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Development of Realistic Mathematics Learning Devices with the Think Pair Share Model on Vector Materials

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Abstract: ***Learning devices are a form of teacher preparation in teaching. Based on the findings in the initial study at SMA Negeri 1 Serui, it shows that the existing tools are not adapted to the needs of students. The development of learning tools using a realistic mathematics learning approach with the Think Pair Share (TPS) model is a solution to this problem. Realistic mathematics learning provides meaningful learning to students and the TPS model helps students learn in their own way. The purpose of this study was to produce learning tools in the form of Teaching Modules, Worksheets. These learning tools were developed using a 4-D development model which was modified into 3 stages, namely Define, Design, and Develop on Vector material for class X at SMA Negeri 1 Serui. The results of this study indicate that the quality of the product produced based on the aspect of validity meets the very good criteria for Teaching Modules with the average total validator rating including very valid criteria. The practicality aspect based on the results of observations of teacher and student activities meets very good criteria, as well as students' responses to the device and positive learning. Based on the Learning Outcome Test (LOT), it was found that the learning tools developed had a very good level of effectiveness.***

Keywords: Learning Devices, Realistic Mathematics Learning, Think Pair Share, Teaching Modules, Student Worksheets, Learning Outcomes Tests

1. Preliminary

Education is an important aspect in improving the quality of human resources. This can be seen from the goals of national education contained in Article 3, Chapter II, Law Number 20 of 2003 concerning the National Education System, namely, developing the potential of students to become human beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable. , competent, creative, independent, and become a democratic and responsible citizen. Thus, students can develop their own potential so that they are able to become quality human beings who can face challenges and changes that occur in the global environment. Efforts to achieve educational goals are carried out by the government by establishing Content Standards which include minimum material and a minimum level of competence to achieve minimum graduate competence at certain levels and types of education (Kemendikbud, 2013). Based on the Content Standards, one of the subjects at each level is mathematics. This shows that mathematics plays an important role in improving the quality of human resources in Indonesia.The facts on the ground state that learning mathematics is less than optimal. Based on an interview conducted with a class X math teacher at SMAN 1 Serui, stated that the problem that often occurs in learning mathematics is that students are indifferent in class. This is because students think that the material presented is just complicated calculations that are not connected with real life. Students also find it difficult to study independently, because they are afraid of being questioned by the teacher while they do not understand the material being taught. Students are more comfortable asking their peers, but the teacher lectures more and does not provide discussion space for students. The teacher has tried to provide opportunities for students to discuss, but this is only done occasionally because usually the teacher pursues a lot of material in the 2013 Curriculum. real life, and learning models that can help students feel comfortable learning. So far, the teacher has not prepared learning tools, the Learning Implementation Plan (RPP) is usually only edited with the date from the previous year, without changing the learning activities. For Student Worksheets (LKPD) and Learning Outcomes Tests usually use what is already in the package book or LKPD from bookstores without being adjusted to the needs of students. The real impact of the lack of innovation on learning tools is student learning outcomes. Based on the results of the documentation review, it can be seen that the average daily mathematics test score of students in the 2021/2022 academic year is relatively low. Of the six basic materials, the lowest average is found in vector material. Based on the information from the subject teacher who teaches the subject, students find it difficult to carry out operations in vectors such as finding the length of a vector. Even though vectors are closely related to everyday life, such as determining displacement measurements. From the presentation of the results of the interviews and review of the documents, it appears that there is a need for development in designing learning. The teacher must consider the essential material to be taught, so there is no need to worry about missing material. The government has presented the Independent Curriculum, where this curriculum has the advantage of being simpler and more in-depth. The material taught is only essential and focuses on developing the competence of students in its phase. The learning that will be experienced by students becomes more in-depth, meaningful, not rushed, and fun (Kemendikbudristek, 2022).

Mathematics learning also needs to be designed to be student-centered. Application of learning models that can provide opportunities for students to discuss. One learning model whose syntax supports the way students learn is

Think Pair Share. According to Budiyanto (2016) the Think Pair Share learning model is a simple learning model. This model uses the pair discussion method which gives students more time to think, answer, and help each other.

