

DEVELOPMENT OF EVALUATION MODEL OF PHYSICS EXPERIMENT EXAM FOR SECONDARY LEVEL

Setiya Utari, Harun Imansyah, Winny Liliawati, Arif Hidayat
Physics Education Department
Indonesia University of Education

Abstract

Survey on using of science laboratory and physics experiment as particular showed schools generally almost never use experiment methods in learning process, some schools performed once until fourth in a 6month-period. Even they applied experiment method, schools tends to use cook-book type of students worksheet with less to equip student's thinking skills, lack of investigating experiment guidance and its rubrics given by government. The research is aimed to develop evaluation model of physics experiment exam for secondary level. Two types of experiment guidance and its evaluation rubrics are developed; type A focused on abilities to plan experiment activities, while type B is related with abilities to conduct the planned experiment. The research was carried in 3 secondary schools at low-medium-high students' categories to gain various feedbacks. The research, which covering 6 physical science (linear motion, change of matters, density, waves, expansion, and electricity), produced revised experiment guidance based on qualitative analysis of students' responses in performed A and B types, respectively. Some strike points has been made to revise the experiments guidance A type such as describing problems, predicting, determine materials, experiment procedures ideas to solve problems. Furthermore, in type B the emphasize lies on data quality, analyzing and inferring aspects. The result of the research is a fundamental research to develop scaling up of evaluation model of physical science.

Introduction

Related to the issue of implementation of the UN polemics , in which the government wants to improve the quality standards of graduation , but on the other hand there is an indication steak holder efforts to achieve maximum targets in ways that do not educate . In addition to the implementation of the UN is not optimal , it is not fair to the evaluation of learning outcomes is dominated by cognitive ability (5 % of the ability we have) , even when these schools tend not to carry out the practice exam so that other important capabilities not terlatihkan and do not scale very well. In connection with the provision that the government less in favor of the implementation of the school examination , the school must have a good process in order to guarantee the quality of its graduates . However, based on the analysis of the experimental instructions that owned the school , showed that the majority (80 %) did not meet the standard manual process experiments correct / good data retrieval requirements (Utari , 2010). Then it is necessary to build a good standard yng experimental process , so that the activities can be used as a media experiment for melatihkan various important abilities.

Considering the implementation of evaluation of learning outcomes through school practice exam several valuation models that have been developed include : Writing - Intensive Tasks and Physic Laboratory Assessment Report (Saalih Allie , The Physic Teacher , 1997) ; Development of procedural tasks performed that illustrate laboratory activities which are then analyzed through communication techniques reported . Assessment and Strategies for Laboratory Reports (Taoufik Nadji , The Physics Teacher , 2003) : the effectiveness of

communication through the development of work in the lab rubric , Assessing - To- Learn : Formative Asessing in Physich Instruction (Robert J. Dufresne , The Physic Teacher , 2004) ,

developing technical questions to see important things related to the interaction of the students during the learning process and understanding gained . The Authentic Assessment Toolbox (Jon Muller , Merlot Learning and Teaching , 2005) developed a model that includes creating authentic tasks , rubrics and standards for measuring and improving student learning . This assessment model is believed to improve the substance of students' understanding of the essential concepts , application of concepts in real and able to describe the progress of the student's work.

Previous research on the development of assessment practice exam in high school physics subjects by applying models of assessment practice activities is developed by Jon Muller (2005) and bebera practice exam material which is developed by adopting and adapting models of problem solving developed by Heller (2005) , indicates that the assessment rubric was valid and reliable for use as materials and practice exams valuation models (Utari , 2010) . The research will be applied to try to design the implementation of the provisions related to the practice exam physics learning process should be done in class, so that the provisions of the implementation of this practice exam is not just the practice exams , but built into the learning process in class . Based on the results of research on the adoption and adaptation of inquiry and problem solving models , then the models considered effective associated with an increased understanding of the concepts of physics (Utari , 2010) . On the basis of these results it can serve targeted models developed as a learning process physics class that supports the implementation of the practice exams in junior high school physics . Research R & D this produces a standard implementation practice exam subjects Physics in junior high (ranging from learning processes suggested , the standard manual test execution practices associated with the standard process pengambilan data and standard tools that are used and rubric assessment practice exams) . Given the government does not have a standard implementation of the school examination and implementation of school exams are not optimal , this research has been very important as a breakthrough alternative to increasing the quality and quality of high school graduates .

