JPPIPA 8(3) (2022)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Electronic Student Worksheet Based on Guided Inquiry on The Topic of Photosynthesis

Aditya Fahlevi[1*], Jumadi[1], Arina Novia Dewi[1], Feby Permata Sari[1]

[1] Master of Science Education Study Program, Faculty of Mathematics and Natural Science, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia.

DOI: 10.29303/jppipa.v8i3.1674

Article Info
Received: May 27, 2022
Revised: July 10, 2022
Accepted: July 20, 2022
Published: July 31, 2022

Abstract: This study is a form of research and development through implementing a Four-D model to generate electronic student worksheets based on guided inquiry on the topic of photosynthesis. The purpose of this research is to attain electronic student worksheets that can be worth using in science learning. Product quality is assessed based on the feasibility and response of learners to the practicality of use. The instruments used in the study were electronic student worksheet eligibility assessment sheets and student response assessment sheets developed using the Likert scale. The results showed that the characteristics of electronic student worksheets based on guided inquiry consist of steps for problem identification, hypothesis definition, problem formulation, data collection, verification of results, and generalization to conclusion drawing. another finding was that electronic student worksheets based on guided inquiry on the topic of photosynthesis obtained a Feasibility score with an average of 108.20 with excellent categories and the results of the student response test obtained a score of 91.80 with an excellent category.

Keywords: Electronic student worksheet; Guided inquiry; Photosynthesis

Citation: Fahlevi, A., Jumadi, J., Dewi, A.N., & Sari, F.P. (2022). Development of Electronic Student Worksheet Based on Guided Inquiry on The Topic of Photosynthesis. *Jurnal Penelitian Pendidikan IPA*, *8*(3), 1408–1415. https://doi.org/10.29303/jppipa.v8i3.1674

Introduction

Science education is a subject that has an important role in education and as a foundation for students to meet future needs. Science education is a unit that involves various elements to obtain information and achieves changes that are closely related to the human living environment (Maryanti et al., 2021). Science learning in schools should emphasize providing a hands-on experience so that learning can be student-centered (Abdurrohim et al., 2016). In science learning, students are expected to be active in the process of finding out or finding so that students can develop their knowledge and understanding.

Science learning teaches about the symptoms of nature consisting of facts, concepts, principles, and theories that are the result or product of a series of scientific processes. Science learning has characteristics that guide students in conducting investigations and discoveries to obtain better learning outcomes (Widani et al., 2019). A significant consequence of teaching and learning about science through research is to pay attention to cognitive and procedural aspects to prepare for the investigation (Firdaus & Wilujeng, 2018). Therefore, science learning means being able to stimulate and develop logical thinking through science activities, as well as the transmission of theories that students remember and understand (Anindiya et al., 2019).

Based on the results of interviews with science subject teachers at SMP Negeri 5 Kerinci on April 1, 2022, information was obtained that science learning in schools had been carried out in an integrated manner by the curriculum used. However, in learning teachers often experience difficulties because of the educational background that is not from integrated science education, but comes from the fields of biology and physics. Science learning in schools also uses learning resources in the form of textbooks and enrichment

* Corresponding Author: adityafahlevi.2021@student.uny.ac.id

modules but has not been integrated with the guided inquiry model.

The interview results also showed that there are various methods used in science learning. Among them are discussion methods, lectures, demonstrations, and practicums. Practicum activities in schools are carried out with practicum guide sheets developed by teachers but not yet based on guided inquiries. While the learning media used by students still needs to be developed to support the learning process. Teachers argue that it's miles necessary to expand getting to know media that may guide students to conduct inquiry-based learning and other scientific activities to train students to excel in science learning. Science learning in schools should emphasize providing a hands-on experience so that learning can be student-centered. Another information was also obtained from the interview that the teacher stated that it was important to develop an electronic student worksheet based on guided inquiries for science learning in schools.