Students also need to get meaningful learning by presenting the problems that exist around them. This needs to be done so that students do not think of mathematics as just a complicated calculation. One of them is by applying the Realistic Mathematics Learning (PMR) approach. According to Freudenthal (2006) PMR is learning that can support students to understand mathematics in ways that are meaningful and relevant to everyday life. This is supported by research from Syahri et al (2022) that, through the PMR approach it was found that students could be encouraged by their enthusiasm and greater responsiveness to learning material.

To apply learning approaches and models that suit the needs of students, teachers need to be designed systematically so that learning objectives are achieved. Therefore, the design will be poured into a learning tool. This is in accordance with the statement of Daryanto & Dwicahyono (2014) that learning devices are a form of preparation made by a teacher before they carry out the learning process.Learning tools or teaching devices needed in managing the teaching and learning process can be in the form of Learning Objectives Flow (ATP), Teaching Modules, Student Worksheets (LKPD), Evaluation Instruments or Learning Outcomes Tests (THB) (Kemendikbudristek, 2022). The government has provided these teaching tools that teachers can directly use or modify. In general, ATP has been determined by the school curriculum section, so that learning tools that can be developed by teachers are teaching modules. The teaching module component contains at least learning objectives, learning steps (which include the learning media to be used), assessments, as well as other learning information and references that can assist teachers in carrying out learning. Teachers are also given the freedom to develop components in teaching modules according to the environmental context and learning needs of students.Teachers can develop Student Activity Sheets (LKPD) which are a complement to the teaching modules. Ozmen & Yildirim (2011) argue that, LKPD is a sheet that contains materials for students to be more active and can take meaning from the learning process. LKPD is also in the form of tasks arranged on sheets and in the form of questions that must be answered/worked on by students (Daryanto and Dwicahyono, 2014).

2. Research Procedure

This research is categorized as research and development or Research and Development (R & D). This research and development method aims to produce learning tools that are valid, practical, and effective. The learning tools that will be produced in this study are in the form of Teaching Modules, Student Activity Sheets (LKPD) and Learning Outcomes Tests (THB) with a realistic mathematics learning approach using the Think Pair Share (TPS) learning model on Vector material for class X SMA.This research was conducted at Serui 1 Public High School in the Even Semester of the 2022/2023 Academic Year. The research was conducted in Class X SMA Negeri 1 Serui for the 2022/2023 academic year. The development model that will be used in developing this learning tool is a modification of the 4-D development model which includes 4 stages (Define, Design, Develop, and Desseminate) (Thiagarajan, 1974). The modified stage is the disseminate or dissemination stage, because the product of this development research is not directly disseminated for use. Figure 1.1 presents the modified stages of the flow in this development model.

3. Results and Discussion

Research on the development of this device was carried out at SMA Negeri 1 Serui, Papua Province, with 30 students in Class X IPA. The learning device was developed based on a modification of the 4-D Thiagarajan model which consists of 3 stages, namely: (1) Define; (2) Design; and (3) Develop. The stages of activities that have been carried out are as follows.Research activities at the Define Stage which include (1) Preliminary Final Analysis: Preliminary final analysis aims to emerge and determine the basic problems encountered in learning mathematics, so that it is necessary to develop learning tools. Researchers conducted interviews with math teachers for class X at SMA Negeri 1 Serui, obtained information that the learning tools made by the teacher did not support students' learning needs. The teacher did not have time to make a Learning Implementation Plan (RPP), only copied from the previous year. In the Independent Curriculum, the Learning Implementation Plan (RPP) is changed to Teaching Module. Furthermore, Student Worksheets (LKPD) and Learning Outcomes Tests (THB) are usually only taken from books without adjusting to the needs of students. The teacher also lectures more often so that students are more passive. From this analysis the researcher concluded that it was necessary to develop learning tools in the form of Teaching Modules, LKPD, and THB at SMA Negeri 1 Serui; (2) Student Analysis: This analysis was conducted to examine the characteristics of students. From the results of observations on students in class X IPA at SMA Negeri 1 Serui, information was obtained that students were indifferent to learning mathematics because it was only considered as a complicated calculation and had nothing to do with real life.

