International Journal of Advances in Social and Economics
Vol. 4, No. 3, (2022), pp. 95-101
ISSN 2685-2691 (online)
DOI: https://doi.org/10.33122/ijase.v4i3.239

SAINTIS publishing

Research Article

Development of student worksheets based Predict-Observe-Explain (POE) model on social arithmetic material

Fatimah Rahmadhani, Hayatun Nufus & Mursalin*

Department of Mathematics Education, Universitas Malikussaleh, Aceh Utara, Indonesia
*Corresponding Author: mursalin@unimal.ac.id

ABSTRACT

This study is designed to: 1) produce of learning media *(Student worksheet)* based Predict-Observe-Explain (POE) model on social arithmetic material. 2) knowing the level of validity and practicality of student worksheet. The test subjects in this study were Grade VII students of SMP Negeri 1 Lhokseumawe. The type of study used is Research and Development (R&D). The development model used is ADDIE *(analysis, design, development, implementation, and evaluation)*. The results of research and development of Student worksheet in the form of media expert validation of the assessment indicators have an average value of 84% with very valid information, while the assessment aspect has an average value of 85.1% with very valid information. The results of the material expert validation obtained from the assessment indicators have an average value of 90% with very valid information, while the assessment aspect has an average value of 92.5% with very valid information. The results of the small group trials on the assessment indicators were 93% and the average score on the assessment aspect was 92.73%. The results of the large group trials on the assessment indicators were 89.6% and the average score on the assessment aspect was 89.26%. So, it can be concluded that the POE (Predict-Observe-Explain) based worksheet can be accepted both valid and practical in accordance with student responses and media experts' responses to material experts can be used in SMP Negeri 1 Lhokseumawe.

Keywords: student worksheets; POE *(predict-observe-explain)*; social arithmetic;

1. INTRODUCTION

Education is a means to advance the nation, this is in accordance with the spirit of Law no. 20 of 2003 concerning the National Education System (sisdiknas), namely: National education functions to develop capabilities and form dignified national character and civilization in the context of educating the nation's life, aims to develop the potential of students to become human beings who believe and fear God Almighty, have noble character, be healthy, knowledgeable, creative, independent, and become democratic and responsible citizens. Therefore, in education, it is necessary for an educator to make students from not knowing to knowing and to be able to develop the potential that students have. This is in line with Aziz's opinion (2017: 174) that educators are people who play a role in the educational process of students. Educators play an important role in the learning process to achieve learning objectives.

The learning process is the process of transferring knowledge between educators and students, and the process of interaction between students and educators in the learning environment with teaching materials, delivery methods, learning strategies, and learning resources. The anticipatory learning process is the interaction between educators and students, with the hope of achieving the goals that have been set. To achieve learning objectives, teachers as educators must be involved in an active, creative, and fun learning process. Meanwhile, to support active, creative and fun learning, educators use learning resources that interest students. According to Ikhsan, et al (2017: 3) learning resources are an important requirement that can be used as a source of information. It was concluded that learning resources mean everything whether it is in the form of learning material, which can be used as a source of information in learning. Learning resources have a very important role in supporting the learning process. Each subject requires learning resources to assist the learning process, one of which is learning Mathematics.

Learning Mathematics is also part of basic science which aims to equip students to think logically, analytically, systematically, critically and creatively as well as in the ability to work together. Meanwhile, according to Sintawati, et al (2020:94) Mathematics is one of the basic sciences that is useful for everyday life. Learning is a system consisting of components that are interconnected with one another. Components consist of: objectives, materials, methods, and evaluation. In such a system there is a process of teacher interaction using students both directly and indirectly (Anwar, et al. 2019: 142) in mathematics learning there are additional teaching materials used, namely in the form of worksheets. This shows that the use of LKS is effective for improving student learning outcomes because it causes students to be more active in learning activities.