This study aims to get a physics lesson practice exam instruments in junior high.

The research objectives are: To obtain draft assessment model practice exam subjects related to physics in junior high (procedures , identification of development tasks , rubrics , and scoring scale for each assessment standard essential concepts in materials physics in junior high. Based on the above research objectives , the expected results of this research are (1) to produce manual implementation practice exam for physics subject in junior high; (2) To produce a number of instruments for the practice exam subjects in junior high school physics ; and to Generate rubrics for assessment practice exam subjects in junior high school physics. Sample of Kinematics are given for detaild, while for a while data should contact researcher directly.

This study is necessarily significance since (1) Absence of practice national exam at school ask to standard guidelines of National Education (content standards, processes, competence of graduates). (2)Various problems which arise in the implementation of the UN which gives an indication of the planting of dishonesty and lack of a sense of fairness in terms of both evaluation and school mapping. The process of learning physics is still dominated by the transfer of knowledge, has not emphasized on the quality of the learning process, the activities that occur in experimental physics field does not meet the standard processes and standard tools. Teachers find it difficult to develop practice activities for junior high school physics subjects.

Theoretical Framework

Physics is part of material science with a unique character, which can display the physical phenomena in a short time and easily repeated. These characteristics provide inspiration for the learning process using physical phenomena, so that teaching physics more real, simple, and easy to understand. Thus physics can be used as a means to build the knowledge, abilities and skills. Based on the analysis of the study of science teaching in several countries with high TIMSS, Eckert (2008) describe the direction of the teaching of science as in Table 1.

Tabel 1. *Distinctive approaches to science instruction in five country*

Country	<i>Distinctive Approaches to Science Instruction</i>
Jepang , the top-performing country in the video study	<i>focuses science instruction on inquiry-oriented, inductive lessons that seek to connect ideas and evidence. However, this finding points to one of the criticisms of the TIMSS video study in that the Japanese study did not include juku schools, private schools that the majority of secondary students attend after the typical state school day (Brown, 1999).</i>
The Czech Republic	<i>focuses instruction on talking about science through whole-class presentations and discussions.</i>
Netherlands	<i>focus instruction on independent science learning through homework, independent investigation, and reading.</i>
Australian	<i>eighth-grade classrooms attempt to make connections between main ideas and real-life issues.</i>
US	<i>classrooms implement a variety of activities and techniques to attempt to communicate concepts.</i>

However, we often find failures in inquiry learning. The failure due to the many flaws in inquiry learning that had been carried out by the teacher. According to Wenning (2006), these weaknesses include:

1. Inquiry scientific process is often introduced as a joint that is not organized, that the implementation stages of the inquiry carried out by partial activity despite having related procedures, some teachers do irregularly inquiry process, in which the activities of inquiry that were not based on experience and students' learning abilities.
2. Teacher does not know the difference between each stage in the proceedings, so that the teacher can not provide appropriate learning to students based on student ability.
3. Teachers do not have enough knowledge about how to teach students to do science (do science), it is related to the experience of the teacher when he was studying in college, either because professors do not teach it to the teacher candidate.
4. Majority of teachers lack the preparation to do the inquiry, it is due to laziness in the preparation, and the presence of excessive self-confidence.

To overcome the weaknesses contained in inquiry learning is to apply a hierarchy of scientific inquiry learning activities (inquiry oriented science). Inquiry learning hierarchy is used to determine the stages of inquiry learning activities that inquiry learning activities take place in a systematic and effective. As described previously, Wenning gives the existence of a hierarchy solution inquiry learning. In his journal, explained that this hierarchy was developed based hierarchy ever made by others who then refined. In the hierarchy that has been enhanced is listed in the diagram in the following figure.

