The Development of Student Live Worksheets Based on Problem Based Learning in the Optical Instrument Chapter

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Received: September 21st, 2021 *Accepted:* January 28th, 2022 *Online Published:* January 31st, 2022

Abstract

Solving science problems theoretically is sometimes difficult for students to do. This is because students have never been in direct contact with science problems. This study aims to develop student live worksheets based on problem based learning on optical instrument chapter The research method used reffered to the research and development by Sugiyono. This model has steps consisting of 10 steps: (1) Potential and problems, (2) Data collection, (3) Product design, (4) Design validation, (5) Design revision, (6) Product trial, (7) Product Revision, (8) Usage Trial, (9) Product Revision, and (10) Mass production. This research was only carried out until the seventh step. This study used data collection techniques in the form of interviews and questionnaires and used qualitative and quantitative descriptive data analysis techniques.The results of the validity of the student live worksheet had been declared very valid based on the results of the validation of the learning material experts who obtained a score of 85% with a very valid category, and media experts obtained a score of 77.08% with a very valid category. In addition, the student work sheet was declared very practical with a value of 97.22% without revision. Based on the students' responses, they scored 91.67% in the very good category. Based on these data, it can be said that the student live worksheet Based on Problem Based Learning on Optical Instrument chapter stated to be very valid and practical to be used as science teaching material in schools.

Keywords: *Live worksheets; problem based learning; Optical Instrument*

How to cite this article :

Hendrayani, A., Permana, N. D., Ilhami, A., Syarif, M. I.(2022). The Development of Student Live Worksheets Based on Problem Based Learning in the Optical Instrument Chapter. *IJIS Edu : Indonesian Journal of Integrated Science Education, 4(*1), 75-*82* . doi:http://dx.doi.org/10.29300/ijisedu.v4i1.6568

INTRODUCTION

Learning is basically an attempt by teachers to direct students into the learning process so that they can achieve learning goals as expected. The learning process must be designed interactively, inspiring, fun, challenging, motivating students to actively participate, as well as providing sufficient space for initiative, creativity, and independence in accordance with students' talents, interests and physical and psychological development.

Teachers are the main motorists who have a direct responsibility to translate curriculum into learning activities and are not the only major source of knowledge.(Urwati & Ernita 2019). Teachers are required to be able to create and develop teaching materials to facilitate the teaching and learning process. This teaching material is compiled and designed by the teacher himself so that learning becomes more effective, can increase the activities and learning achievements of learners.

In this era of globalization, teachers are also required to have the ability to complete technology in the 21st century one of the abilities or skills that must be possessed by a teacher is mastery of technology for example good at using computers and the internet by utilizing computers and the internet so that not only teachers can have these skills but also teach them to students. In this day and age we can use technology to learn there are a lot of web-based applications or applications that can be accessed.

But in fact there are still teachers who have not been able to make learning facilities that are appropriate and in accordance with the times and adjust them to the right learning methods for SCIENCE learning which causes not the maximum results of SCIENCE learning and it causes students still not able to be independent in learning such as solving existing problems because of the lack of variety of media and resources used when studying because students are only Using textbooks and LKS that are less interesting because they are not colored and the presentation that seems to be embroidered and ditmabah often how to teach teachers who seem centered only on teachers so that it is not suitable for SCIENCE learning itself.

This problem can be overcome by creating a learning media in the form of student worksheets or abbreviated as student work sheet. For the creation of student work sheet, teachers should not make students solely do questions but teachers should be able to make students actively think independently by finding a problem and students can solve or solve the problem independently so that students can gain new knowledge. In accordance with the actual learning of SCIENCE, which is learning that requires students to participate directly in finding and solving these problems and SCIENCE learning is not obtained from the results of human thought, but SCIENCE is the result of observation and experimentation of a natural symptom on earth. Natural Sciences (SCIENCE) is concerned with how to find out about nature systematically, so that SCIENCE is not only a mastery of a collection of knowledge in the form of facts, concepts or principles, but also a process of discovery.(Kumala, 2016)

SCIENCE learning must adjust the learning model to maximize the learning of the SCIENCE. The learning process in school should be carried out interactively, fun, challenging, and motivate students to be active in learning so that learning is centered to students (student centered) and teachers become facilitators.(Permana, 2015).