The facts in the field and the results of observations by researchers at SMP Negeri 1 Lhokseumawe on January 11 2022 showed that the learning media used were textbooks and student worksheets that had been provided by the school. The textbooks used have not been well understood by students. Likewise, the student worksheets used so far are not the result of the teacher's own design so that the existing student worksheets are also not able to facilitate students' ability to build student thinking. the provided student worksheets are very simple and unattractive because they use plain and opaque paper, the available colors are only black and white, and the use of animation and designs that are less creative and innovative, some of the student worksheets do not provide real-life related images related to questions that exist and do not direct students to solve a problem related to everyday life and the practice questions available on student worksheets are difficult to understand when compared to the example questions found on student worksheets. As a result of this, the available student worksheets are less attractive to student learning, and have not increased learning outcomes and activities and students' understanding of learning material, making it difficult for students to answer the exercise questions in the student worksheets, student worksheets that are there should be able to facilitate students in the learning process so that students more easily understand and answer questions and assignments in student worksheets.

The use of student worksheets at SMP Negeri 1 Lhokseumawe is still very simple, only using white paper which does not have an attractive color, the color of the paper used is also very monotonous, only white and the writing is still the same as ordinary books that are used daily during the learning process and less interesting animations and student worksheet designs that are still monotonous like books so that students are also less interested in working on the questions contained in student worksheets and students are also less active during the learning procces. One model that can create active learning is POE (Predict-Observe-Explain). According to (Muna, 2017: 75) that the POE (Predict-Observe-Explain) learning method is an efficient method for creating student discussions about scientific concepts. The POE (Predict-Observe-Explain) learning stage consists of three parts, the first is predict, then observe, and the last is explain. This model can be used to explore students' conceptual knowledge and motivate students to carry out investigative activities. In addition to learning activities, the POE (Predict-Observe-Explain) model is effectively used to increase students' understanding of science. So it can be concluded that the POE (Predict-Observe-Explain) model can help students understand the concept of a lesson, increase student activity and creativity so that the POE (Predict-Observe-Explain) model can improve student learning outcomes.

Previous research conducted by Nurjannah (2018), with the results of this study showing that the development of student worksheets based on POE (Predict-Observe-Explain) through the Metaphoral Thinking approach is oriented to the mathematical reasoning abilities of junior high school students. The results of material expert validation obtained an average of 89, 4% with very feasible criteria, media experts obtained an average of 94.9% with feasible criteria, and linguists obtained an average of 75% with very feasible criteria. Previous research was also carried out by Yulianti (2019) with the results of data collection instruments in the form of questionnaires and test questions. The data obtained were analyzed using qualitative and quantitative data analysis techniques. The results showed that the quality of the worksheets for mathematics students using the Creative Problem Solving learning model developed was classified as very valid (91.11) and very practical for small groups (90.55%) and for large groups (87.74%).

Mahanani (2017: 5) shows that the use of student worksheets based on POE (Predict-Observe-Explain) can be used to find ideas and explore student knowledge while at the same time triggering students to carry out investigations. This makes students more active in the learning process in the classroom. In addition, the advantages of student worksheets based on POE (Predict-Observe-Explain) can be used as interesting learning media that can help students develop critical thinking skills. Therefore the development of student worksheets based on POE (Predict-Observe-Explain) is necessary for the practicality of student learning. By using student worksheets based on POE (predict-observe-explain), students are guided to predict first, then make observations and finally students will explain the true or false initial predictions that have been taken or made. So, in addition to increasing critical thinking power, the use of POE (Predict-Observe-Explain) based student worksheets can also develop students' curiosity.

Tyas (2016; 78) explains social arithmetic means material that is very close to everyday life. Activities related to buying and selling can be found in traditional markets, modern markets or supermarkets. when traders finish selling, they will calculate the sales results, profit or loss, return on investment or not, this concept applies social arithmetic in everyday life. This social arithmetic calculation uses algebraic concepts through arithmetic operations in the form of fractions and others. Therefore learning social arithmetic in everyday life is very important. The benefits of applying social arithmetic include facilitating calculations in trading and others. In addition to clarifying the unit price and overall price, selling price and purchase price, profit and loss, discount interest and taxes, net gross and tare there are other advantages of being able to find errors in calculations that can cause losses. Based on this description, the researcher is interested in conducting research entitled "Development of student worksheets based on POE (predict-observe-explain) on Social Arithmetic Material for class VII students of SMP Negeri 1 Lhokseumawe."