Other problems are also discovered through interviews with students and observations of the learning process. Based on the outcomes of the interview, information was obtained that the minimum compliance criteria set were 70. While the test results obtained by the sample group on photosynthesis material showed that 62% of students were still under minimum completion criteria. In addition, the results of observations on learning show that there are still many students who are not active in learning. Learning situations in the classroom still tend to be teacher-centered, where students only listen to explanations and pay attention to demonstrations from teachers so that learning only lasts one direction.

One of the efforts that can be made to overcome the above problems is to develop teaching materials based on guided inquiry. The learning process requires learning components that include learning resources from a scientific approach. Some of the learning resources are students' modules, books, and worksheets. One of the learning resources that can facilitate active learning is the remaining worksheets (Utami & Aznam, 2020). as compared to books, student worksheets are more entire due to the fact they include learning procedures, support data, and methods. Worksheets may be designed to make gaining knowledge of procedure interactive and discover each element of the scientific process. (Asma et al., 2020). Student worksheets can be packaged in an electronic form called electronic student worksheets. Electronic Student Worksheets are an innovative integration of various learning media such as video, simulation media, and images. Electronic student worksheets (Rochman, & Yuliani, 2021), are an innovation in completing learning shortcomings that only focus on textbooks or printed teaching materials. Learning with textbooks and teacher-centered can limit student interaction with teachers as well as interaction with learning resources that are only in the classroom. While student Worksheets are packaged in electronic format and can be accessed anytime and anywhere.

The development of student worksheets cannot be separated from the integration of learning models so that the established learning goals can be achieved. One of the learnings that support the achievement of active learning and train students in conducting investigations, discovering and developing knowledge, skills, and scientific attitudes is inquiry learning. Inquiry learning is a learning model that can accommodate the nature of science as knowledge and science as a process (Kızılaslan et al., 2012). Inquiry-based learning places particular emphasis. On the core concepts of cognitive learning and discovery learning, the goal is to develop high-level thinking that teachers do not teach directly or explicitly (Lee, 2014). However, the implementation of inquiry learning in high school students needs to be considered, this is because students are not used to conducting investigations independently. Therefore, inquiry learning that is suitable to be applied to junior high school students is guided inquiry learning (Astuti & Setiawan, 2013).

Guided inquiry learning is considered to have a positive impact on student development. Some previous research has revealed that the development and use of student worksheets based on guided inquiry in science learning can help in achieving desired learning goals. Research by (Firdaus & Wilujeng, 2018). States that guided inquiry-based student worksheets are worthy of use in science learning, in the use of student worksheets based on guided inquiry there is an increase in students' critical thinking skills with a total average gain score of 0.43 and there is an increase in learner learning outcomes with a total average gain score of 0.34. Furthermore, in research by (Abdurrohim et al., 2016), the title is the development of student worksheets based on guided inquiries on the topic of salt hydrolysis. Overall, the average percentage of student worksheets developed at 81.62% falls into the category of decent with very good criteria. Other efforts were also made by (Astuti & Setiawan, 2013), with the title of the research being the development of Student Worksheets based on the guided inquiry approach in cooperative learning on heat materials. This research obtained validation results that show that the student worksheet development results have a good category and the process skills are improved so that it can be stated that the developed student worksheet is feasible and effective.

Based on previous problems and research, it takes to research and developing about of electronic student worksheets based on guided inquiries. The purpose of this research is to produce an electronic student worksheets based on guided inquiry on the topic of

photosynthesis for junior high school science learning. So that this guided inquiry-based electronic student worksheet can help teachers and students in learning and help students master competencies in photosynthesis materials.

Method

The research methods used in this research are research and development. The object targeted for development is an electronic student worksheet based on a guided investigation on the topic of photosynthesis for junior high school. Products are developed by applying a 4-D model (define, design, develop, and disseminate).

The defined stage consists of several analyses. The analysis carried out is the analysis of electronic student worksheet needs based on guided questions, curriculum analysis, and material analysis. Needs analysis is intended to obtain information about the worksheet needs of electronic students based on guided questions in the school. Needs analysis is also carried out by looking for information about the continuity of learning, as well as problems faced by teachers and learners during the learning process. Furthermore, curriculum analysis is carried out by studying core competencies and basic competencies. While material analysis is carried out for the content of energy transformation, by identifying facts, concepts, principles, and theories, compiling concept maps of learning indicators, and learning objectives.