So it was chosen is a problem-based learning model that according to researchers in accordance with the concept of SCIENCE itself. The selection of learning models in the development of the right student work sheet is indispensable in a good learning process. The selection of the PBL model is considered to be able to make learners' learning more meaningful(Novia, Husna, & Zulva 2021). PBL is suitable for developing higher thinking skills, problem-solving skills, and attitudes necessary in real life such as active, independent and cooperative.(Manurung & Panggabean, 2020)

Problem Based Learning (PBL) model is a model used to develop thinking, problem solving, and self-regulation skills by using authentic problems as the focus of learning. The goal of the PBL learning model is to develop critical thinking patterns to solve problems and mastery of learning materials. With the PBL Learning Model, it is considered effective because students can search for solutions and solve problems themselves so that the understanding of students' mathematical concepts can increase. The application of this model can change students' thinking patterns based on cognitive levels from low to higher.

In the learning of the PBL Model, students can conduct analysis, trials, make references and draw conclusions by carrying out

an investigation into the problem at hand.(Nurrohma & Adistana 2021). In PBL, teachers take on the role of facilitator rather than as teachers. Facilitators help groups build understanding and connect concepts by informing, directing exploration, strengthening understanding of difficult concepts, and introducing resources. The facilitator can also be considered a coach or guide who provides feedback and encouragement(Seibert, 2021).

From the description above created an idea to create student work sheet Problem Based Learning. student work sheet based on Problem Based Learning was chosen because it makes students learn based on problems so that students are required independently to solve problems in SCIENCE learning. The learning with the worksheets had a significant influence on the junior high school students (Sutarto et al., 2018). students' worksheet (LKPD) about multiple intelligences-based lens materials can enhance their visual-spatial intelligence and learning outcomes. (Gani, Safitri, & Mahyana, 2017). The results of research conducted (Yustina & Kapsin, 2017) stated that LKS can improve students' competence in building knowledge about forest and land fire prevention.

Liveworksheets is an application that can be accessed through the website. Liveworksheets allow teachers to create interactive worksheets for their students. Web-based application "Liveworksheet.com" is a worksheet learner that can convert printed worksheets in the form of .doc, .pdf, .jgg into interactive worksheets that can correct systematically. The form of questions that can be created with this application varies greatly such as multiple choice, short answers, choosing right wrong, and matching. This learner worksheet gives learners the opportunity to study independently (Prabowo, 2021).

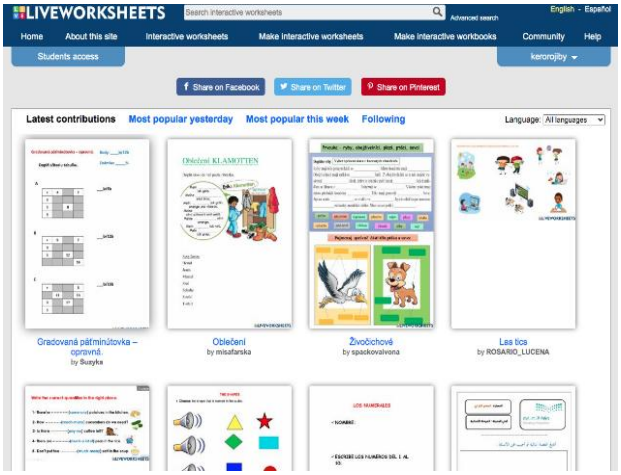

Figure 1. *Liveworksheet*

The use of live worksheet itself is very easy and profitable and very helpful because we do not need to print it on tape so that we can save more paper and it is better for nature or our earth itself and we can also maximize the use of gadgets we have such as smartphones and laptops for learning and other benefits we can save costs other than that at this time the school conducts the process of learning and teaching online or online.yang due to the COVID 19 pandemic. So that the use of student work sheet based on problem-based learning assisted by live worksheet can be done remotely anywhere and anytime.

Based on the background that has been stated above, the author is interested in conducting research on the development of student work sheet based on liveworksheet-assisted learning on optical tool materials.

