Development of Peer Tutor Learning Model Using Guide Book (TSBP) to Unfold Student's Learning Activity and Results of Public High School X MIPA 1 Bojong

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Abstract. Teaching Physic subject at SMA Negeri 1 Bojong still rudimental with non-optimal results. In learning process, teachers tend to use one way lecture system. The absence of learning applications that can stimulate students to be interested in learning results in a lack of attention and interest from students. The teachers also have not implemented contextual learning strategies. Furthermore, teachers require students to understand learning using memorization strategy. It affects students to avoid assignments and they tend to not focus. The learning process tend to be happened in not-conducive way, for that a learning strategy is needed to overcome these problems including the development of Peer Tutor Learning Models with Guide Books (TSBP). The purpose of this research is to increase the activeness and learning achievement of Physics Class X MIPA students at SMA Negeri 1 Bojong. The method used is the ADDIE procedural model and is limited to Analysis, Design, Development. The validity of the construct used in this study refers to the concept of the validity of the Messick construct where the validity of the construct used is content validity. The results showed that the peer tutor learning model with guidebooks was effective in increasing the activeness and learning achievement of Class X MIPA students at SMA Negeri 1 Bojong, as evidenced by the values of 0.206 P≤0.410 , 0.842≤MNSQ≤1,200 and -0.8550123≤ZSTD 0.9758487

Keywords: Peer Tutor; Guide Book, Learning Activity; Learning Achievement

1. Introduction

Learning Physics is one of the scientific clusters that study matter or energy based on empirical methods. Thus Physics seeks to obtain scientifically proven information. The objective of Physics courses is that the students learn how to use what they know to solve problems in the real world (competencies), but no one learns to do that seeing as the professor think in the blackboard. [1]

Physics is one of the oldest academic disciplines and, through the inclusion of astronomy, perhaps the oldest [2]. For more than the last two millennia, physics, chemistry, biology, and certain branches of mathematics have been part of natural philosophy. Physics intersects with many interdisciplinary research areas, such as biophysics and quantum chemistry, and the boundaries of physics are not rigidly defined. New ideas in physics often explain the

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fundamental mechanisms studied by other sciences and open up new avenues of research in academic disciplines such as mathematics and philosophy.

Research on the learning and teaching of physics is essential for the cumulative improvement in the teaching of physics [3]. Problem solving can increase learning efficiency [4] if the problem causes reasoning. Great emphasis has been placed on teaching Physics with a well-designed set of questions [5]. A teacher uses books, experiments, simulations, and web resources; its success is measured against class goals with standardized testing [6]. So the idea of learning related to the topic is taken when students succeed in answering some questions related to the topic, often those questions are presented in the assessment. Most tests encourage memorization and rote learning, which is of little use in a world connected to many sources of information via the Internet. So maybe the first question we need to answer is why we want to teach Physics to students. For students, they must be able to solve the problems they are expected to solve, according to the appropriate title of the degree. But for students from primary education to high school, they need to understand the changing world in which they live, and the science that is part of their culture. Students need to learn how to apply their knowledge in real life, which is often interpreted as "becoming competent". Since 2003 the PISA Project evaluates how students face problems that they have to read and understand, and after that they have to reason to get the right answer [7].

One of the materials taught in Class X Mathematics and Natural Sciences is about work and energy. This learning is often considered not easy by students, especially at SMA Negeri 1 Bojong, Tegal Regency. These difficulties include distinguishing between force and work, understanding the work done by gravity, determining the sign of work acting on objects. Students also still have difficulty understanding that the work done by objects must cause the object to experience displacement. This is because the matter of work and energy is an abstract material.

Anawati, et al [8] in their research explained that in learning Physics, it is also often found that the problem is that students do not have a good interest in learning, this is because they consider Physics to be a full-fledged learning using formulas. In addition, based on observations at SMA Negeri 1 Bojong, several problems related to the material were found, namely the previous study completeness was only 63.82%. This condition is still below the ideal classical completeness expected (75%), meaning that there are still many students who have not obtained optimal results. Then from the results of interviews conducted with students, several problems were found that resulted in students experiencing disinterest in learning Physics, namely (1) in carrying out their activities the teacher tends to use the lecture system, (2) the absence of learning applications that can stimulate students to be interested in learning. learning or teachers have not implemented contextual learning strategies and (3) teachers require students to understand learning with the concept of memorization.