Furthermore, at the design stage, it is done by selecting the media for product development and product format. In this case, used Canva and Heyzine Flipbook to create electronic student worksheets that are interactive and easily accessible using smartphones and laptops. The initial design of this product is in the form of an initial design of guided inquiry-based electronic student worksheets.

The development stage consists of product feasibility tests and students' responses to the practicality of product use. Product feasibility tests are assessed by experts by reviewing the feasibility components of content, language, presentation, and infographics (Direktorat Pembinaan SMA, 2008), and the suitability of guided inquiry requirements. While students' response to the practicality of using products is reviewed from the components of usability, ease of use, attractiveness, and clarity.

Product feasibility test data is collected through a feasibility assessment questionnaire sheet developed on the Likert scale. The product feasibility instrument consists of 24 aspects and is assessed by 4 experts. While the student response assessment instrument consists of 21 aspects. The assessment of student worksheets based on student responses was carried out through a limited test at SMP Negeri 5 Kerinci, Jambi Province in March - April 2022 with the subject of research being class VII students. The limited test respondents consisted of 22 randomly selected class VII students.

Data from the product feasibility test and data from the student response test are analyzed by calculating the average score using the formula:

$$\bar{X} = \sum x/n \quad (1)$$

with :

$\bar{X}$= average (mean)

$\sum$x= total score

n = amount of data

Then, calculate the ideal average with $(\bar{X}_i)$ = ½ (Ideal Maximum Score + Ideal Minimum Score), and standard deviation (SBi) = 1/6 (Ideal Maximum Score - Ideal Minimum Score). Then the score is converted into a value with the criteria and comparisons displayed in Table 1 (Sukardjo, 2013).

Table 1. Convert Actual Score to Scale 5

Score Range	Value	Category
$\bar{X} > \bar{X}_i$+ 1.80 SBi	A	Very Good
$\bar{X}_i$+ 0.60 Sbi $< \bar{X} \leq \bar{X}_i$+ 1.80 Sbi	B	Good
$\bar{X}_i$- 0.60 Sbi $< \bar{X} \leq \bar{X}_i$+ 0.60 Sbi	C	Enough
$\bar{X}_i$- 1.80 Sbi $< \bar{X} \leq \bar{X}_i$- 0.60 Sbi	D	Bad
$\bar{X} < \bar{X}_i$- 1.80 Sbi	E	Very Unkind

Based on the ideal average equation, the ideal standard deviation, and Table.1 can then be set the feasibility criteria for electronic student worksheets to a scale of five. From the results of the calculation obtained the ideal highest score of 120 and the ideal lowest score is 24. the ideal average is 72 and the ideal standard deviation value is 16. The results of the calculation are processed based on the criteria in Table 1. So that the eligibility criteria for electronic student worksheets are obtained as shown in Table 2.

Table 2. Electronic Student Worksheet Assessment Criteria Based on Eligibility

Score Range	Value	Category
$\bar{X} >$ 100.80	A	Very Good
81.60 $< \bar{X} \leq$ 100.80	B	Good
62.40 $< \bar{X} \leq$ 81.60	C	Enough
43.20 $< \bar{X} \leq$ 62.40	D	Bad
$\bar{X} <$ 43.20	E	Very Unkind

The same step is applied to obtain electronic student worksheet assessment criteria based on student responses. The highest ideal score for student responses is 105, while the ideal lowest score is 21. The ideal average obtained is at a value of 63 with the ideal standard deviation of 14. So those eligibility criteria are

obtained based on the response of students presented in Table 3.