Theoretically, the research is based on following research series

1. Saalih Allie , et al . (2003) , developed a statistical analysis of the results of experimental data processing is motivated by the difficulty students in data processing experimental results . Saalih develop experimental physics (thermodynamics) . Experimental procedure developed is essential where the procedure was developed to build an understanding of a concept . There are two reasons why this needs to be developed , namely :
 - a. student prior that knowledge about the nature of measurement has not been taken into account
 - b. that there has been no logically consistent framework that could be used to teach the basic concepts
2. Taoufik Nadji (2003) , developed a model of assessment strategies for reporting laboratory results depart from what has been suggested by the National and State Science Standards , Toufik develop assessment model as an effective strategy assessment approach : National and State Science Standards tell us that we should use inquiry approaches to help develop student understanding of key concepts . Physics education research groups have validated effectiveness of this tea approach. Is the left to the teacher to provide the scaffolding on the which to construct the concept , the guidance necessary to complete the task , and the assessment strategies to Evaluate the effectiveness of the approach.

Taufik develop valuation models " Self " Approach , which lack the understanding of these acronyms as follows : S " short , friendly and more manageable version " , E , " stresses the fact that the intent behind this lab is to truly understand approach not only the underlying concept of the lab but to comprehend the very process and could be better behind writing it as well " , If , " lab - related paper that is on the form format " The Self form is a single two-sided page that is in the lab with instruction on the front and the form to be complete on the back that focuses on some aspect of the report .
3. Michael Lach (2003) ; communication effectiveness in laboratory work better expressed in the form rubric , trains his student to effectively communicate their work by extensive use of the rubric . The approach used by Michael , student explore a carefully chosen scenario and design an experiment to identify the relationships between the variables being targeted . The key to this strategy is providing a well - defined method for assessing the work focused on clear performance standards .

John Muller (2005) Model

Principally , a model was developed on the basis of standards that have been developed , leading to the development of better assessment of what is known to the students to do something . The development of standards has been accompanied by an Increased interest in reconsidering the types of assessments that will measure those statements of what a student should know and be able to .

Muller defines authentic assessment as a form of assessment in which students are asked to deal with real life that requires the ability to translate knowledge and skills in an integrative way . (Grant Wiggins in Muller 2005) describes authentic assessment as " ... engaging student must use knowledge to fashion performances effectively and creatively " effort to spur students to use the performance as a whole , effectively , and creatively " . The exercises given analogous to the complexity of the problems faced like adults or professionals.

Actually exercise that leads to authentic assessment can be structured to collaborate with project tasks are done in a few weeks . This emphasizes the understanding of teachers

during that same authentic assessment with extensive assessment which requires a lot of time and effort involving students and teachers optimally . Whereas in authentic assessment seeks to simplify and packing tasks that have relevance to their lives . The results of the study on various domains of learning suggests that students need to demonstrate the application of learning and practicing their skills like the ability to summarize and generalize , analyzing and testing hypotheses (Marzano, Pickering & Pollock , 2001 ; Pelligino Chudowsky , & Glaser , 2001 in Muller)The reasons for the need for authentic assessment are as follows:

1. Authentic Assessment to measure directly
2. Evaluation is good , not only measure whether or not students already know the subject matter being taught , but can use their knowledge and ability in real life . Thus , the assessment should be able to measure the ability of students to apply the authentic problems . If you want to know whether the student can master how to play golf , his judgment is not in the theory test to be done , but the form of the test to the students how to play golf . This is called authentic assessment that can measure directly
3. Assessment authentically measure the characteristics of constructivist learning
4. Research suggests that knowledge can not be given directly to the students such as giving ' feedback eat' , but also need to establish themselves in the students' understanding of the significance of learning to use the information obtained and the experience of self- taught and students (Bransford , Brown & Cocking , 2000; Brown, Collins & Duguid , 1989; Pelligino , Chudowsky , & Glaser , 2001 in Muller) . Assessment is not only the memory of the student reps , but by demonstrating the significance of understanding established with the students about what they have been taught . Therefore, students need to be given the opportunity to establish the significance of learning . In this case not only serves authentic assessment as an assessment but rather a vehicle for learning.
5. Authentic Assessment gives a lot of options in the run method of learning
6. each faculty has its own differences about how to execute a learning (Pelligino , Chudiwsky & Glaser , 2001 in Muller) . Looking at the traditional assessment model , answering multiple choice does not give room for students to demonstrate knowledge and skills students have achieved . On the other hand such tests can be compared between students in the same domain and objectives as well as demonstrate the consistency and comparability of the assessment . Tests such as these provide the best size limits without going through the selection of students to demonstrate their ability to best show .