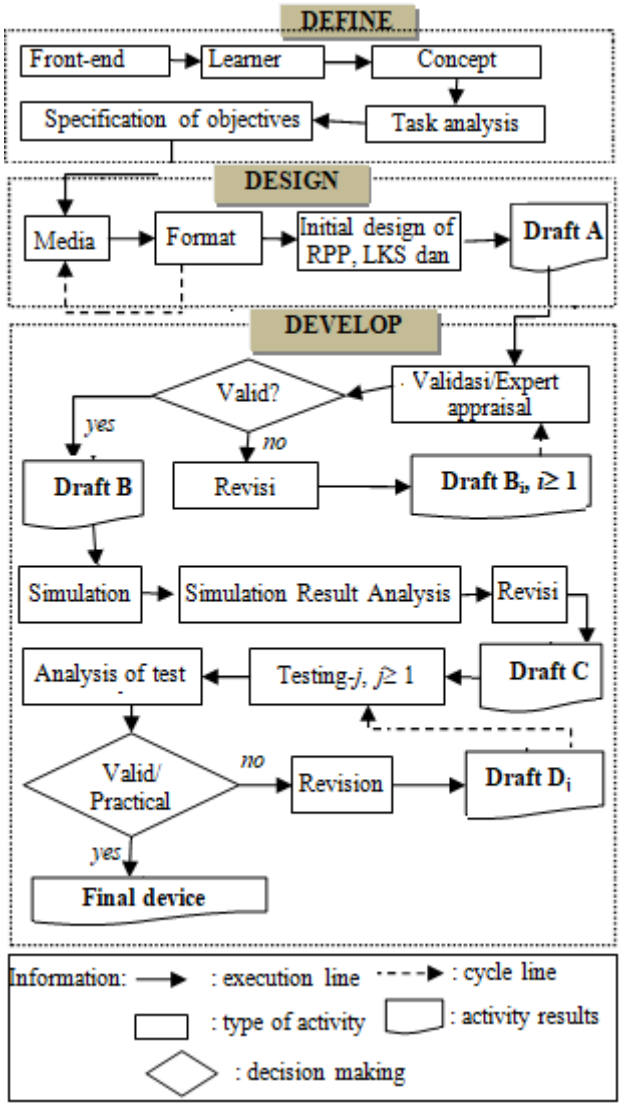

Figure 1.1: Modified Thiagarajan 4-D Model Development Research Scheme

The teacher also said that students are more comfortable learning in pairs, but students are rarely given space to discuss in the learning process because teachers have to pursue so much material.From this analysis the researcher concluded that students need to get meaningful learning by presenting the problems that exist around them.This needs to be done so that students do not think of mathematics as just a complicated calculation. The right learning approach is a realistic mathematics learning approach. Teachers also need to design learning that can help students to be able to study in discussion groups in pairs. The learning model that is right for the needs of students at SMA Negeri 1Serui is the Think Pair Share (TPS) learning model; (3) Concept/Material Analysis: This analysis is carried out to identify and systematically compile relevant materials that will be developed and taught in realistic mathematics learning vector material, so a schematic is drawn up regarding related materials;(4) Task Analysis: Based on the concept analysis of vector material, the main tasks or skills that students must have after studying this material are as follows: (a) Defining vectors and providing examples; (b) Express vectors visually and symbolically; (c) Determine vector components and vector lengths related to real problems. Specifications of Learning Objectives: Specifications of learning objectives are the basis for the preparation of learning device designs and the preparation of learning achievement tests. The indicators for learning objectives for Vector material are as follows: (i) Students explain the meaning of Vectors and provide examples of Vector shapes in real life; (ii) Students are able to express Vector visually and symbolically; (iii) Students are able to determine the components of a Vector based on the coordinates of the start and end points, and determine the length of the Vector.Design Stage: This stage aims to prepare a learning device design that will be developed. Some of the things that are done in this stage are: (1) Selection of media: Learning media needed in the implementation of realistic mathematics learning on tube material, namely: teaching modules, student worksheets, balls, and measuring devices (meters); (2) Selection of format: The format for developing this learning tool includes selecting a format for designing content, selecting learning strategies, and learning resources. The learning device formats are: Teaching Module validation instruments, LKPD validation instruments, and THB validation instruments; (3) Initial design: The initial design is the design of the learning device before the trial is carried out. At this stage learning tools are made in the form of Teaching Modules, LKPD, THB, observation sheets of teacher and student activities, response questionnaires, along with their validation instruments. The teaching modules that are structured are oriented towards the Independent Curriculum with a realistic mathematics learning approach using the TPS model which consists of learning outcomes, learning objectives, learning activities, and assessments. The Teaching Module is arranged in 1 meeting and is accompanied by an LKPD which contains questions, steps that must be taken by students in order to draw a conclusion. Then the THB is arranged in the form of a description of 3 questions. Develop stage: (1). Expert validation: (a) One of the main criteria for determining whether or not a learning tool is used is the result of expert validation. Based on the experts' assessment, the researcher revised the teaching modules, Student Activity Sheets (LKPD), Learning Outcomes Tests (THB), Teacher and Student Activity Observation Sheets, and Student Questionnaires, all of which were preliminary designs. For validation of the Learning Outcomes Test the researcher did not abort the study results items, but the items that did not meet the requirements were revised and the results of the revisions were consulted with experts; (b) Readability Test: The readability test was carried out on 8 class X students of SMA Negeri 1 Serui consisting of 2 students with high ability, 4 students with medium ability and 2 students with low ability. This class is not used for test classes; (c) Trial of Learning Devices: Trials of learning devices were carried out in class X at SMA Negeri 1 Serui with a total of 30 students.The trial was carried out by the researchers themselves with 2 teachers as observers. The first teacher's duty is to observe teacher activities to determine the suitability of the implementation of the device with the learning activities on the device. The second teacher is tasked with observing the responses of students. Learning activities were carried out at the first meeting on May 16 2023 and at the second meeting on May 17 2023 a Learning Outcomes Test (THB) was carried out. From the THB, data on the effectiveness of the learning tools developed will be obtained. After learning and THB, students fill out a