Table 3. Electronic Student Worksheet Assessment Criteria Based on Student Response

Score Range	Value	Category
$\bar{X} > 88.20$	A	Very Good
$71.40 < \bar{X} \leq 88.20$	B	Good
$54.60 < \bar{X} \leq 71.40$	C	Enough
$37.80 < \bar{X} \leq 54.60$	D	Bad
$\bar{X} < 54.60$	E	Very Unkind

Result and Discussion

Development of electronic student worksheets based on guided inquiry on the topic of photosynthesis materials includes the define, design, and develop stage. The define stage is used to analyze the development needs of electronic student worksheets, curriculum analysis, and material analysis. From the results of interviews with science subject teachers and students in schools, it is known that science learning has some obstacles and required student worksheets based on guided inquiry. Furthermore, an analysis of the curriculum is carried out by studying Core Competencies and Basic Competencies of science subject in Class VII Junior High School, then the selection of basic competencies that will be used for product development, namely basic competencies 3.5 Analyzing energy concepts, various energy sources, and changes in energy forms in everyday life including photosynthesis, and basic competencies 4.5 Presenting the results of experiments on changes in energy forms, Including photosynthesis. Next, selected and assign the topic to be used for the development of electronic student worksheets which in this case is the topic of energy transfer in the process of photosynthesis. The material is analyzed by identifying facts, concepts, principles, and theories, and compiling a concept map, learning indicators, and learning objectives. Then the appropriate experiments were established for the material, namely the Ingenhousz experiment and the Sach experiment.

The design stage begins with the preparation of electronic student worksheet designs which become the initial design of the electronic student worksheets based on guided inquiry on the topic of photosynthesis. In the preparation of the initial design, activities are systematically arranged following the steps of guided inquiry learning. Furthermore, the selection of media will be used in the development of electronic student worksheets. The medium used in development is Heyzine Flipbook which can be accessed online. The selection of this development media is based on the output produced easily accessed through smartphones and laptops.

The electronic student worksheet consists of a cover presented with illustrations describing the characteristics of the material to be discussed as seen in Figure 1. The next section is the foreword, study instruction, table of contents, learning competencies and objectives, supporting information, work assignments or steps, and assessment.

Figure 1. Cover of Electronic Student Worksheet

Tasks or work steps on electronic student worksheets based on guided inquiry photosynthesis materials, divided into 2 activities. The first activity is the task and step of work to investigate whether light is needed in the process of photosynthesis. While the second activity is to investigate the influence of light intensity on the rate of the photosynthesis process. The work steps are arranged based on steps that are guided by inquiry learning, namely identifying problems, defining hypotheses, problem formulation, data collection, verification of results, and generalizations for conclusion making.

At the develop stage, product feasibility tests are conducted by experts, product revisions by expert advice, and student response test on the practicality of using worksheets. Product feasibility assessment is carried out by reviewing the feasibility components of content, language, serving, graphicness, (Direktorat Pembinaan SMA, 2008), and the suitability of guided inquiry requirements. The number of assessment indicators of 6 components i.e. 24 indicators with the maximum value as a whole is 120. Products are assessed by 4 experts with the results of data analysis as shown within the Table 4.

Table 4. Electronic Student Worksheet Eligibility Assessment Results Become a Scale of 5

Component	Average	Value	Category
Content Eligibility	109	A	Very Good
language	109.50	A	Very Good
serving	106.80	B	Good
graphicness	106.50	B	Good
Suitability of Guided Inquiry Requirements	109.20	A	Very Good

The feasibility assessment by experts on the electronic student worksheets based on guided inquiry on the topic of photosynthesis as a whole had an average of 108.20. The score is in the range of $\bar{X} > 100.80$ cores that are in the category of very good or obtained an A. This indicates that the student worksheets can serve to assist students discover a idea, practice and combine various ideas which have been learned earlier (Rahmi et al., 2014).

Based on the outcomes of the analysis of the feasibility data on the electronic student worksheets based on guided inquiry on the topic of photosynthesis, it was found that the highest eligibility was in the feasibility component of the contents. The feasibility of obtaining a score of 109 with a very good category, shows that electronic student worksheets are by core competencies and basic competencies, on student needs, according to the needs of teaching materials, containing appropriate material substance, can add students' knowledge and insights, and by values, morality and social. This is in line with what was stated by (Sukma & Ibrahim, 2016), that the teaching materials used as a means to support learning activities must contain relevant and appropriate content.

