aisyiyah Palembang, with 18 students consisting of 8 boys and 10 girls.

Data collection technique

This study collects data using observation sheets, questionnaires, interviews, and documentation. Measurement of science process skill improvement (SPS) uses observation sheets filled out by teachers and observers. The science process skills thatmust be measured are basic, process, and investigative skills. The data has been analyzed, and the percentage is obtained. Each item answered correctly is givena score of one.

Data analysis

Student science process skill (SPS) assessments were analyzed using SPS scores. Based on comparing the percentage results obtained on science process skills and the indicators set in cycle I and II, the researcher can suggest whether the action was successful. To find out that the success of applying the inquiry model is usedan indicator of success if the percentage of students' science process skills is ≥70%. Gain score action implementation, and reflection. Before starting the action cycle, research begins by identifying problems.

SPS score = Gain score/ Maximal score x 100%

Research procedure

Classroom action research examines activities that are deliberately raised and occur in a class. CAR canbe interpreted as efforts or actions taken by teachers or researchers to solve learning problems through researchactivities.

CAR research was carried out over cycles, cycles I and II. The action research model used in this research is Classroom Action Research (CAR), referring to Kemmis and Taggart, which consists of severalaction cycles, where each cycle consists of 4 stages which include planning, action implementation, and reflection. Before starting theaction cycle, research begins by identifying problems.

RESULTS AND DISCUSSION

The educator's task is to develop the skills students possess, one of which is science process skills. The 2013 curriculum student assessment in the learning process is closely related to thinking skills [13]. Students' thinking skills can be trained by providing meaningful experiences in the learning process [14].

The learning process is a complex result; the student determines whether or not learning occurs [15]. The teacher is a guide and director, while those who drive the process must come from students. Thus, a teacher needs to apply an approach that directs students to play an active role andexplore their potential so that students can develop science process skills such as observing, classifying, predicting, measuring, concluding, and communicating. Learning biology in high school is designed to prepare, improve, and develop soft and hard skills, including aspects of knowledge competence, attitudes, and skills [16]. Meaningful learning is learning that directs students to solve life's problems [17-18]. Students' thinking skills in building new concepts in science learning can be trained through the development of SPS.

The problems found in the first pre-action stage were that the teacher had not used the learning model in the 2013 curriculum in the classroom, so the teacher provided materialthrough lecture and question-and-answer methods. Learning activities like this make students not active in the learning process or teacher-centered; students are busy in class and donot pay attention to the teacher's explanation. The actions taken by the teacher are to make students active in class learning, observing, following instructions, submitting hypotheses, finding their sources of information, and concluding the results of self-exploration.

Problems with implementing learning in cycle1 affect science process skills, which still need to improve, especially investigative skills (Table 1). The teacher must still fully carry out the learning stages, such as communication activities, closing, time management, and questioning techniques. In addition, teachers and students are not accustomed to using the learning process using the inquiry model in the learning process in class. The results of cycle 1 show that it has not reached the level of success indicators (≥70%). It is necessary to carry outfurther actions to cycle 2.

Learning problems that are not student-centered makethe teacher more dominant in the learning process. The teacher should facilitate students to solve their problems [19] and develop their knowledge. In cycle 1, students and their group members propose hypotheses, explore their knowledge [20], and present the results of group discussions in front of the class. The benefits of inquiry learning are encouraging students to formulate their hypotheses [21], learning becomes student-centered (student-centered), and preventing students from traditional learning methods (memorizing) [22]. Inquiry learning is a learning activity thatmaximally learns all students' abilities to seek andinvestigate something [23] systematically, critically, and logically so that they can confidently formulate their findings [24].

Meanwhile, inquiry-based learning is an educational strategy in which students follow methods and practices similar to professional scientists to build knowledge and, as a process, discover new causal relationships [3]. By acquiring science process skills and inquiry models, students can find and develop their own factsand concepts and grow and develop the attitudes and values required [25].

Based on the data in Table 2, science process skills for all aspects in cycle 2 were carried out in verygood basic skills, process skills, and investigative skills. Especially experiencing an increase in science process skills, including planning skills at 77.77%, implementing at 80.55%, and reporting experiments at 75%. This It happened because of the results of the teacher's reflection and discussion with observers who applied the practicum in cycle2, so the researchers succeeded in improving science process skills with the inquiry learning model.