Therefore , it is recommended that the selection of multiple tests and other assessment types can be used if the sample size is sufficient and the many options appraisal determination (Wiggins , 1998, in Muller) . Variations in the determination of this assessment should be given to the students , so that they can apply what they have learned in different ways and from different perspectives . Authentic assessment tends to give students the freedom to show what they learned . In this case the teacher can give the student performance assessment through which differ from each other according to their ability level . For example : how students demonstrate authentic learning may be different forms : posters , oral presentations , videos , websites and so on . Students are also able to provide the same form in a way different statement. For example , writing a good essay requires a student's ability to write , but also how the construction of the essay is another variation that can be seen from the students

Research Methods

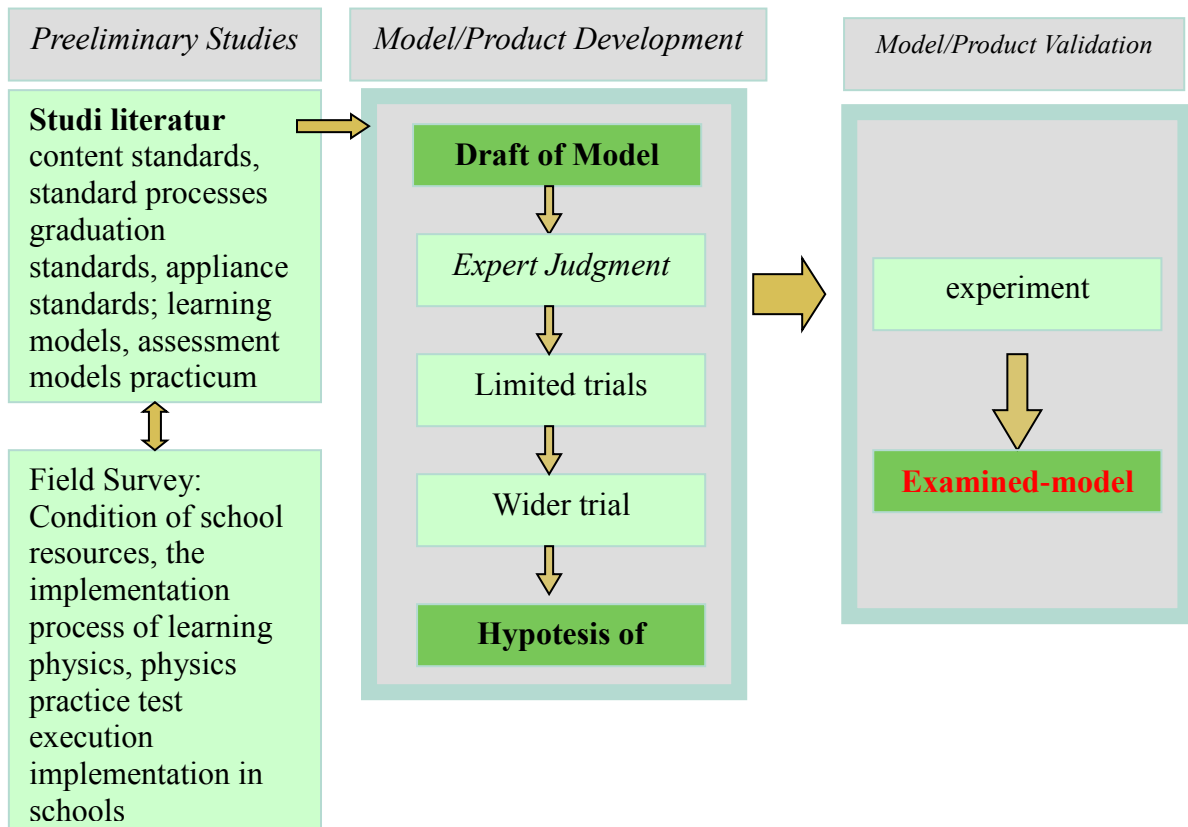
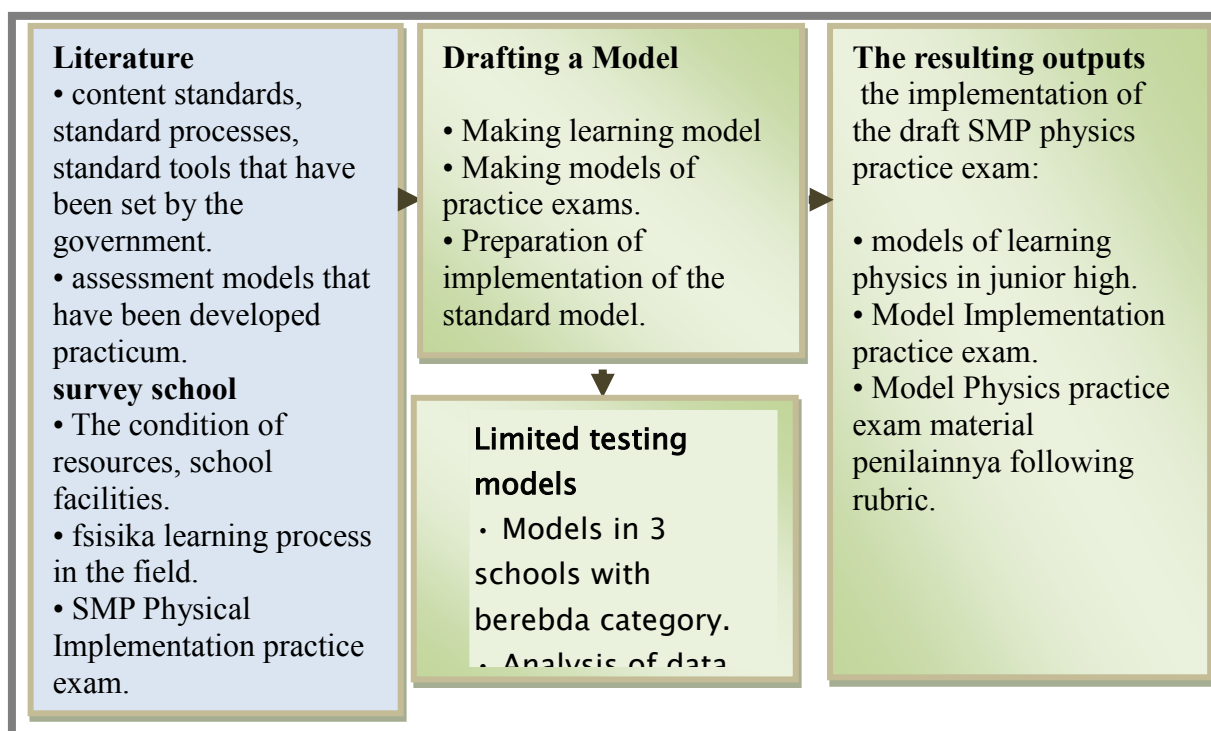


Figure 2. R&D research flow

Based on the Figure 2, the study begins with a literature study, survey / assessment to the school, as well as the continued development of the model draft to the final draft of the model development. The study will be conducted over two years, the research design follows:

1. The study will produce a draft standard implementation practice exam physics that links between the learning process with the implementation of the practice exams in some school physics test.