The language component also occupies a very good category with a score of 109.50. It identifies that electronic student worksheets are feasible in terms of readability and clarity of information and following the rules of Indonesian and using effective and efficient language. The good language aspect also has to do with the conformity of the sentence with the student's level of thinking, his ability, and sentences that do not have much interpretation (Misbah et al., 2018).

On the serving component, it is known that electronic student worksheets have a good presentation. The outcomes of the evaluation showed that the electronic student worksheet contained readability of mastering goals. similarly, student worksheets electronically also can provide learning motivation to students, can provide stimulus and response to increase interactivity, and present complete information. So that the feasibility of electronic student worksheets in the presentation component obtained a score of 106.80 which was in the good category.

The feasibility of electronic student worksheets is reviewed from the graphicness component obtaining a score of 106.50 with a good category. In general, this shows that electronic student worksheets use the appropriate font type and size, have a good layout and layout, contain illustrations in the form of appropriate photos and videos, and have attractiveness. however, based on the results of the assessment, there are some suggestions or inputs for product improvements in this component. After analyzing the results of the assessment, it is known that there are still writings coming out of the template of electronic student worksheets, and writings that cover tables and images thereby reducing the value of infographics. This becomes the basis for the initial revision of the product so that better electronic student worksheets are produced and can be used in limited trials.

The guided inquiry component obtained a score of 109.20 is in the category of very good. The results of the assessment showed that the guided inquiry component consisting of six steps had been well integrated. developed electronic student worksheets can guide students in identifying problems, defining hypotheses, problem formulation, data collection, verification of results, and generalizations for conclusion making. From the results of the assessment, it can be stated that the students have a good understanding of topics related to guided inquiry activities that may be sourced from the student's profile (Castro & Morales, 2017). The appropriateness of the components of guided inquiry also suggests that learning will lead students to engage in learning and learn science concepts in a profound way (Repinc & Juznic, 2013).

Furthermore, a limited trial was conducted which was used to determine students' responses to the use of electronic student worksheets based on guided inquiry on the topic of photosynthesis. The number of respondents in the trial was 15 students from class VII of junior high school. The assessment based on the learner's response consists of four components, namely usability, ease of use, attractiveness, and clarity. The results of student responses reviewed by these components also require how practical the use of electronic student worksheets is in learning. Each component is assessed based on indicators developed using the Likert scale. The score obtained from the evaluation is transformed into a value in step with the criteria in Table 3 with a maximum value of 105 while the minimum value is 21. The consequences of the restrained trial of using digital student worksheets describe the student response to electronic student worksheets within the following table.

Table 5. Electronic Student Worksheet Assessment Results Based on Student Responses To Scale 5

Component	Average	Value	Category
Usability	91.28	A	Very Good
Ease of use	92.68	A	Very Good
Attractiveness	91.70	A	Very Good
Clarity	91.20	A	Very Good

Based on the information provided in table 5. it may be visible that the student response to electronic student worksheets is in the grade range of 91.20 – 92.70. The average score on the limited test was 91.72 which was in the category of very good or obtained an A. This shows that electronic student worksheets are useful for students in science learning and easy to use. Electronic

student worksheets also have appeal and are presented according to the student's assessment or response.

The usability component shows how useful electronic student worksheets are for students. This component gets a value of 91.28 or with a very good category. This means that electronic student worksheets are beneficial for students in increasing independence in learning and assisting in understanding learning materials. Electronic student worksheets used are also useful to add student insights and encourage students to dare to be prestigious.

The response of students was also assessed to the ease of use of electronic student worksheets. The ease of use component obtained the highest score in the student's response, which was 92.68 which was in the category of very good. Ease of use shows that electronic student worksheets can save time and be efficient, contain language that is easy to understand, practical, and easy to carry anywhere because it can be stored on electronic devices, and can be accessed anywhere and anytime.