Table 1. Science Process Skills in Cycle 1 Students

No.	Science Process Skills (SPS)	Meeting 1 (%)	Meeting 2 (%)	Meeting 3(%)	Average	Category
1	Basic Skills					
	Observe	100	100	100	100	Very good
	Recording/recording data and information	100	100	100	100	Very good
	Follow orders/instructions	86.11	88.88	88.88	87.95	Good
	Take measurements	72.22	86.11	91.66	81.94	Good
	Perform movement manipulation	75	86.11	91.66	84.24	Good
	Implement procedures, techniques, or use of equipment	86.11	88.88	88.88	87.95	Very good
2	Skills to process / process (process skills)					
	Predict	88.88	91.66	91.66	90.73	Very good
	Inferring	88.88	88.88	88.88	88.88	Good
	Selecting procedures	88.88	91.66	91.66	90.73	Very good
3.	Investigation skills					
	Designing investigations/research (non-experimental/experimental)	36.11	66.66	75	59.25	Not enough
	Carry out investigations/research (non-experimental/experimental)	25	30.55	77.77	44.44	Not enough
	Report the results of the investigation	5.55	19.44	77.77	34.25	Not enough

Table 2. Science Process Skills for Cycle 2 Students

No.	Science Process Skills (SPS)	Meeting 1 (%)	Meeting 2 (%)	Meeting 3 (%)	Average	Category
1.	Basic Skills					
	Observe	100	100	100	100	Very good
	Recording/recording data and information	100	100	100	100	Very good
	Follow orders/instructions	91.66	91.66	94.44	92.58	Very good
	Take measurements	94.44	94.44	100	96.29	Very good
	Perform movement manipulation	94.44	94.44	100	96.29	Very good
	Implement procedures, techniques or use of equipment	91.66	91.66	94.44	92.58	Very good
2.	Skills to process / process (process skills)					
	predict	94.44	94.44	100	97.22	Very good
	Inferring	91.66	91.66	94.44	91.66	Very good
	Selecting procedures	83.33	94.44	100	91.66	Very good
3.	Investigation skills					
	Designing investigations/research (non-experimental/experimental)	77.77	91.66	91.66	87.03	Good
	Carry out investigations/research(non-experimental/experimental)	80.55	88.88	97.22	88.88	Good
	Report the results of the investigation	75	77.77	94.44	82.40	Good

In cycle 2, the teacher is more focused on increasing the value of investigative skills. Inquiry is a learning model requiring experiments and experiments [26]. Inquiry is a process of obtaining andobtaining information by observing and experimenting [27] to find answers or solve problems with questions or problem formulation by using critical thinking skills [28] and logically. The teacher uses the lucky weels application so that students are active in presenting the results of their discussions in front of the class. The general condition for the emergence ofinquiry activities for students is the social aspect in class [29] and an open atmosphere that invites students to discuss [30]. The inquiry model focuses on hypotheses and uses facts as evidence (information and facts) [31]. The science process skills described in science learning can involve various skills, including intellectual, manual, and social skills [32].

The results of the teacher's reflection and discussion with observers in cycle two were carried out in practicumthrough the third syntax of inquiry: investigation. Students can experiment through the practicum of making tempeh and tape. Thus the results of the SPS investigation skills of students increase from cycle 1 and cycle 2 (Table 3), namely the skills to design an investigation 59.25-87.03%, the skills to carry out an investigation 44.44-88.88%, and investigative reporting skills 34.25-82.40%. Based on Table 3, there was an increase in students' SPS scores. Cycle 1 basic skills (89.96%) increased in cycle 2 (96.29%), cycle 1 process skills. (90.43%) increased in cycle 2 (94.13%), and investigative skills in cycle 1 (46.29%) also increased in cycle 2 (86.10%). Therefore, it was not continued to the next cycle because thescience process skills (SPS) improvement value had reachedthe success indicator value (≥70%).

Table 3. Percentage comparison value of the increase in science process skills for cycles 1 and 2.