2. METHOD

The development model that will be used in this research is the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). This type of research is research development or Research and Development (R&D). According to Sugiyono (2018: 297) Research and Development (R&D) is a research method used to produce certain products and test the validity and practicality of these products. This study aims to produce teaching materials in the form of student worksheets based on the POE (Predict-Observe-Explain) model on social arithmetic material at SMP Negeri 1 Lhokseumawe. Researchers conducted research and developed student worksheets based on POE (Predict-Observe-Explain) on social arithmetic material. The level of validity and practicality of student worksheets based on POE (Predict-Observe-Explain) on social arithmetic material is known through validation by material experts,

validation by media experts, and trials of product usage by students.

This study was conducted at SMP Negeri 1 Lhokseumawe which is located at JL. Samudra, Kp. Old Java, Kec. Banda Sakti Lhokseumawe City The reason for choosing this school as a research location was because the school did not yet have POE (Predict-Observe-Explain)-based student worksheet learning media. The research was carried out in the even semester, academic year 2021/2022 on social arithmetic material in class VII. Data collection techniques in developing student worksheet research used three types, namely interviews, questionnaires (questionnaires), and documentation. The following is a research procedure presented in the form of a structured chart.

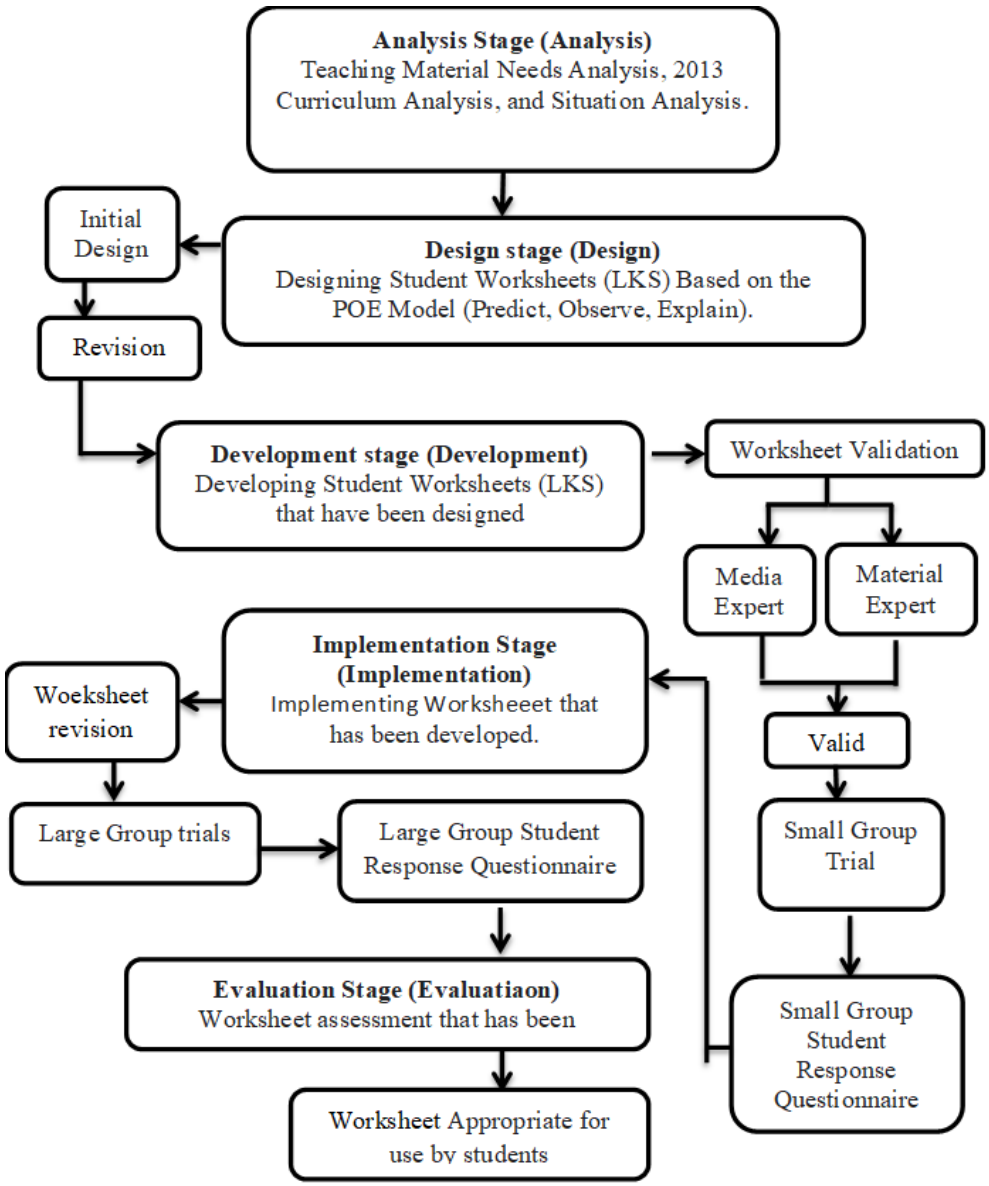

Figure 1. Research Procedure

3. RESULTS AND DISCUSSION

In this study the learning tool developed was the development of POE (Predict-Observe-Explain)-based student work sheet. The development model used is ADDIE. The development stages used in the ADDIE model in this study are Analysis, Design, Development, Implementation, and Evaluation. The results of developing POE (Predict-Observe-Explain) based student work sheet learning media on social arithmetic material using the ADDIE model are as follows:

Analysis stage

The analysis stage in the development of POE (Predict-Observe-Explain)-based student worksheet, namely analyzing the problems faced at SMP Negeri 1 Lhokseumawe related to the learning media used and determining the learning media needed by students to improve the quality of learning and student interest in learning. On January 11, 2022 the researchers interviewed a teacher at SMP Negeri 1 Lhokseumawe with several results, namely:

The results of an interview conducted with one of the Mathematics teachers at SMP Negeri 1 Lhokseumawe said that during the learning process the teacher only used book media and used simple student worksheet. This is because the teacher is less creative in designing student worksheet that attracts students' learning interest because the student worksheet used is still very simple. as well as coupled with the limited time that teachers have to produce learning media student worksheet. Based on the results of interviews conducted with one of the mathematics teachers, it can be concluded that SMP Negeri 1 Lhokseumawe needs mathematics learning media in the form of interesting and good student worksheet which are easily developed by the teacher, so that learning mathematics is in accordance with the objectives to be achieved by the teacher and can improve understanding. as well as students' interest in learning mathematics, students are interested in participating in the learning process and make it easier for students to understand learning mathematics.

Design stage

The design of learning media based on POE (predict-observe-Explain) student worksheet on social arithmetic material is adjusted using the basic competencies and core competencies contained in the 2013 curriculum. The stages of making this learning media consist of several steps, namely: a). Determine the Initial Design of student worksheet, b). Preparing Teaching Materials, c). Making POE (Predict-Observe-Explain) Based student worksheet Learning Media.

Development stage

At the development stage, the researcher carried out 2 stages, namely the trial stage of media experts and material experts. Media experts to validate the student worksheet developed by researchers are two lecturers at Malikussaleh University, North Aceh. After the revision was carried out, the material validation stage was carried out by one lecturer in mathematics education at Malikussaleh University and one mathematics teacher at SMP Negeri 1 Lhokseumawe.

Implementation stage

The implementation stage means the advanced stage of the development stage. At this implementation stage, the media that has been created and those that have been developed are then applied after revision. Learning media student worksheet based on POE (Predict-Observe-Explain) on social arithmetic material that has been developed, then implemented in class. but at this stage, the researcher only carried out product trials on small groups and large group trials, by looking at student responses to the learning media that had been developed. Trials were conducted to see the practicality of the media. The first trial was conducted on a small group consisting of 6 students. after conducting trials on small groups and having made revisions, until the results of the media were practical, then trials were carried out on large groups consisting of 30 students at SMP Negeri 1 Lhokseumawe.