The attractiveness component derives a score from the student's response of 91.70 indicating that the attractiveness of electronic student worksheets is excellent. The assessment on this component explains that students have a high interest in the use of electronic student worksheets. The display design of the presentation of electronic student worksheets is interesting for students to see. Electronic student worksheets are also equipped with illustrations of images and videos that match the material to attract the attention of students. This component also shows that the selection of fonts and color combinations on electronic student worksheets also has good appeal for students. This is in keeping with the results of the studies (Minawati et al., 2014), that guided inquiry-based student worksheets are appealing to students and will add to students' learning references.

The clarity component of electronic student worksheets shows how electronic student worksheets provide a clear understanding for students. This component gets a score of 91.20 which belongs to the category of very good. Findings from the study revealed that electronic student worksheets present clear images and videos, and contain clear learning goals and indicators to understand. Clarity also includes the commands contained in electronic student worksheets, the readability of writing, and the clarity of activities in learning using electronic student worksheets.

Overall, the electronic student worksheets based on guided inquiry on the topic of photosynthesis are of very good quality for use in learning. This electronic student worksheet has met the eligibility and received a good response from students. Based on the results of the feasibility assessment, logically the electronic student worksheets based on guided inquiry on the topic of photosynthesis can have a nice effect on student mastering outcomes. This is due to electronic student worksheets integrated with guided inquiry learning that can train and improve students' knowledge and skills in an investigation (Pedaste et al., 2015).

Electronic student worksheets that have good eligibility criteria have quality content and have a systematic and detailed arrangement of materials or concepts (Abdurrohim et al., 2016). The feasibility of electronic student worksheets is also related to the fulfillment of the requirements of the learning model or method, which in this case is a guided investigation. Empirically, the student who learns with integrated guided questions will have better learning achievements than students taught by being teacher-centered (Matthew & Kenneth, 2013). The results of the study (Johnson, 2011; Kam & Hoop, 2013), stated that the integration of guided inquiry in learning successfully encourages students to excel. This is in step with the opinion (Margunayasa et al., 2019), which states that guided inquiry-based learning can interact with students' cognitive styles and influence learning achievement. The guided inquiry method is likewise very suitable for younger learners, as teachers are capable of suit the extent of inquiry and scaffolding with the beginners' skills (Song & Looi, 2012).

Electronic student worksheets also received a positive response from students. This illustrates that the worksheet is practical to use. Teaching materials or learning media that have ease of use, attractiveness, usability, and clarity will be more practical to use in learning and make users easier to apply (Fahlevi, 2021). The practicality of electronic student worksheets also shows that the language used in electronic student worksheets is easy for college students to apprehend (Fakhruddin Z et al., 2017). This is in line with what was stated by (Putri & Widiyatmoko, 2013) that the results of positive responses from students to the inquiry-based Science student worksheets showed that student worksheets was interesting to learn and different from other teaching materials.

Conclusion

Based on the results of research and development of electronic student worksheets based on guided inquiry on the topic of photosynthesis, it can be concluded that the characteristics of electronic student worksheets based on guided inquiry consist of steps for problem identification, hypothesis definition, problem formulation, data collection, verification of results, and generalization for drawing conclusions. from the study it can also be concluded that the feasibility of student worksheets electronically shows that the average assessment belongs to the very good category, and the test results of the student's response to the use of

electronic student worksheets based on guided inquiry on the topic of photosynthesis in the category are very good. thus, inquiry-based electronic student worksheets guided on photosynthetic materials are worth using in science learning.

References

Abdurrohim, Feronika, T., Sapinatul Bahriah, E., Studi Pendidikan Kimia, P. & Syarif Hidayatullah Jakarta, U. (2016). Pengembangan Lembar Kegiatan Siswa (Lks) Berbasis Inkuiri Terbimbing Pada Materi Hidrolisis Garam. *Jppi*, *2*(2), 197–212. http://dx.doi.org/10.30870/jppi.v2i2.895