Meanwhile, Puspitasari, et al. [9] in their research explained that attitudes in Physics really determine that it can help solve problems faced by students. With a scientific attitude, students need to have a high enough concentration. As it is known, that Physics requires a sufficient level of accuracy so that students can easily understand Physics subjects. This is because one of the most common goals in physics is finding equations that explain how a system changes over time which is generally defined as a difficult subject even by computers.

Physicists are often interested in explaining mathematically how a system behaves: for example, a formula tracks the motion of the planets and their moons in their intricate dance around the sun. The researchers worked on this equation by measuring objects at various points in time and then developing a formula that connected all of those points together. With each new variable, however, it becomes more difficult to find the right equation[12].

This condition causes students' understanding ability in physics material, especially work and low energy material, is poor. Thus to be able to study the material, an effort is needed so that students have interest and ease in understanding the material, including by choosing the right learning method, namely by choosing the right learning method of peer-tutoring method with guidebook.

Febianti [13] explained that peer tutoring is one of the techniques included in cooperative learning because in peer tutoring, students learn together in a group. In peer tutoring, students work together in taking on their roles as peer tutors and tutees. Currently, teachers use group learning as a variation in teaching because it has a beneficial effect.

The peer tutoring method is one of the learning concepts that focuses on learning based on utilizing students who already understand the material to provide assistance or teach students who do not understand, thus the application of this method will provide a cooperative learning atmosphere [14]. This method facilitates students who already understand the material, then it is conveyed to students who have not mastered the material, thus the hope achieved in this method is to share knowledge between students.

A guide book is a book that is used as a reference to obtain information and instructions in carrying out an activity. Aims to guide and provide guidance to readers in carrying out the steps that will be carried out in the book [15]. There are many types of guidebooks, one of which is the guidebook in education, namely the Principal's Guidebook, Teacher's Guidebook, and Student's Guidebook. Each of these manuals has a different function, but the goal is the same, namely to provide direction to the reader and those who use the manual.

Based on the circumstances mentioned above, it is necessary to study the Development of Peer Tutor Learning Models with Guide Books as an effort to increase the activeness and achievement of learning physics in students of Class X MIPA SMA Negeri 1 Bojong. With research questions: 1) Is the peer tutor learning model with a guidebook effective for increasing the activity of Class X MIPA students at SMA Negeri 1 Bojong, Tegal Regency. 2) Is the peer tutoring learning model with guidebooks effective for improving the learning achievement of Class X MIPA students at SMA Negeri 1 Bojong, Tegal Regency?

2. Method

This research was conducted in Class X MIPA SMA Negeri 1 Bojong, Tegal Regency. The form of this research is Research and Development, which is a form of research used to produce certain products, and to test the effectiveness of these products [16]. The object of this research is learning tools, instruments and guidebooks which were compiled, revised, and validated with Rasch modeling. In the research design the instrument development uses the ADDIE procedural model and is limited to Analysis, Design, Development [15][16]. There are several stages of instrument development which can be explained as follows:

2.1 Analysis

Analysis is an initial activity to determine the needs and objectives of the product to be developed. Included in this step are literature review related to the problem being studied, and requirements are prepared to formulate a research framework. In this research, the researcher prepares the needs (school conditions, students, experts/experts, colleagues, prepares learning tools, instruments and guidebooks) for research purposes. The product of this research is an instrument to determine the importance of conducting peer tutoring learning models with

guidebooks, instruments that measure student activity, instruments to measure learning achievement and guidebooks for tutors.

2.2 Design

In the design stage, the researcher begins to collect, compile and design the product to be developed. including in this step designing learning tools, elaborating the design, formulating skills and expertise related to the problem, determining the objectives to be achieved at each stage, and if possible/necessary carrying out a limited feasibility study. In this step the researcher designs and describes the learning tools that will be made including: readiness, goals, benefits, time and what goals will be achieved or desired by the researcher, including designing the need for a peer tutor learning model with a guide book as well as preparing a learning scenario using the Peer Tutor model. with the HOTS-oriented Handbook on Business and Energy in Class X MIPA.

Table 1. Learning Device Trial Design.

Class	Pretest	Action	Posttest
Experiment	T1	X	T2
Control	T1	Y	T2

The experimental research design of the learning device used was a true-experimental design with a pretest posttest control group design. The paradigm in this model trial research can be seen in the following table.