Evaluation stage

In the evaluation stage the researcher examined the results of the development of the POE (Predict-Observe-Explain) based student worksheet by collecting the results from the validation of media experts, material experts, and student response questionnaires by looking at comments and suggestions. Based on the results of research that has been done, it can be seen from several stages that have been carried out by researchers.

Validasi Ahli Media

Based on the validation sheet of the student worksheet developed, you can see the student worksheet which has been corrected based on the data obtained by the researcher. Improvements were made based on suggestions and comments obtained from the validation sheet. The results of the student worksheet validation developed are as shown in **Table 1.**

Table 1. Results of Media Expert Validation on Assessment Aspects

No.	Rated aspects	Percentages of student worksheet	
		Averages	Descriptions
1	Integration	90	Very Valid
2	Balance	90	Very Valid
3	Letter shape	77,5	Valid
4	Color	86	Very Valid
5	Language	82,5	Very Valid
	Amount	425,5	
	Average Percentage (%)	85,1%	
	Description	Very Valid	

The results of media expert validation have the three highest value aspects, namely integration and balance with values of 90% and 90%.

Material Expert Validation

Table 2. Material Expert Validation Results on Assessment Aspects

No.	Rated aspects	Percentages of student worksheet	
		Averages	Descriptions
1	Content quality	87,5	Very Valid
2	Quality of learning	90	Very Valid
3	Language	100	Very Valid
	Amount	277,5	
	Average Percentage (%)	92,5%	
	Description	Very Valid	

The results of the material expert validation on the assessment aspect have the highest scores on the quality of learning and language, namely 90% and 100%. To find out the practicality of students, researchers used student response questionnaires. The results of the student response questionnaire used to assess the developed student worksheet are as follows.

Table 3. Small Group Student Response Questionnaire on Assessment Aspects

No	Rated aspects	Percentages	
		Averages	Descriptions
1	Quality of content and purpose	93%	Very Practical
2	Technique Quality	93%	Very Practical
3	Quality of learning	92,5%	Very Practical
	Amount	278,2	
	Average Percentage (%)	92,73%	
	Description	Very Practical	

After knowing the results of the small group data and it was stated that it was practical, the researcher conducted a large group trial. The results of the student response questionnaire used to assess the developed student worksheet are as follows.

Table 4. Questionnaire Results of Large Group Student Responses on Assessment Aspects

No.	Rated aspects	Percentages of student worksheet	
		Averages	Descriptions
1	Quality of content and purpose	90	Very Practical
2	Technique Quality	91	Very Practical
3	Quality of learning	86,8	Very Practical
	Amount	267,8	
	Average Percentage (%)	89,26%	
	Description	Very Practical	

Based on the results of research and development conducted by researchers, learning media based on POE (Predict-Observe-Explain) student worksheet on social arithmetic material is categorized as valid and practical to develop. In accordance with the results of Eka Nur Setiyani's research (2017) concerning the Development of material expert validation results on the aspect of content quality obtained an average score of 3.25 with sufficiently valid criteria, on the aspect of accuracy of coverage obtained an average score of 3.33 with valid criteria, aspects the POE model obtained an average score of 3.13 with quite valid criteria, and on the language aspect it obtained an average score of 3.33 with valid criteria. Media expert validation on the size aspect of student worksheet obtained an average score of 3.5 with valid criteria, the skin design aspect of student worksheet obtained an average score of 3.33 with valid criteria and on the content design aspect of student worksheet obtained an average score of 3.20 with quite valid criteria. Student responses in small group trials obtained an average score of 3.67 with very interesting criteria and field trials obtained an average score of 3.47 with very attractive criteria. The test responses were also carried out on teachers with an average score of 3 .15 with interesting criteria.

Based on the results of the validity and practicality of learning media student worksheets based on POE (Predict-Observe-Explain) on social arithmetic material that has been obtained that the results of validity are from the results of the questionnaire responses of media experts and material experts while the results are from practicality, namely from the results of the questionnaire student responses in small and large groups and from the results of student responses obtained from the results from the student response questionnaire filled out by students getting very practical results to use and from the responses of media experts and material experts based on validation from media experts and worksheet material valid students are used in accordance with the criticisms and suggestions and responses given by the validator.