METHOD

This research is a type of development research (Research and Development). Research and development is a research method used to produce a particular product and test the effectiveness of that product (Sugiyono, 2013). This development research is derived from the sugiyono development model with the following stages: 1) potential and problems, (2) data collection, (3) product design, (4) design validation, (5) design revision, (6) product trials, (7) product revisions 1, (8) usage trials, (9) product revisions 2, (10) mass production. But in this study was only done until the seventh stage because of the limitations experienced by researchers. This research uses data collection techniques in the form of interviews and questionnaires and uses qualitative and

quantitative descriptive data analysis techniques. Quantitative descriptive data analysis is done by analyzing quantitative data in the form of numbers. This analysis is used to analyze the data obtained from the questionnaire. This analysis consists of three parts, including: validity test analysis, practicality test analysis, and student response analysis.

Indicators of validation results criteria, practicality, and student response can be seen in the following table.

Table 1.Result Criteria

No.	Percentage	Criterion
1.	81%- 100%	Very Valid/Very Practical/Very Good
2.	61% - 80%	Valid/Practical/Good
3.	41% - 60%	Valid Enough/Practical Enough/Good Enough
4.	0% -20%	Invalid/Impractical/Unkind

(Source: Hamka & Effendi, 2019)

RESULT AND DISCUSSION

1. Potential and Problems

Researchers collect data by conducting interviews to identify potentials and problems where researchers conduct interviews with SCIENCE teachers. The results of this study show that the learning resources used during the learning process are package books, environments, and LKS. The learning resources used seem to be not varied and tend to be boring and less stimulating for learners to be active in learning.

We need innovation in the field of education to overcome problems in education. Facing these great challenges, education is required to carry out technological developments that can facilitate the learning process. One of the results of technological developments is the use of information and communication technology in education. Mobile devices that are majority owned and used in the daily life of students are communication tools in the form of mobile phones (Saputra & Kurniawati, 2021).

In addition, learning is oriented towards the advancement of technology, information and communication to make it easier to convey more interesting learning so as to increase the interest in learning learners(Hamka & Effendi, 2019).

Based on the results of interviews in schools have never used student work sheet Based on Live work Sheet in SCIENCE learning Therefore it takes a teaching material in the form of the development of student work sheet Problem Based Learning Assisted Live Work Sheet on Optical Tool material with the development of student work sheet is expected that students will be more active and easily understand the concept of materials in learning and add curiosity to students.

2. Data Collection

To get information that supports product development in the form of student work sheet Problem Based Learning Assisted Live Work Sheet on Optical Tool material in the form of relevant teaching material sources, namely the book "Natural Sciences for Junior High School / MTs Class VIII" by education and Culture of the Republic of Indonesia. Researchers also take reverence from several relevant sources that could help for the development of student work sheet to be developed by researchers.

These relevant sources such as making student work sheet where in making student work sheet in accordance with the KI and KD curriculum 2013 and with these references researchers can compare with student work sheet to be made by researchers.

After that, the researcher also compiled an instrument that will be used during the study consisting of a questionnaire for validation of material aspects, media aspects, practicality test questionnaires, and student response questionnaires.

3. Product design

The student work sheet Preparation Product Design starts with designing the outside of the v, namely the front cover or cover. The front cover contains the author's name, module title, material title, class description, agency description, and logo.

This student work sheet cover is designed using applications that researchers think are easy to use, namely the Microsoft Power Point application and the Mobile version of adobe lightroom application. The application used to design the cover is Microsoft Power Point is being to adjust the color there is an student work sheet Cover made in the Mobile version of adobe lightroom application.

Color has an impact on a person's behavior and perception of a thing unconsciously.(Audrey, 2020). The color chosen in the manufacture of this student work sheet cover is dominant with green. Green is related to nature and development.(Suriadi et al., 2022).

Because SCIENCE learning is related to nature, the green color will be suitable for use in IPA learning. Green is a color with a level of description (brightness) that tends to be low, so this color is comfortable to see. From the perspective of color psychology, green is a great counterbalance of heart and emotion, creating a balance between head and heart. This color provides coolness, the ability to maintain peace, and is able to display positive emotions so that it is suitable for use in learning.(Purbasari & Jakti, 2014).