Response Questionnaire. In addition to the results of observations of teacher and student activities, student response questionnaires also obtained data on the practicality of the developed learning tools. At this stage it is intended to find out whether the vector material learning device with a realistic mathematical approach and the Think Pair Share learning model developed has valid, practical, and effective criteria.The details of the data analysis are as follows: (1) Validity Data Analysis: The learning instruments and tools in this study were validated by three experts, namely, one Lecturer in Mathematics Education at Manado State University and two mathematics teachers at the school where the study was conducted; (2) Teaching Module Validity Analysis: Data and analysis of Teaching Module validation data as a whole can be seen in the appendix. The following is a summary of the results of the Teaching Module validation, which can be seen in Table 3.1. Based on the results of data analysis in Table 3.1, it can be seen that the initial design of the Teaching Modules that was developed met the minimum good criteria in all aspects and the average total score of Teaching Module validation from the three experts was 4.12 with good criteria.

Table 3.1 Teaching Module Validation Results

No.	Assessment Aspects	Average	Criteria
1	Compatibility of Material with CP and TP	4.22	Very good
2	Material Accuracy	4.25	Very good
3	Material Update	4.22	Very good
4	Serving Technique	4.16	Good
5	Presentation Support	4.06	Good
6	Presentation of Learning	4.00	Good
7	Presentation Completeness	4.11	Good
8	Straightforward Language	4.00	Good
9	Communication	4.16	Good
10	Dialogic and Interactive	4.00	Good
Average Total Score		**4.12**	**Good**

From these criteria it can be concluded that the Teaching Modules developed are valid and suitable for use in Vector learning. (3) Analysis of LKPD Validity: Data and analysis of LKPD validation data as a whole can be seen in Appendix 16. Following is a summary of the results of LKPD validation can be seen in Table 3.2.

Table 3.2: LKPD Validation Results

No.	Assessment Aspects	Average	Criteria
1	LKPD format	4.46	Very good
2	Fill in the LKPD	4.33	Very good
3	Language	4.16	Good
Average Total Score		4.32	Very good

Based on the results of data analysis in Table 3.2, it can be seen that the initial LKPD design that was developed met the minimum good criteria in all aspects and the average total score of LKPD validation from the three experts was 4.32 with good criteria. From these criteria it can be concluded that the LKPD developed is valid and suitable for use in Vector learning; (4) THB Validity Analysis: Data and analysis of THB validation data as a whole can be seen in the appendix. The following is a summary of the results of the THB validation, which can be seen in Table 3.3.