In this design, there are two groups, each of which is chosen randomly. The first group (X) was given a Peer Tutor model learning with a Guidebook with HOTS-oriented assessment called the experimental class, and the second group (Y) was given conventional learning treatment with HOTS assessment called the control class [17]. Both groups were taken the value of the previous test results as the pretest value (T1) to determine the state of the students' initial abilities between the experimental class and the control class. After receiving treatment, the two test classes did a post-test, namely the HOTS-oriented Physics Ability Test (T2). The implementation of the trial of learning tools in the classroom includes 2 (two) observers from peers, namely a friend of a Physics teacher. Observers are tasked with observing student activity during the learning process in class. From the results of the learning device trials conducted in the classroom, then analyzed. If the learning tools are not yet practical and the learning is not effective, then revisions must be made and retesting is necessary. This activity is repeated until practical and effective learning tools become the final learning tools.

2.3 Development

In the development stage, the researcher begins to validate the instruments he developed, in this case developing the initial form of the product to be produced. Included in this step is the preparation of supporting components, preparing prototypes (syllabus, lesson plans, student books, and worksheets), preparing guidelines and guidebooks, and evaluating the feasibility of supporting tools. At this step the researcher has prepared, made and designed a prototype in such a way (syllabus, lesson plans, student books, worksheets and guide books) which will be tested on a limited or broad scale with input from experts/experts and teachers, so that the results are as expected. The type of validation is content aspect validation using Rasch modeling. Content validation is carried out with the consideration of 2 experts related to the test material and the achievement of the activity to be measured. The instrument was tested in class X MIPA SMA Negeri 1 Bojong, Tegal Regency, involving 108 students so that the parameter estimation of the item became stable. The validity of the construct used in this study refers to the concept of validity of the Messick construct [18][19] where the validity of the construct used is content validity as shown in Table 2. Construct validation with Rasch modeling using PCM to see the fit of the items with the model and the complete identification of item bias can be seen in Table 2.

Table 2. Types and Indicators of Contract Validity

Construct Validation Type	**Indicator**
Contents	Evidence of content relevance and representativeness of test items

Susongko [20] provides quantitative criteria related to indicators of construct validity according to Rasch modeling as described in Table 3.

Table 3. Valid test criteria are seen from various aspects of validity and criteria by applying the Rasch Model

Construct Validity Aspect	**Indicator**	**Criteria**
Contents	Itemfit	P > 0.01 0,5 <MNSQ<1,5 -2,0 < ZSTD<2,0
	Person-item Map	All item difficulty levels are in the testee's ability domain
	Person/Item Map	The testee's ability is equal to or close to the item's difficulty level
	Test Information Function	The test information function has a maximum value in the testee's ability domain

At this point validation stage, it is expected to produce test items that meet all the test validity requirements that are tested empirically. In this study, the software used in analyzing the Rasch modeling uses the R version 3.5.0 program with the eRm package version 0.16-2.

This software is used because it is open source so it is easy to access and develop for educational assessment research observers [21].

3. Result & Discussion

The results of the data with the R application are as follows:

Table 4. Item (Category) Difficulty Parameters (eta):

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Item (Category) Difficulty Parameters (eta):
             V1.c2     V2.c1      V2.c2     V3.c1      V3.c2     V4.c1
Estimate -0.8550123 0.2185877 -0.1011011 0.3968742 -0.5815186 0.2975086
Std.Err   0.2664078 0.2418362  0.2221724 0.2779596  0.2195446 0.2377575
             V4.c2      V5.c1      V5.c2     V6.c1     V6.c2      V7.c1
Estimate 0.05094158 -0.4041807 -0.3123144 0.3426642 0.4512379 -0.4345037
Std.Err  0.22198065  0.2405063  0.2423257 0.2247147 0.2313260  0.2271521
             V7.c2     V8.c1     V8.c2     V9.c1     V9.c2    V10.c1    V10.c2
Estimate 0.05118273 0.2017096 0.1299924 0.9758487 0.5361559 0.6177518 0.8514929
Std.Err  0.25041284 0.2315715 0.2263565 0.2523972 0.2183693 0.2236370 0.2410462
            V11.c1     V11.c2     V12.c1    V12.c2     V13.c1      V13.c2
Estimate -0.6552874 -0.3497949 -0.3403229 0.2497403 -0.1311397 -0.03484178
Std.Err   0.2433757  0.2540254  0.2209563 0.2521748  0.2311440  0.23472477
            V14.c1    V14.c2     V15.c1     V15.c2     V16.c1     V16.c2
Estimate 0.03210771 0.6043722 -0.5902389 -0.4288170 0.03528247 0.05105993
Std.Err  0.21383956 0.2499280  0.2460954  0.2501347 0.23056944 0.23022733
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Table 5. Personfit Statistics