In the perspective of Islam, some verses of the Qur'an put green in one noble place and are seen as beautiful by Allah. This color is said to be the favorite color of the Prophet SAW. The dome of the Prophet's Mosque itself is green.one example of a verse in the Qur'an that discusses the color green is the letter Ar-Rahman verse 64 which readsمُدْهَآمَّتَانِ *The two heavens (visible) dark green color (Qur'an).*

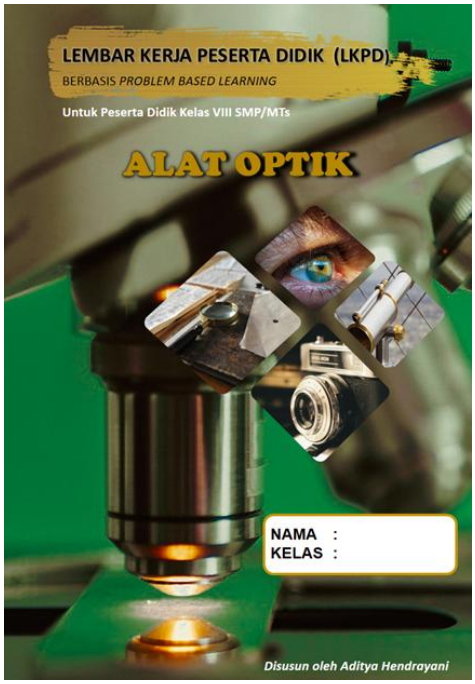

Figure 2.Cover of student work sheet

In the content section of student work sheet consists of instructions for using student work sheet to make it easier for students to use student work sheet, after that there is a concept map, then a sub cover to limit each sub-material, then a worksheet tailored to problem based learning which consists of observing, investigating, presenting data, problem-solving analysis and evaluation. At the end of student work sheet there is a bibliography. The content of student work sheet has been adjusted to the core competencies and basic competencies. After the student work sheet is finished and there are no more revisions in its making, the student work sheet can be uploaded to the Liveworksheet.com website and ready to be used.

4. Validation of student work sheet Design that has been designed is further validated by validators through media experts and material experts. In this assessment is done by spreading questionnaires that have previously been validated by validators, then validators provide values, suggestions and criticisms of the student work sheet developed.

A. Material Validation Based on the results of material expert validation the overall percentage value of the assessment is 85% with the category "very valid" with notes must be revised in accordance with suggestions and criticisms by the material expert validator. In the first indicator, the Quality Aspect of the contents gets a percentage value of 100% validity with a very valid category. The Truth aspect of the concept gets a percentage value of validity of

78% with very valid categories. The Conformity Aspect of the concept gets a validity percentage value of 81% with a very valid category. The Language Aspect gets a validity percentage value of 88% with a very valid category. The conformity aspect of student work sheet based on Problem Based Learning is 77% with a very valid category. The highest value obtained from the Quality Aspect of the content gets a validity percentage value of 100% with a very valid category.