Anindiya, S., Putri, P., Dewi, C., Fakhriyah, F., Purbasari, I., Guru, P. & Dasar, S. (2019). Peningkatan Sikap Ilmiah Siswa Melalui Guided Inquiry Berbantuan Media Papan Putar Pada Tema Pahlawanku Kelas Iv Info Artikel Abstract Sejarah Artikel. *Jurnal Prakarsa Paedagogia*, *2*(2). Https://Doi.Org/10.24176/Jpp.V2i2.4521

Asma, R., Asrial, A. & Maison, M. (2020). Development Of Interactive Electronic Student Worksheets On Electromagnetic Induction Based On Scientific Approaches. *Jurnal Penelitian Pendidikan Ipa*, *6*(2), 136. Https://Doi.Org/10.29303/Jppipa.V6i2.387

Astuti, Y., & Setiawan, B. (2013). Pengembangan Lembar Kerja Siswa (LKS) Berbasis Pendekatan Inkuiri Terbimbing Dalam Pembelajaran Kooperatif Pada Materi Kalor. *Jurnal Pendidikan IPA Indonesia, 2*(1). https://doi.org/10.15294/jpii.v2i1.2515

Castro, J. A. F. & Morales, M. P. E. (2017). "Yin" In A Guided Inquiry Biology Classroom - Exploring Student Challenges and Difficulties. *Journal Of Turkish Science Education*, *14*(4), 48–65. Https://Doi.Org/10.12973/Tused.10212a

Direktorat Pembinaan Sma. (2008). *Panduan Pengembangan Bahan Ajar*. Departemen Pendidikan Nasional.

Fahlevi, A. (2021). Practicality E-Moduleofvibration In Everyday Life On Online Learning To Improve Science Process Skills Of Grade X High School Students. *Pillar of Physics Education.* 14(2). http://dx.doi.org/10.24036/11642171074

Fakhruddin Z, Halim, L. & Subahan Mohd Meerah, T. (2017). Practicality Assessment of Student Worksheets For Smp Physics Learning On The Traditional Culture-Based Equipment. In *Journal Of Educational Sciences*. 1(1). http://dx.doi.org/10.31258/jes.1.1.p.69-78

Firdaus, M. & Wilujeng, I. (2018). Pengembangan Lkpd Inkuiri Terbimbing Untuk Meningkatkan Keterampilan Berpikir Kritis Dan Hasil Belajar Peserta Didik. *Jurnal Inovasi Pendidikan Ipa*, *4*(1), 26–40. Https://Doi.Org/10.21831/Jipi.V4i1.5574

Johnson, C. (2011). Activities Using Process-Oriented Guided Inquiry Learning (Pogil) In the Foreign Language Classroom. *A Journal Of American Association Of Teacher Of German*, *14*(1), 30–38. http://dx.doi.org/10.1111/j.1756-1221.2011.00090.x

Kam, R. & Hoop, B. (2013). Facilitating Inquiry-Based Science Learning Online In A Virtual University. *Higher Learning Research Communications*, *3*(2), 79. Https://Doi.Org/10.18870/Hlrc.V3i2.100

Kızılaslan, A., Sözbilir, M. & Diyaddin Yaşar, M. (2012). Inquiry Based Teaching In Turkey: A Content Analysis Of Research Reports. In *International Journal Of Environmental & Science Education*. 8(1). Retrieved from Http://Www.Ijese.Com/

Lee, H. Y. (2014). Inquiry-Based Teaching in Second And Foreign Language Pedagogy. *Journal Of Language Teaching and Research*, *5*(6), 1236–1244. Https://Doi.Org/10.4304/Jltr.5.6.1236-1244

Margunayasa, I. G., Dantes, N., Marhaeni, A. A. I. N. & Suastra, I. W. (2019). The Effect of Guided Inquiry Learning And Cognitive Style On Science Learning Achievement. In *International Journal Of Instruction* 12(1). http://dx.doi.org/10.29333/iji.2019.12147a

Maryanti, R., Nandiyanto, A., Hufad, A., & Sunardi, S. (2021). Science Education for Students with Special Needs in Indonesia: From Definition, Systematic Review, Education System, to Curriculum. *Indonesian Journal of Community and Special Needs Education, 1*(1), 1-8. https://doi.org/10.17509/ijcsne.v1i1.32653