Personfit Statistics:							
	Chisq	df	p-value	Outfit MSQ	Infit MSQ	Outfit t	Infit t
P1	5.061	5	0.408	0.844	0.911	-0.26	-0.21
P2	6.850	5	0.232	1.142	1.093	0.45	0.36
P3	5.583	5	0.349	0.931	0.959	-0.24	-0.16
P4	4.525	5	0.477	0.754	0.772	-0.58	-0.56
P5	6.263	5	0.281	1.044	1.128	0.33	0.41
P7	5.214	5	0.390	0.869	0.896	-0.53	-0.51
P8	9.341	5	0.096	0.096	1.485	2.19	2.30
P10	5.030	5	0.412	0.412	0.968	0.10	0.19
P11	5.056	5	0.409	0.409	0.831	-0.31	-0.37
P12	7.914	5	0.161	0.161	1.300	0.89	0.88
P14	5.030	5	0.412	0.412	0.968	0.10	0.19
P16	5.030	5	0.412	0.412	0.968	0.10	0.19
P17	5.455	5	0.363	0.363	0.981	-0.09	0.03
P18	4.858	5	0.433	0.433	0.833	-0.83	-0.87
P19	7.297	5	0.199	0.199	1.216	0.52	0.48
P20	5.056	5	0.409	0.409	0.843	-0.31	-0.37
P21	10.065	5	0.073	0.073	1.677	0.95	0.60
P22	4.525	5	0.477	0.477	0.754	-0.58	-0.56
P23	6.263	5	0.281	0.281	1.044	0.33	0.41
P24	5.030	5	0.412	0.412	0.838	0.10	0.19
P26	6.850	5	0.232	0.232	1.142	0.45	0.36
P28	4.064	5	0.540	0.540	0.677	-0.83	-0.77
P29	4.299	5	0.507	0.507	0.716	-0.06	0.08
P31	4.064	5	0.540	0.540	0.677	-0.83	-0.77
P33	5.056	5	0.409	0.409	0.843	-0.31	-0.37
P37	5.061	5	0.408	0.408	0.844	-0.26	-0.21
P38	6.850	5	0.232	0.232	1.142	0.45	0.36
P39	5.583	5	0.349	0.349	0.931	-0.24	-0.16
P40	4.525	5	0.477	0.477	0.754	-0.58	-0.56
P41	6.263	5	0.281	0.281	1.044	0.33	0.41
P43	5.214	5	0.390	0.390	0.869	-0.53	-0.51
P44	9.341	5	0.096	0.096	1.557	2.19	2.30
P46	5.030	5	0.412	0.412	0.838	0.10	0.19
P47	5.056	5	0.409	0.409	0.843	-0.31	-0.37
P48	7.914	5	0.161	0.161	1.319	0.89	0.88
P50	5.030	5	0.412	0.412	0.838	0.10	0.19
P51	7.297	5	0.199	0.199	1.216	0.52	0.48
P52	5.030	5	0.412	0.412	0.838	0.10	0.19
P53	5.455	5	0.363	0.363	0.909	-0.09	0.03
P54	4.858	5	0.433	0.433	0.810	-0.83	-0.87
P55	7.297	5	0.199	0.199	1.216	0.52	0.48
P56	5.056	5	0.409	0.409	0.843	-0.31	-0.37
P57	10.065	5	0.073	0.073	1.677	0.95	0.60
P58	4.525	5	0.477	0.477	0.754	-0.58	-0.56
P59	6.263	5	0.281	0.281	1.044	0.33	0.41
P60	5.030	5	0.412	0.412	0.838	0.10	0.19
P62	6.850	5	0.232	0.232	1.142	0.45	0.36
P64	4.064	5	0.540	0.540	0.677	-0.83	-0.77
P65	4.299	5	0.507	0.507	0.716	-0.06	0.08
P67	4.064	5	0.540	0.540	0.677	-0.83	-0.77
P69	5.056	5	0.409	0.409	0.843	-0.31	-0.37
P73	5.061	5	0.408	0.408	0.844	-0.26	-0.21
P74	6.850	5	0.232	0.232	1.142	0.45	0.36
P75	5.583	5	0.349	0.349	0.931	-0.24	-0.16
P76	4.525	5	0.477	0.477	0.754	-0.58	-0.56
P77	6.263	5	0.281	0.281	1.044	0.33	0.41
P79	5.214	5	0.390	0.390	0.869	-0.53	-0.51
P80	9.341	5	0.09	0.096	1.557	2.19	2.30
P82	5.030	5	0.412	0.412	0.838	0.10	0.19
P83	5.056	5	0.409	0.409	0.843	-0.31	-0.37
P84	7.914	5	0.161	0.161	1.319	0.89	0.88
P86	5.030	5	0.412	0.412	0.838	0.10	0.19
P87	7.297	5	0.199	0.199	1.216	0.52	0.48
P88	5.030	5	0.412	0.412	0.838	0.10	0.19
P89	5.455	5	0.363	0.363	0.909	-0.09	0.03
P90	4.858	5	0.433	0.433	0.810	-0.83	-0.87
P91	7.297	5	0.199	0.199	1.216	0.52	0.48
P92	5.056	5	0.409	0.409	0.843	-0.31	-0.37
P93	10.065	5	0.073	0.073	1.677	0.95	0.60
P94	4.525	5	0.772	0.754	0.772	-0.58	-0.56
P95	6.263	5	0.281	1.044	1.128	0.33	0.41
P96	5.030	5	0.412	0.838	0.968	0.10	0.19
P98	6.850	5	0.232	0.232	1.142	0.45	0.36
P100	4.064	5	0.540	0.540	0.677	-0.83	-0.77
P101	4.299	5	0.507	0.507	0.716	-0.06	0.08
P103	4.064	5	0.540	0.677	0.710	-0.83	-0.77
P105	5.056	5	0.409	0.843	0.831	-0.31	-0.37