Based on the research results of Eka Nur Setiyani (2017) in this study Demonstrates the development of student worksheets developed on POE (Predict-Observe-Explain) based flat-sided geometric material for the mathematical representation abilities of Grade VIII students of junior high school. What distinguishes this research from mine is that the material used is different, using representational abilities, and using linguists in designing student worksheets while the similarities are using the same learning model and learning media in the form of student worksheets. It can be concluded that in this study the valid criteria were used.

The results of Nuryani's research (2019) in this study show the development of student worksheets based on the RME approach on the subject of arithmetic in class VII SMP Aisyiyah Paccinong. What distinguishes this research from my research is using the RME approach, using test questions, and similarities, namely using social arithmetic material and the advantage of the research is that students' worksheets are viewed in terms of validity, practicality and effectiveness. So it can be concluded that this study has met the criteria for use. The results of Cut Roza Maizaliani's research (2019) Development of Student Worksheets Based (Predict-Observe-Explain) on Business and Energy Materials at Inshafuddin High School Banda Aceh. What distinguishes this research from my research is that it tested the feasibility of student worksheets and qualitative research and the advantage of this research was that there was a teacher's response questionnaire to see the usability of the product. So it can be concluded that the developed Student Worksheets can be used.

Based on the results of Nurul Mawaddah's research (2021) Development of Ethnomatematics-Based Student Worksheets on Circle Material for Grade VI Elementary School Students. There is a difference between this study and my research which is based on ethnomathematics, the borg and gall development model, circle material and equations in terms of validity and practicality. As for the advantages of this study, student worksheets were developed based on ethnomathematics. It can be concluded that student worksheets are appropriate for use. The results of Nurul Puspita

Sari's research (2018) Development of student worksheets based on POE (Predict-Observe,-Explain) Class XII SMA Negeri 16 Makassar. There are advantages, namely descriptive statistical analysis, and there are similarities in the research and development development model, the POE (Predict-Observe-Explain) based learning model, so it can be concluded that the student worksheets developed meet the valid categories and are very positive to use.

4. CONCLUSION

Based on the results of research and development of student worksheets based on POE (Predict-Observe-Explain). on social arithmetic material, it can be concluded that: POE (Predict-Observe-Explain) based student worksheets on social arithmetic material developed at SMP Negeri 1 Lhokseumawe. Meets valid and practical criteria. The results of the media expert's assessment were obtained from the indicators having an average value of 84%, while the assessment aspects had an average value of 85.1%, and the results of the material expert's assessment were obtained from the indicators having an average value of 90%, while aspects of the assessment have an average value of 92.5%. The average value of the small group on the assessment indicator is 93% and the average value on the assessment aspect is 92.73%. The result of the average value of the large group on the indicator is 89.6% and the average value on the assessment aspect is 89.26%. The result of the average score of the large group on the indicator was 89.6% and the average value of the large group on the assessment aspect was 89.24 Thus the use of POE (Predict-Observe-Explain) student worksheets was declared practical.

ACKNOWLEDGEMENTS

The authors would like to thank the supervisor who has guided to success in conducting this research.

AUTHOR'S CONTRIBUTIONS

The authors discussed the results and contributed to from the start to final manuscript.

CONFLICT OF INTEREST

The authors declare that he has no competing interests.

REFERENCES

Anwar, A., Maonde, F., & La Masi, L. M. (2019). Deskripsi Pengetahuan Dasar Matematika Siswa SMP Negeri 1 Napabalano. *Jurnal Penelitian Pendidikan Matematika,* 6(2), 141–154.

Aziz, A. (2017). Komunikasi Pendidik dan Peserta Didik Dalam Pendidikan Islam. *Jurnal Mediakita*, l(2),173-184.