Matthew, B. M. & Kenneth, I. O. (2013). A Study On The Effects Of Guided Inquiry Teaching Method On Students Achievement In Logic. *International research.* 2(1). Retrieved from Www.Iresearcher.Org

Minawati, Z., Haryani, S., & Pamelasari, S. D. (2014). Pengembangan Lembar Kerja Siswa Ipa Terpadu Berbasis Inkuiri Terbimbing Pada Tema Sistem Kahidupan Dalam Tumbuhan Untuk Smp Kelas Viii Info Artikel. *Unnes Science Education Journal*. 3(3). https://doi.org/10.15294/usej.v3i3.4265

Misbah, Dewantara, D., Muhammad Hasan, S., & Annur, S. (2018). The Development of Student Worksheet By Using Guided Inquiry Learning Model To Train Student's Scientific Attitude. *Unnes Science Education Journal*, *7*(1), 11–26. https://doi.org/10.15294/usej.v7i1.15799

Putri, B., & Widiyatmoko, A. (2013). Pengembangan Lks Ipa Terpadu Berbasis Inkuiri Tema Darah Di SMP N 2 Tengaran. *Jurnal Pendidikan IPA Indonesia, 2*(2). https://doi.org/10.15294/jpii.v2i2.2709

Rahmi, R., Hartini, S. & Wati, M. (2014). Pengembangan Lembar Kerja Siswa (Lks) Berbasis Inkuiri Terbimbing Dan Multimedia Pembelajaran Ipa Smp. In *Berkala Ilmiah Pendidikan Fisika*. 2(2). http://dx.doi.org/10.20527/bipf.v2i2.894

Repinc, U. & Juznic, P. (2013). Guided Inquiry Projects: Enrichment for Gifted Pupils. *School Libraries Worldwide*, 114–127. Https://Doi.Org/10.29173/Slw6857

Rochman, JK.A. & Yuliani, Y. (2021). Pengembangan Lembar Kerja Peserta Didik Elektronik (E-Lkpd) Berbasis Inkuiri Pada Submateri Fotosintesis Untuk Meningkatkan Kemampuan Argumentasi Peserta Didik. BioEdu: Berkala Ilmiah Pendidikan Biologi. 10(3). https://doi.org/10.26740/bioedu.v10n3.p663-673

Song, Y. & Looi, C. K. (2012). Linking Teacher Beliefs, Practices and Student Inquiry-Based Learning In A Cscl Environment: A Tale Of Two Teachers. *International Journal of Computer-Supported Collaborative Learning*, *7*(1), 129–159. Https://Doi.Org/10.1007/S11412-011-9133-9

Sukardjo, S. (2013). *Evaluasi Pembelajaran IPA Untuk Mahasiswa S2 Program Studi Pendidikan Sains*. Program Pascasarjana Universitas Negeri Yogyakarta.

Sukma, M. C. & Ibrahim, M. (2016). Developing Materials for Active Learning Of Guided Inquiry-Integrated Bowling Campus On The Topic Of Sense Of Hearing And Sonar System Of Living Organism. *Jurnal Pendidikan Ipa Indonesia*, *5*(2), 256–260. Https://Doi.Org/10.15294/Jpii.V5i2.5981

Utami, D. N. & Aznam, N. (2020). Pengembangan Lkpd Ipa "Pesona Pantai Parangtris" Berbasis Learning Cycle 7e Beserta Efeknya Terhadap Critical Thinking. *Jurnal Inovasi Pendidikan Ipa*, *6*(1). Https://Doi.Org/10.21831/Jipi.V6i1.30404

Widani, K.T., Sudana, D.N., & Agustiana, I.G.A.T. (2019). Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Hasil Belajar Ipa Dan Sikap Ilmiah Pada Siswa Kelas V Sd Gugus I Kecamatan Nusa Penida. In *Journal of Education Technology.* 3(1). https://doi.org/10.23887/jet.v3i1.17959