2. The research will result in design implementation practice exam junior physics lesson, the development is done by improving the teaching models and models based on limited test practice exams. The same pattern will be applied to schools with different categories of schools. Second year of study will result in the implementation of the standard junior physics practice exams that have been tested.



Result and Findings

In this section we will develop a model instrument practice exams , the first year of the study we tried to develop six titles related instruments practice exam , this material was developed only in conformity with the agenda of class VII school , among others: Mechanics : Motion with constant velocity and motion with constant acceleration, density ; Electric magnet: Dynamic Electricity ; Thermodynamics : Expansion and change of state ; wave : vibration and wave characteristics.

The sample used for testing have been three public schools are 2 public schools in Bandung and 1 public school in West Bandung regency . School election only schools that have taken on the cluster was based on the value of the UN . Each instrument developed was tested on 6 students (3 groups) , a group of low, medium , and high so that all samples used were 36 students . Students work on two types of practice exam questions is type A (planned) and type B (executing practices) . This practice test execution activities made the video to be analyzed . The results of the video analysis is used to :

1. Fixing instruments and develop an assessment rubric .
2. Testing interim assessment system through interrater reliability that is done repeatedly for the same rater (3 repetitions) .

The following are the results of an analysis of the findings from the instrument developed . We took samples for Motion with constant velocity and motion with constant acceleration .

Type of A

This instrument is an instrument that was first tested at 6 students, all student difficulties with using the term that is the problem, prediction, methods and procedures. So the

term is converted into a problem, approximate, way to be done, and the job step. The more familiar term used for all other experiments (30 other students).

a. Problem / Issue

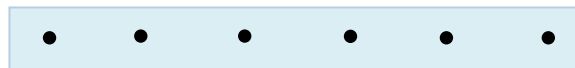
On the issues raised, no visible difference between the low, medium, and high clarity context to ask again, all the difficulties of the issues raised so that the statement is seen as less operations, for example:

b. Problem

Ali was asked to describe the motion characteristic of motion with constant velocity and motion with constant acceleration. Based on the ticker tape timer, students recording the motion of the cart.



Picture 6 : experiment setting for motion with constant velocity



Picture 7 : ticker timer tape result

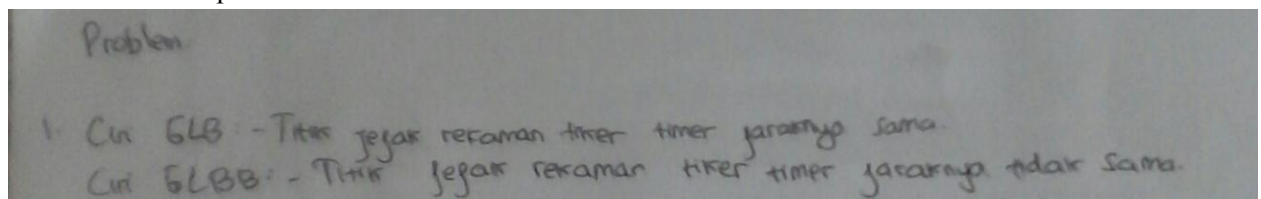


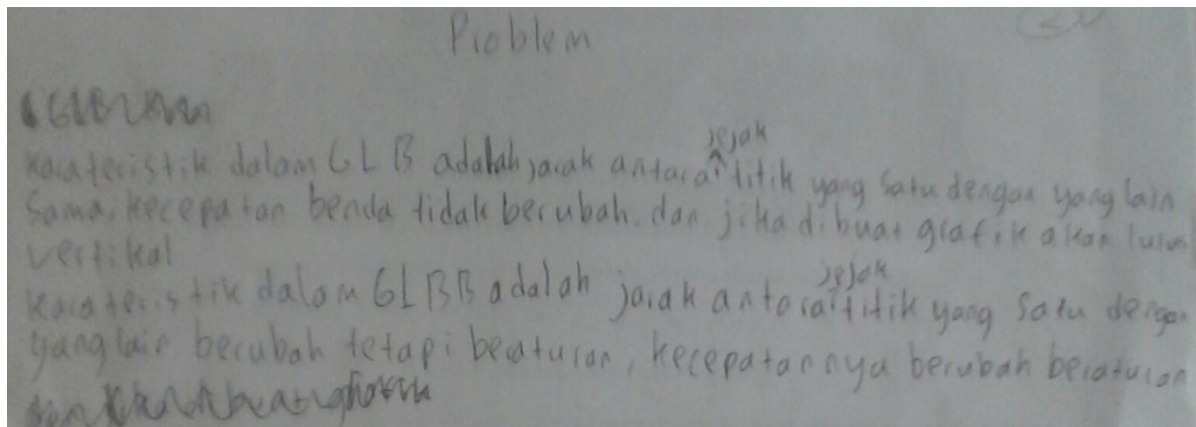
Picture 8 : experiment setting of motion with constant acceleration