Table 3.3: THB Validation Results

No.	Question Number	Average	Criteria
1	Number 1	4.26	Very good
2	Number 2	4.26	Very good
3	Number 3	4.19	Good
Average Total Score		4.23	Very good

Based on the results of data analysis in Table 3.3, it can be seen that the initial THB design that was developed met the minimum criteria both in all aspects and the average EHB validation total score of the three experts was 4.23 with very good criteria. From these criteria it can be concluded that the developed THB is valid and suitable for use in Vector learning; (5) Analysis of the Validity of the Teacher Activity Observation Sheet: Data and analysis of data validation of the teacher activity observation sheet as a whole can be seen in the appendix. The following is a summary of the results of the validation of the teacher's activity observation sheet, which can be seen in Table 3.4.Based on the results of data analysis in Table 3.4, it can be seen that the initial design of the teacher activity observation sheet that was developed met the minimum criteria both in all aspects and the average total score of the teacher activity observation sheet validation from the three experts, namely 4.21 with very good criteria.

Table 3.4: Validation Results of Teacher Activity Observation Sheets

No.	Assessment Aspects	Average	Criteria
1	Appearance	4.44	Very good
2	Language	4.00	Good
3	Conformity Question	4.20	Very good
Average Total Score		4.21	Very good

From these criteria it can be concluded that the observation sheet developed is valid and suitable for use in making observations. (5) Analysis of the Validity of Student Activity Observation Sheets: Data and data analysis validation of student activity observation sheets as a whole can be seen in the appendix. Following is a summary of the validation results of the observation sheet of student activities, which can be seen in Table 3.5

Table 3.5: Validation Results of Student Activity Observation Sheets

No.	Assessment Aspects	Average	Criteria
1	Appearance	4.56	Very good
2	Language	4.00	Good
3	Conformity Question	4.13	Good
Average Total Score		4.23	4.23

Based on the results of the data analysis in Table 3.5, it can be seen that the initial design of the student activity observation sheet that was developed met the minimum criteria both in all aspects and the average total score of the teacher activity observation sheet validation from the three experts, namely 4.23 with very good criteria. From these criteria it can be concluded that the observation sheet developed is valid and feasible to use in making observations. (6) Analysis of Student Response Questionnaire Validity: The following is a summary of the validation results of the observation sheets of student activities can be seen in Table 3.6.

Table 3.6: Student Response Questionnaire Validation Results

No.	Assessment Aspects	Average	Criteria
1	Appearance	4.22	Very good
2	Language	4.22	Very good
3	Conformity Question	4.13	Good
Average Total Score		4.19	4.19

Based on the results of data analysis in Table 3.6, it can be seen that the initial design of the student response questionnaire that was developed met the minimum criteria both in all aspects and the average total score of student response questionnaire validation from the three experts was 4.19 with good criteria. From these criteria it can be concluded that the developed questionnaire is valid and feasible to use in obtaining student response data. Practicality Data Analysis: (1). Analysis of Teacher Activity Observation Sheets. The following is a summary of the results of observations of teacher activities, which can be seen in Table 3.7.Based on the results of data analysis in Table 3.7, it can be seen that the teacher's activities in the learning process meet the minimum criteria both in all aspects and the average total score is 4.21 with good criteria.

Table 3.7: Results of Analysis of Teacher Activity Observation Sheets

No.	Assessment Aspects	Average	Criteria
1	Introduction	4.21	Good
2	Core		
3	Closing		
4	Time Management		
5	Class situation		

From these criteria it can be concluded that the learning tools developed fulfill practical aspects. (2) Analysis of Student Activity Observation Sheets. The following is a summary of the results of observations of student activities, which can be seen in Table 3.8.

Table 3.8: Results of Student Activity Observation Analysis

No.	Assessment Aspects	Average	Criteria
1	Introduction	4.57	Very good
2	Core		
3	Closing		

Based on the results of data analysis in Table 3.8, it can be seen that the activities of students in the learning process meet the minimum criteria both in all aspects and the average total score is 4.57 with very good criteria. From these criteria it can be concluded that the learning tools developed fulfill practical aspects. (3) Student Response Questionnaire Analysis. Based on the results of student response questionnaire data analysis, the percentage in each category was more than equal to 80%, so that it can be said that the student response was positive. Based on the results of the analysis of the results of observations of teacher and student activities, as well as student response questionnaires, it can be concluded that learning tools fulfill practical aspects.