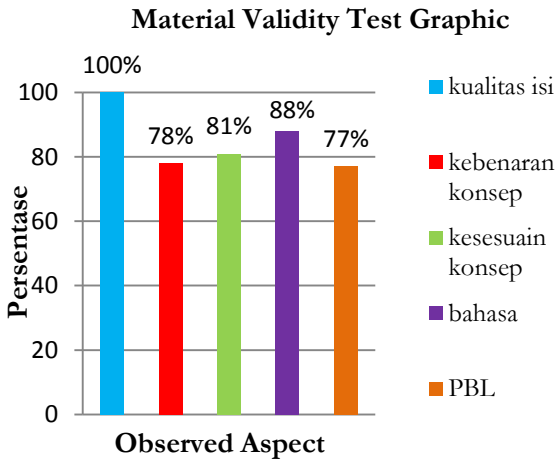

Figure 3. Material Validity Test Graph

b.Media Validation

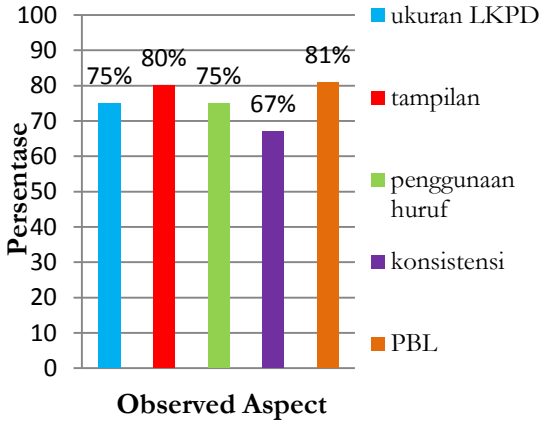

Figure 4. Media Validity Test Graph

Furthermore, the assessment of the results of media expert validation of the overall percentage of the assessment is 77.08% with a very valid category with a note that it must be revised in accordance with the advice and criticism by the media expert validator. In the first indicator, the student work sheet size aspect gets a validity percentage value of 75% with a valid category. The Display aspect gets a validity percentage value of 80% with a very valid category. The Use aspect of letters gets a validity percentage value of 75% with valid categories. The consistency aspect gets a validity percentage value of 67% with a valid category and a Problem Based Learning-based student work sheet conformity aspect of 81% with a very valid category which is the highest value.

5. Design Revision

After product validation on aspects of content eligibility, presentation feasibility, feasibility of infographics and language eligibility. Furthermore, researchers revise the design of products developed based on input and suggestions from validators.

6. Test of Completed Product Products, then assessed its practicality and tested in learning activities. Trials were conducted to find out student work sheet learning SCIENCE Problem Based learning assisted by Liveworksheet is valid, practical and used as teaching material.

Grafik Uji Praktikalitas

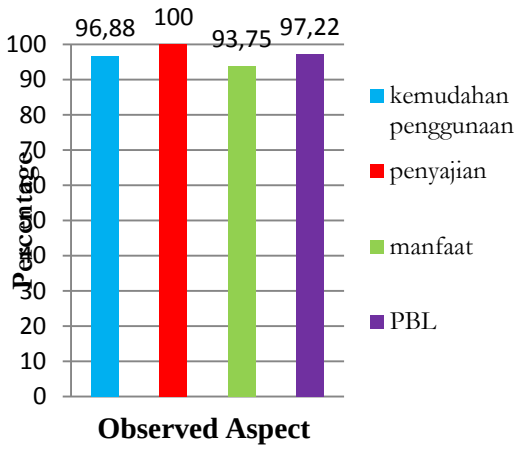

Figure 4. Media Validity Test Graph

Practicality was carried out by 2 SCIENCE teachers and student response as many as 15 people. Based on the results of the practicality test obtained an overall average value of 97.22% with the criteria "very practical". This proves that the student work sheet developed is practical and can be used as an SCIENCE learning resource. Based on the results of the response test, students obtained an overall average score of 91.67% with the criteria of "excellent." This shows that the student work sheet developed gets a good response from students, in terms of interest, language, material, and benefits.

According to students student work sheet based on Problem Based Learning and assisted by Liveworksheet is a new and interesting thing.

From the above explanation, it can be concluded that student work sheet learning SCIENCE Problem Based learning assisted by Live work Sheet is valid, practical and used as teaching material. . This is in line with Anis Nur Rosyidah's opinion that modules can be applied to learning if the responses of teachers and students regarding the application of these modules are minimal in the good category.(Rosyidah & Sudarmin, 2013).

7. Product Revision

From the results of product trials, if the response of teachers and learners says that this product is good and interesting, then it can be said that student work sheet has been completed, resulting in the final product. However, if the product is not perfect then the results of this trial are used as a material for repairing and refining the teaching materials made, so that it can

produce an interesting final product and can be used in schools.

CONCLUSSION

Conclusion Based on research on the development and analysis of data conducted on student live worksheet based on problem based learning in the optical instrument chapter can be concluded as follows:
1.Validity of student live worksheet based on problem based learning in the optical instrument chapter developed to get very valid results.
2. The practice of student live worksheet based on problem based learning in the optical instrument developed get very practical results.
3. Students' response to of student live worksheet based on problem based learning in the optical instrument developed gets excellent results. Some suggestions that can be given to of student live worksheet based on problem based learning in the optical instrument as follows:
1. of student live worksheet based on problem based learning in the optical instrument that researchers do can be improved in quality.
2.furthermore, of student live worksheet based on problem based learning in the optical instrument with wider material.
3.It is necessary to conduct further research on the of student live worksheet based on problem based learning in the optical instrument to the next stage, namely Usage Trials, Product Revisions, and Mass Production.
4.For SCIENCE teachers who will implement of student live worksheet based on problem based learning in the optical instrument, it is necessary to manage learning time effectively and efficiently so that learning goals in student work sheet can be achieved.