No.	Science processskills (SPS)	Cycles1(%)	Cycles2 (%)	Information
1.	Basic Skills			
	Observe	100	100	Increase
	Recording/recording data and information	100	100	Increase
	Follow orders/instructions	87.95	92.58	Increase
	Take measurements	81.94	96.29	Increase
	Perform movement manipulation	84.24	96.29	Increase
	Implement procedures, techniques, oruse of equipment	87.95	92.58	Increase
2.	Skills to Process / process (process skills)			
	predict	90.73	97.22	Increase
	Inferring	88.88	91.66	Increase
	Selecting procedures	90.73	91.66	Increase
3.	Investigation skills			
	Designing investigations/research (non-experimental/experimental)	59.25	87.03	Increase
	Carry outinvestigations/ research (non-experimental/experimental)	44.44	88.88	Increase
	Report the results of the investigation	34.25	82.40	Increase

The solution to improving science process skills in this classroom action research can be improved through an inquiry approach. In the process of improving these aspects of skills, the teacher should guide more intensively so that students are more accustomed to learning on their own to findconcepts [33], scientific principles [34] and develop creativity in solving science problems [35]. The average percentage of process skills increased by 10.55% from 62.89% to 73.44%. Investigative skills in cycle 1 are still low because the teacher in the learning process is only theoretical, has not shown investigative science processes such as practicum or experiments, so investigative skills are still low. The reflection results show the need for practicum in the second cycle to improve the process of investigative skills. After the practicum was carried out, there was an increase in investigative skills in cycle 2. Investigation skills are part of the psychomotor skills that students must have [36], where these skills will develop higher skills. However, to improve these skills, experience is needed to carry out a practicum [37]. Process skills are easy to observe when students carry out practical or experimental activities [38]. The purpose of this skill is to solve problems and find practical solutions which are basic and integrated science process skills [39-40]. Basic process skills will become the basis for integrated skill development

[41]. These two science process skills will influence students to solve problems in the environment practically. Science process skills (SPS) using the inquiry learning model are important aspects that must bepossessed in learning science. This is because both are skills that involve scientific investigation and problem solving about scientific concepts that exist in life [42-44].Science process skills can be used by students to solve scienceproblems in everyday life [45-46].

CONCLUSION

The results of applying the inquiry learning model carried outin cycles 1 and 2 can be concluded that the inquiry learning model can improve science process skills (SPS). It is obvious in one type of SPS, namely increasing investigative skills, where the value in cycle (46.29%) increased in cycle 2 (86.10%). Therefore an indicator of research success wasachieved on SPS with the ≥70% category.

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REFERENCES

[1] Daryanto, M. R. (2012). Model pembelajaran inovatif. *Yogyakarta: gava media*.

[2] Astuti, A. (2016). Analisis Keterampilan Proses Sains pada Lembar Kegiatan Siswa (LKS) Biologi Kelas X di Kecamatan Wonosobo yang Dikembangkan Berdasarkan Kurikulum 2013. *Jurnal Pendidikan Biologi*, 5(8), 55- 61.

[3] Pedaste, M., Mäeots, M., Siiman, L. A., de Jong, T., van Riesen, S. A. N., Kamp, E. T., Manoli, C. C., Zacharia, Z.C., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. In *EducationalResearch Review*.

[4] Gul, S. & Mustafa, S. (2016). International Trends in Biology Education Research from 1997 to 2014: *A Content Analysis of Papers in Selected Journals*. 12(6), 1631-1651.

[5] Derlina, D. (2016). Efek Penggunaan Model Pembelajaran Inquiry Training Berbantuan Media Visual dan Kreativitas terhadap Keterampilan Proses Sains Siswa. *Jurnal Cakrawala Pendidikan*, *35*(2).

[6] Robiatul, L. L., Setiono, S., & Suhendar, S. (2020). Profil Keterampilan Proses Sains Siswa Kelas VII SMP Pada Materi Ekosistem. *BIODIK: Jurnal Ilmiah Pendidikan Biologi*, *6*(4), 519-525.

[7] Subali, B. (2011). Pengukuran kreativitas keterampilan proses sains dalam konteks. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *1*, 130–144.

[8] Sari, H. K. (2016). Peningkatan Keterampilan Proses Sains dan Hasil Belajar Fisika Peserta didik pada Model Pembelajaran Kooperatif Tipe Student Team Achievement Division. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, *1*(1), 15–22.

[9] Siswono, H. (2017). Analisis Pengaruh Keterampilan Proses Sains Terhadap Penguasaan Konsep Fisika Peserta didik. *Momentum: Physics Education Journal*.