Effectiveness Data Analysis. The effective aspect of this study was obtained from the completeness of the students' learning outcomes. The following is a summary of the results of observations of student activities, which can be seen in Table 3.9.

Table 3.9: The results of the completeness analysis of student learning outcomes

Number of Students	Number of Completed Students	Completeness presentation	Number of Students who did not complete	Incompleteness presentation (%)
30	27	90	3	10

From Table 3.9 it can be seen that 27 out of 30 students scored above the KKM. While 3 students got scores below the KKM. The percentage of students who complete is 90%, so it can be said that the learning tools developed are effective for use. The weakness of the research is the learning approach used, namely realistic mathematics learning requires a long implementation time for each meeting. So it is necessary to consider using this approach in certain parts of a subject. This research also only reached the product development stage and did not disseminate the final product.

4. Conclusions and Suggestions

Based on the results of research conducted at SMA Negeri 1 Serui in class X, as well as the results of data analysis and discussion of the learning tools developed using the Realistic Mathematics Learning Approach with the Think Pair Share learning model on vector material, it is concluded that the learning tools developed fulfill the valid aspects, practical, and effective, so that it can be used as an alternative source to support learning activities. The suggestions recommended for further researchers are as follows. The learning tools developed in this study are still limited to one math subject matter, namely Vector, so that other researchers can develop learning tools with other materials. Even though it has fulfilled valid, practical, and effective aspects, the learning tools developed have not yet reached the deployment stage. It is possible for further researchers to arrive at the dissemination stage in order to find out the effectiveness of the learning tools that have been developed.

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References

[1] Budiaji, W. (2013). Skala Pengukuran dan Jumlah Respon Skala Likert (The Measurement Scale and The Number of Responses in Likert Scale). *Ilmu Pertanian dan Perikanan, 2 (2)*, 127-133.
[2] Budiyanto, M. K. (2016). *Sintaks 45 Model Pembelajaran dalam Student Centered Learning*

*(SCL).*Malang: Penerbitan Universitas Muhammadiyah Malang.

[3] Burrowes, R. (1960). *The Process of Education.* Cambridge: Harvard University Press.

[4] Damanik, W. J., & Syahputra, E. (2018). Pengembangan Perangkat Pembelajaran Untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis Peserta Didik Menggunakan Model Discovery Learning. *Jurnal Inspiratif, 4(2)*, 27-38.

[5] Daryanto, & Dwicahyono, A. (2014). *Pengembangan Perangkat Pembelajaran (Silabus, RPP, PHB, Bahan Ajar).* Yogyakarta: Gava Media.

[6] Fauzan, A. (2002). *Applying Realistic Mathematics Education (RME) in Teaching Geometry in Indonesia Primary Schools.* Enschede, The Netherlands: Print Partners ipskamp.

[7] Frudenthal, H. (1991). *Revisiting Mathematics Education: China Lectures.* Dordrecht: Kluwer Academic Publisher.

[8] Fruedenthal, H. (2006). *Revisiting mathematics education (9th ed.).* New York: Kluwer Academic Publisher.

[9] Kementerian Pendidikan dan Kebudayaan. (2013). *Peraturan Menteri Pendidikan dan Kebudayaan No 64 Tahun 2013 tentang Standar Isi untuk Satuan Pendidikan Dasar dan Menengah.*Jakarta: Kementerian Pendidikan dan Kebudayaan.

[10] Kementerian Pendidikan dan Kebudayaan. (2016). *Peraturan Menteri Pendidikan dan Kebudayaan Nomor 21 Tahun 2016 tentang Standar Isi Satuan Pendidikan Dasar dan Menengah.* Jakarta: Kementerian Pendidikan dan Kebudayaan.

[11] Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. (2022). *Peraturan Menteri Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia Nomor 56 Tahun 2022 tentang Pedoman Penerapan Kurikulum Dalam Rangka Pemulihan Pembelajaran.* Jakarta: Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

[12] Laily, D. F., & Yolanda, F. (2021). Pengembangan Bahan Ajar dengan Model Kooperatif Tipe Think Pair Share pada Materi Segiempat. *Symmetry Pasudan Journal of Research in Mathematics Learning and Education, 6(2)*, 133-147.