REFERENCES

Audrey, N. (2020). *Perancangan Desain Cover Buku Jurnal untuk Target Market Gen Z*. 733–740.

Gani, A., Safitri, R., & Mahyana, M. (2017). Improving the Visual-Spatial Intelligence Snd Results of Learning of Juniour High School Students' with Multiple Intelligences-Based Students Worksheet Learning on Lens Materials. *Jurnal Pendidikan IPA Indonesia*, 6(1).

Hamka, D., & Effendi, N. (2019). Pengembangan Media Pembelajaran Blended Learning Berbasis Edmodo Pada Mata Kuliah Fisika Dasar di Program Studi Pendidikan IPA. *Journal of Natural Science and Integration*, *2*(1), 19.

Kumala, F. N. (2016). *Pembelajaran IPA SD*. Ediide Infografika.

Manurung, S. R., & Panggabean, D. D. (2020). Improving students' thinking ability in physics using interactive multimedia based problem solving. *Cakrawala Pendidikan*, *39*(2), 460–470.

Novia, N., Husna, H., & Zulva, R. (2021). Pengembangan LKPD Dinamika Rotasi dan Kesetimbangan Benda Tegar Berorientasi Problem Based Learning. *Journal of Natural Science and Integration*, *4*(2), 214.

Nurrohma, R. I., & Adistana, G. A. Y. P. (2021). Penerapan Model Pembelajaran Problem Based Learning dengan Media E-Learning Melalui Aplikasi Edmodo pada Mekanika Teknik. *Jurnal Ilmu Pendidikan*, *3*(4), 1199–1209.

Permana, N. D. (2015). Penggunaan website dalam penerapan model pembelajaran learning cycle 7e untuk meningkatkan pemahaman konsep siswa pada materi kinematika gerak lurus. Gravity: Jurnal Ilmiah Penelitian dan Pembelajaran Fisika, 1(1)

Prabowo, A. (2021). Penggunaan Liveworksheet dengan Aplikasi Berbasis Web untuk Meningkatkan Hasil Belajar Peserta Didik Using Liveworksheet with Web-Based Applications to Improve Student Learning Outcomes. *Jurnal Pendiidkan Dan Teknologi Indonesia*, *1*(10), 383–388.

Purbasari, M., & Jakti, R. A. D. R. I. K. (2014). Warna Dingin Si Pemberi Nyaman. *Humaniora*, *5*(1), 357.

Rosyidah, A. N., & Sudarmin, K. S. (2013). Pengembangan Modul Ipa Berbasis Etnosains Zat Aditif Dalam Bahan Makanan Untuk Kelas Viii Smp Negeri 1 Pegandon Kendal. *USEJ - Unnes Science Education Journal*, *2*(1), 133–139.

Saputra, W. D., & Kurniawati, Y. (2021). Desain Media Pembelajaran Berbasis Android pada Materi Praktikum Pengenalan Alat Laboratorium Kimia Sekolah Menengah Atas. *Journal of Natural Science and Integration*, *4*(2), 268.

Seibert, S. A. (2021). Problem-based learning: A strategy to foster generation Z's critical thinking and perseverance. *Teaching and Learning in Nursing*, *16*(1), 85–88.

Sugiyono. (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

Suriadi, J., Mardiyana, M., & Reza, B. (2022). Concept of Color Psychology and Logos To Strengthen Brand Personality of Local Products. *Linguistics and Culture Review*, *6*, 839–856.

Sutarto, S., Indrawati, I., Prihatin, J., & Putra, P. D. A. (2018). Geometrical optics process image-based worksheets for enhancing students' higher-order thinking skills and self-regulated learning.*Jurnal Pendidikan IPA Indonesia.7*(4). 376-382

Urwati, K., & Ernita, N. (2019). Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Terhadap Hasil Belajar Kognitif Siswa Pada Materi Hukum Newton Kelas X MA Darul Muhajirin Praya. *Journal of Natural Science and Integration*, *2*(2), 203–215.

Yustina, Y., & Kapsin, K. (2017). The Implementation of Constructivism-Based Student Worksheets within The Theme 'The Prevention of Land and Forest Fire'in Science Education for Grade VII of Secondary Schools in Riau. Jurnal Pendidikan IPA Indonesia, 6(2), 298-305.