[10] Dewi, N. L., Dantes, N., & Sadia, I. W. (2013). *Pengaruh model pembelajaran inkuiri terbimbing terhadap sikap ilmiah dan hasil belajar IPA* (Doctoral dissertation, Ganesha University of Education).

[11] Duran, M., Isik, H., Mihladiz, G., & Özdemir, O. (2011). The Relationship between the Pre-Service Science Teachers' Scientific Process Skills and Learning Style. *Western Anatolia Journal of Educational Sciences*, 467– 476.

[12] Duran, M., & Dökme, I. (2016). The effect of the inquiry-based learning approach on student's critical-thinking skills. *Eurasia Journal of Mathematics Science and Technology Education*, *12*(12).

[13] Jamaluddin, J., Jufri, A. W., Muhlis, M., & Bachtiar, I. (2020). Pengembangan Instrumen Keterampilan Berpikir Kritis Pada Pembelajaran IPA di SMP. *Jurnal Pijar Mipa*, *15*(1), 13-19.

[14] Astuti, T. N., Sugiyarto, K. H., & Ikhsan, J. (2020). Effect of 3D Visualization on Students' Critical Thinking Skills and Scientific Attitude in Chemistry. *International Journal of Instruction*, *13*(1), 151-164.

[15] Dimyati, M. (2006). *Belajar dan Pembelajaran*. PT. Rineka Cipta. Jakarta.

[16] Asih, Tr. (2015). Pengembangan Model Panduan PembelajaranKeterampilan Proses Sains Biologi SMA/MA. *BIOEDUKASI Jurnal Pendidikan Biologi*, 6(1), 30-37.

[17] Alkharusi, H. A., Al Sulaimani, H., & Neisler, O. (2019). Predicting Critical Thinking Ability of Sultan Qaboos University Students.*International Journal of Instruction*, *12*(2), 491-504.

[18] Widodo, W., & Budijastuti, W. (2020). Guided Discovery Problem-Posing: An Attempt to Improve Science Process Skills in Elementary School. *International Journal of Instruction*, *13*(3).

[19] Rahdar, A., Pourghaz, A., & Marziyeh, A. (2018). The Impact of Teaching Philosophy for Children on Critical Openness and Reflective Skepticism in Developing Critical Thinking and Self-Efficacy. *International Journalof Instruction*, *11*(3), 539-556.

[20] Harahap, F., Nasution, N. E. A., & Manurung, B. (2019). The Effect of Blended Learning on Student's Learning Achievement and Science Process Skills in Plant Tissue Culture Course.

International Journal of Instruction, *12*(1), 521-538.

[21] Miterianifa. (2013). *Strategi Pembelajaran Kimia*. Pekanbaru: Pustaka Mulya.

[22] Setiadi, I. & Irhasyuarna, Y. (2017). Improvement of Model Student Learning Through the Content of Solutions Guided Discovery Buffer. *IOSR Journal of Research & Method in Education* (IOSR-JRME), 7 (1), 1-9.

[23] Sanjaya, W. (2016). Pengembangan Perangkat Kurikulum dan Rancangan Pembelajaran. *PEDAGOGIA Jurnal Ilmu Pendidikan*, 12(2), 126.

[24] Trianto. 2011. *Model-model Pembelajaran Inovatif Berorientasi Konstruktivistik*. Jakarta: Prestasi Pustaka.

[25] Davis, B.G. (2013). *Tools for Teaching*. Jakarta: Rajawali Press.

[26] Hasruddin, F. H. (2018). Contextual Inquiry Model to Improve Students' Science Process Skill on Microbiology Lesson. *Jurnal Pendidikan Dan Pembelajaran*, 25 (1), 8-15.

[27] Basri, H. (2019). Investigating Critical Thinking Skills of Junior High School in Solving Mathematical Problems. *International Journal of Instruction*, *12*(3), 745-758.

[28] Dewi, N. & Sudana, D. (2016). Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Pemahaman Konsep IPA dengan Mengontrol Minat Belajar pada Siswa Kelas V SD. *Jurnal Pendidikan dan Pengajaran*, 49(1), 40- 47.

[29] Amri, Sofan dan Ahmadi, I.K. (2010). *Proses Pembelajaran Inovatif dan Kreatif dalam Kelas.* Jakarta: Pustakarya.