[13] Latif, A., Suanto, E., & Solfitri, T. (2021). Pengembangan Perangkat Pembelajaran Model Kooperatif Tipe Think Pair Share untuk Materi Sistem Persamaan Linier Dua Variabel. *JURING (Journal for Research in Mathematics Learning), 4(3)*, 225-234.

[14] Lestari, K. E., & Yudhanegara, M. R. (2017). *Penelitian Pendidikan Matematika (Panduan Praktis Menyusun Skripsi, Tesis, dan Laporan Penelitian dengan Pendekatan Kuantitatif, Kualitatif, dan Kombinasi Disertasi dengan Model Pembelajaran dan Kemampuan Matematis.* Bandung: PT. Refika Aditama.

[15] Mulyantiningsih, E. (2012). *Metodologi Penelitian Terapan.* Yogyakarta: Alfabeta.

[16] Mulyasa, E. (2008). *Menjadi guru Profesional.* Bandung: PT. Remaja Rosdakarya offset.

[17] Ozmen, & Yildrim. (2011). Effect of Worksheets on Student's Succes: Acid and Based Sample. *Journal of Turkish Education, II (2)*, 4.

[18] Prastowo, A. (2013). *Panduan Kreatif Membuat Bahan Ajar Inovatif.* Yogyakarta: DIVA Press.

[19] Purwanto. (2009). *Evaluasi Hasil Belajar.* Yogyakarta: Pustaka Belajar.

[20] Slavin, R. E. (2005). *Cooperative Laerning.* London: Allymand Bacon.

[21] Sudijono, A. (2005). *Pengantar Evaluasi Pendidikan.* Jakarta: PT. Raja Grafindo.

[22] Suhardi. (2007). *Petunjuk Perangkat Pembelajaran.* Surakarta: Universitas Muhammadiyah Surakarta.

[23] Sukino. (2016). *Matematika Jilid 1 untuk SMA/MA Kelas X Kelompok Peminatan Matematika dan Ilmu-Ilmu Alam.* Jakarta: Penerbit Erlangga.

[24] Suryanto, & Sugiman. (2001). *Pendidikan Matematika Reaalistik.* Yogyakarta: PPPG Matematika.

[25] Susanto, D., & dkk. (2021). *Buku Panduan Guru Matematika untuk SMA/MA Kelas X.* Jakarta: Pusat Kurikulum dan Perbukuan Badan Penelitian dan Pengembangan dan Perbukuan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

[26] Syahri, A. A., Halim, S. H., & Bahar, E. E. (2022). Pengembangan Perangkat Pembelajaran Matematika Realistik Pada Materi Operasi Hitung Bentuk Aljabar. *Aksioma, 11(1)*, 8-20.

[27] Syaifurahman, & Ujiati, T. (2013). *Manajemen dalam pembelajaran.* Jakarta Barat: PT Indeks.

[28] Tim KREATIF. (2014). *Belajar Praktis Matematika Mata Pelajaran Peminatan Matematika dan Ilmu Pengetahuan Alam Untuk SMA/MA Kelas X Semester 2.* Klaten: Viva Pakarindo.

[29] Trianto. (2007). *Model Pembelajaran Inovatif Berorientasi Konstruktivistik.* Jakarta: Prestasi Pustaka.

[30] Trianto. (2007). *Model Pembelajaran Terpadu dalam Teori dan Praktek.* Jakarta: Prestasi Pustaka Publisher.

[31] Wauran , G. W., Tuerah, P. E., & Pesik, A. (2022). Development of Mathematics Learning Devices on Sequence-Arithmetic Topic with Problem Based Learning Model. *International Journal of Science and Research (IJSR), Vol. 11 (6)*, 1708-1712.

[32] Widjajanti, E. (2008). *Kualitas Lembar Kerja Siswa.* Retrieved from staff.uny.ac.id/system/files/pengabdian/endang.../kualitas-lks.pdf

[33] Wulansari, A. M., Pardimin, P., & Arcana, I. N. (2018). Pengembangan perangkat pembelajaran model kooperatif tipe think pair share (TPS) berbantuan modul baris kolom untuk persamaan garis di SMP. *Prosiding Seminar Nasional Etnomatnesia*, 120-128