Can you help Ali to find the motion characteristics of motion with constant velocity and motion with constant acceleration?

Here is an example of the students' answers



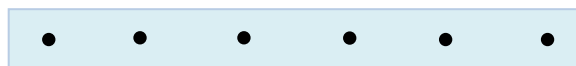


The statement in this section is then revised to be:

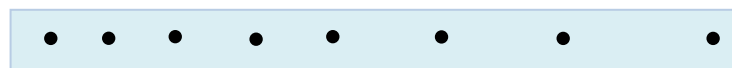
Revision

Masalah

Ali was asked to describe the characteristics of MCV and MCA of the tape recording timer tiker train motion dynamics, given the following teacher (teacher gives tiker timer recording on tape):



Picture: MCV tape results



Picture : Tape results of MCA.

By watching the tape, you can find traits GLB moving objects and uniformly accelerated motion?

Can we find another characteristic of GLB and uniformly accelerated motion, eg through the graph?

Graph, what can you describe?

Based on the example of the rubric that was developed is as follows

Tabel . Developed Rubrics

No	Theme	Descriptor			
		4	3	2	1
1	Experiment problem about motion with constant velocity (MCV) and motion with constant acceleration (MCA)	MCV has a fixed trace tape, 1 cm distance from the data of each of its points, the object's velocity does not change, while the tape has traces MCV is not fixed, the original data distance between its points closer together more and more reduced density, the speed of the object changes.	MCV has traces of tape fixed, the velocity does not change, while MCV has traces of tape that is not fixed, the velocity of change.	MCV has traces of the tape are fixed, whereas MCA have traces of tape that is not fixed.	Only partly be explained MCV or MCV
		Got the tape, distance and time graphs, velocity and time graph, graphics acceleration and time	Got the tape, distance and time graphs, velocity and time graph,	Got the tape, distance and time graphs or got velocity and time graph	Could not get the graph

CONCLUSION AND SUGGESTION

Based on the field test results obtained that the bar exam is not digging abilities / skills of high -level processes such as the ability of students to design research activities (29 %) , interpret and report data (43 %) . During this capability is still measured in basic skills is the ability to observe , measure , and implement the concept . The material tested was limited to certain topics that electricity and magnetism , density , and wave . Equipment used in the implementation of general practice exams using KIT not use local content . Assessment practice exams done only at the time of execution and reporting . Generally teachers using experimental methods in one semester amounted to 1-4 times the experiment so that students have not been trained in doing experiments , this affects current practice exam found yang constraints associated with liveliness and low ability students experiment.

Constraints faced by teachers is limited preparation time , less equipment , difficulty preparing the assessment rubric , low ability students in conducting experiments , students are less active and enthusiastic . Attempts to overcome that there is cooperation between the science teacher , has spare time to prepare equipment and experiments , preparing the package even more practical , the need for debriefing to practice procedures and develop

assessment rubrics.

Future working

Test Validity Content	• Testing will be performed using triangular test and readable test. • Obtaining experiment exam questions that meet validity core
Reliability Test	• Data retrieval. • interrater reliability test at certain schools • Obtain experiment exam questions and its rubrics which meets the reliability. • Obtain model draft practice exam question in junior physics lesson that has been tested on a limited scale.

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