[30] Alemu, M. (2020). Improving Secondary School Students Physics Achievement Using Reciprocal Peer Tutoring: A Multi-level Quasi-Experimental Study. *EURASIA Journal of Mathematics, Science and Technology Education*, *16*(4), em1832.

[31] Af'idayani, N., Setiadi, I., & Fahmi. (2018). The effect of inquiry model on science process skills and learning outcomes. *European Journal of Education Studies*, 4 (12), 177-182.

[32] Marjan, J., Arnyana, I. B., &Setiawan, I. G. N. (2014). Pengaruh Pembelajaran Pendekatan Saintifik Terhadap Hasil Belajar Biologi dan Keterampilan Proses Sains Siswa MA Muallimat NW Pancor Selong Kabupaten Lombok Timur Nusa Tenggara Barat. *Jurnal Pendidikan IPA*, 4(1), 1-14.

[33] Akcay, H., & Yager, R. E. (2016). Students learn to use the skills used by practicing scientists. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(3), 513-525.

[34] Tiruneh, D. T., De Cock, M., Weldeslassie, A. G., Elen, J., & Janssen, R. (2017). Measuring critical thinking in physics: Development and validation of a critical thinking test in electricity and magnetism. *International Journal of Science and Mathematics Education*, *15*(4), 663-682.

[35] Saputra, M., & Kuswanto, H. (2019). The Effectiveness of Physics Mobile Learning (PML) with HomboBatu Theme to Improve the Ability of Diagram Representation and Critical Thinking of Senior High School Students. *International Journal of Instruction*, *12*(2), 471-490.

[36] Puspita, I., Kaniawati, I., & Suwarma, I. R. (2017). Analysis of critical thinking skills on the topic of static fluid. In *Journal of Physics: Conference Series*, 895 (1), 1-5.

[37] El Islami, R. A. Z., & Nuangchalerm, P. (2020). Comparative study of scientific literacy: Indonesian and Thai pre-service science teachers re-report. *International Journal Evaluation and Research Education*, *9*(2), 261-268.

[38] Aldahmash, A. H., Alshamrani, S. M., Alshaya, F. S., & Alsarrani, N. A. (2019). Research Trends in In-Service Science Teacher Professional Development from 2012 to 2016. *International Journal of Instruction*, *12*(2), 163- 178.

[39] Duda, H. J., Susilo, H., & Newcombe, P. (2019). Enhancing different ethnicity science process skills: Problem- based learning through practicum and authentic assessment. *International Journal of Instruction*, *12*(1), 1207- 1222.

[40] Fitriani, E. Y., & Fibriana, F. (2020). Analysis of Religious Characters and Logical Thinking Skills After Using Solar System Teaching Material Integrated with Islamic Science. *Journal of Innovation in Educational and Cultural Research*, *1*(2), 69-76.

[41] Darmaji, D., Kurniawan, D. A., Suryani, A., & Lestari, A. (2018). An Identification of Physics Pre-Service Teachers' Science Process Skills Through Science Process Skills-Based Practicum Guidebook. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *7*(2), 239-245.

[42] Tanti, T., Kurniawan, D. A., Kuswanto, K., Utami, W., & Wardhana, I. (2020). Science process skills and critical thinking in science: Urban and rural disparity. *Jurnal Pendidikan IPA Indonesia*, *9*(4), 489-498.

[43] Solikah, M., & Novita, D. (2022). The effectiveness of the guided inquiries learning model on the critical thinking ability of students. *Jurnal Pijar Mipa*, *17*(2), 184-191.

[44] Is' ad, N., & Sukarmin, S. (2022). Implementation of problem-solving learning

model assisted by student worksheets to improve critical thinking skills in the context of reaction rate. *Jurnal Pijar Mipa*, *17*(2), 199-208.

[45] Darmaji, D., Kurniawan, D. A., Suryani, A., & Lestari, A. (2018). An Identification of Physics Pre-Service Teachers' Science Process Skills Through Science Process Skills-Based Practicum Guidebook. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *7*(2), 239-245.

[46] Wibawa, I. M. C., Marhaeni, A. A. I. N., Arnyana, I. B. P., & Suma, K. (2020). Triggering on Science Concepts Mastery and Science Process Skills Through Combination of Cooperative Learning Models and Performance Assessments. *Journal of Talent Development and Excellence*, *12* (3s), 2214-2227.