Ikhsan, A., Sulaiman, Ruslan (2017). Pemanfaatan Lingkungan Sekolah Sebagai Sumber Belajar Di SD Mal Negeri 2 Teunom Aceh Jaya. *Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, 2(1), 1-11. http://jim.unsyiah.ac.id/pgsd

Muna, I., A. (2017) Model Pembelajaran POE (*Predict-Observe-explain*) Dalam Meningkatkan Pemahaman Konsep dan Keterampilan Proses IPA. *Jurnal Studi Agama*, 5(1), 74-91

Sintawati, M., Utami, A., Panuntun,v., E. (2020). Penggunaan *Realistic Mathematic Education* dalam Pembelajaran Matematika di Sekolah Dasar. *Jurnal Cakrawala Pendas,* 6(2), 93-101.

Sugiyono. (2018). *Metode Penelitian Kuantitatif, Kualitatif, dan R &D*. Bandung: Alfabeta.

Tyas, H., Sujadi, I., Riyadi. (2016). Representasi Matematis Siswa Dalam Menyelesaikan Masalah Matematika Pada Materi Aritmatika Sosial dan Perbandingan Ditinjau Dari Gaya Kognitif Siswa Kelas VII SMP Negeri 15 Surakarta Tahun Ajaran 2014/2015. *Jurnal Elektronik Pembelajaran Matematika*, 4(8), 781-782.

Mahanani, N. (2017). Pengembangan Lembar kerja siswa Berbasis *Predict-Observe-Explain* (POE) Pada Materi Perubahan Wujud *Artikel Skripsi Universitas Nusantara PGRI Kediri.* 1(7), 1-14.

Nurjannah, (2018). Pengembangan Lembar kerja siswa (LKS) Berbasis POE (*predict-observe-explain*) Melalui Pendekatan Metaphoral Thingking Berorientasi Kemampuan Penalaran Matematis Siswa SMP. *Skripsi*. Universitas Islam Negeri Raden Intan Lampung. Tidak diterbitkan.

Yulianti, E. (2019). Pengembangan Lembar kerja siswa (LKS) Berbasis Model Pembelajaran *Creative Problem Solving* Untuk Memfasilitasi Kemampuan Berpikir Kreatif Matematis Siswa SMP Negeri 4 Pekan Baru. *Skripsi*. Universitas Islam Negeri Sultan Syarif Kasim Riau. Tidak diterbitkan.

Setiyani, E., N. (2017*).* Pengembangan Lember Kerja Siswa (LKS) Bangun Ruang Sisi Datar Berbasis POE (*Predict, Observe, And Explain*) Untuk Kemampuan *Representasi* Matematis peserta Didik kelas VIII SMP. *skripsi.*Universitas Islam Negeri Raden Intan Lampung. Tidak diterbitkan

Nuryani, (2019). Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Pendekatan *Realistic Mathematic Education* (RME) Pada Materi Aritmatika Sosial Siswa Kelas VII SMP Aisyiyah Paccinongan. *Skripsi*. Universitas Islam Negeri Alauddin Makassar. Tidak diterbitkan.

Sukandi, E., Khaerul, M. (2020). Pengembangan LKS Berbasis POE Terhadap Pemahaman Konsep Siswa SMA Kelas X Pokok Bahasan Gerak Lurus. *Jurnal Pendidikan Informatika dan Sains*, 9(2), 90-102 https://doi.org/10.31571/saintek.v9i2.2377

Maizaliani, C., R. (2019*).* Pengembangan Lembar Kerja Peserta Didik Berbasis *Predict, Observe, Explain* Pada Materi Usaha dan Energi di SMA Inshafuddin Banda Aceh. *Skripsi.* Universitas Islam Negeri Ar-Raniry Darussalam-Banda Aceh. Tidak diterbitkan.

Mawaddah, N. (2021) Pengembangan LKS Berbasis Etnomatematika pada Materi Lingkaran Siswa Kelas VI SD. *Skripsi.* Universitas Muhammadiyah Mataram. Tidak diterbitkan.

Sari, N., P, Pengembangan Lembar kerja siswa (LKS) Berbasis POE *(Predict, Observe, Explain)* Kelas XII SMA Negeri 16 Makassar, *Skripsi.* Universitas Islam Negeri (Uin) Alauddin Makassar. Tidak diterbitkan.