The initial conditions in the implementation of the effort and energy learning material carried out by educators are still using the lecture method but not using peer tutor learning methods. In the initial conditions, many students are passive and sleepy. In addition, the activity during the learning of business and energy materials is still relatively low. Learners are less actively involved in learning. When the teacher explained the material, none of the

students asked the teacher about the material being explained. The initial conditions in the implementation of the effort and energy learning material carried out by educators are still using the lecture method but not using peer tutor learning methods. In the initial conditions, many students are passive and sleepy. In addition, the activity during the learning of business and energy materials is still relatively low. Learners are less actively involved in learning. When the teacher explained the material, none of the students asked the teacher about the material being explained.

Based on the results of the data obtained using the R application, the P value of 108 respondents is as follows:

The lowest ZSTD with the number -0.8550123 in the questionnaire statement no. 1

The highest ZSTD with the number 0.9758487 in the questionnaire statement no.9

The lowest P with the number 0.206 in respondents P21, P57 and P93

The highest P with the number 0.410 in the respondent P65

The lowest MNSQ is 0.842 in respondent P65

The highest MNSQ with 1,200 in respondents P21, P57 and P93

From the results of the data obtained using the R application, it meets the following requirements:

$-2.0 < ZSTD < 2.0$

So it was concluded that the peer tutoring learning model with guidebooks was effective in increasing the activity of Class X MIPA students at SMA Negeri 1 Bojong, Tegal Regency.

And $P > 0.01$

$0.5 < MNSQ < 1.5$

So it was concluded that the peer tutoring learning model with guidebooks was effective for improving the learning achievement of Class X MIPA students at SMA Negeri 1 Bojong, Tegal Regency.

4. Conclusion

Based on the conclusions above, the researchers can provide suggestions, namely (1) for educators, because the development of peer tutoring models with guidebooks has succeeded in increasing activeness and learning achievement of business and energy materials for students, it is recommended for educators to use them (2) for students, the

results of this study are beneficial for all students because independent and group learning occurs, and (3) for schools, the results of this study help improve learning that was previously monotonous with lectures to become more interesting, so that the success of students in school is more successful increase.

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