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Development of Learning Tools Based On Inquiry *Training Models* to Understand Student Concepts On Harmonic Vibration Material

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ABSTRACT

This study aims to develop learning tools using the Inquiry Training model on Harmonic Vibration material. The learning tools developed are RPP, LKPD, and Concept Understanding Tests. The research method used is Research and development (R&D) to produce products and test the effectiveness of these products, in this case in the form of learning tools. Research design uses the 4D model, namely Define, Design, Development and Dissemination. The data collection technique was validated by a validator consisting of three people, namely, two supervising lecturers and one discussing lecturer. Based on the results of the study, it was obtained that the average validity-2 Learning Implementation Plans (RPP), Student Worksheets (LKPD), and concept understanding tests were 3.43 very high categories with validity criteria, namely valid. The results of the validity-2 RPP were 3.42 very high categories with validity criteria namely valid, the results of the validity-2 LKPD were 3.52 very high categories with validity criteria namely valid, and the results of the validity-2 concept understanding test were 3.36 very categories high with the criteria of validity that is valid. Based on the results of the data analysis obtained from the research conducted, it can be concluded that the development of learning tools oriented to the Inquiry Training learning model on SMA harmonic vibration material was declared valid by the validator with the results obtained in validation-2 being in the very high category and can be used as material teach in the learning process in schools.

Keywords: *Inquiry Training Model, Learning Devices, harmonic vibration*

1 Introduction

Education is an element that deserves attention in addition to science and technology in placing Indonesia in line with what has been achieved by developed countries (Taufik et al., 2022) . Science or Natural Sciences (IPA) is knowledge about the natural world which is divided into several fields, namely, biology, physics and chemistry (Tipler, 1998) Science learning is expected to provide knowledge (cognitive) which is the main purpose of learning (et al., 2022). In addition to providing knowledge, science learning is also expected to provide skills (psychomotor), scientific attitude abilities (affective), understanding, habits, and appreciation as the purpose of education in general (Trianto, 2012). Physics is part of Natural Sciences (IPA) which studies natural phenomena and events through a series of processes known as scientific processes that are built on the basis of scientific attitudes and the results are in the form of scientific products in the form of concepts, laws and theories that apply universally (Trianto, 2013). As part of science, physics has an important role in the development of technology, this is because physics is the basis of all engineering and technology (Giancoli, 2001). Physics is essentially a product, process, and application (Trianto, 2013). Physics learning must emphasize physics concepts based on the nature of science which concerns products, processes, and scientific attitudes (Inriani et al., 2021).

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It is stated that the subject matter of physics in high school and MA is a continuation of the subject matter of junior high school physics with an expansion on abstract concepts that are discussed quantitatively analytically (Ministry of Education Curriculum Center, 2003), (Reichenbach et al., 2019) states that the purpose of learning physics does not only emphasize the acquisition of learning outcomes, memorizing a number of facts and concepts, but having the ability to solve physics problems. Learning is the most important activity in the educational process at school, this means that the success or failure of achieving educational goals depends a lot on how the learning process experienced by students as learners(Apriani et al., 2017). The learning process is still teacher centered does not provide flexibility for students to develop independently, where the teacher only emphasizes understanding concepts through rote memorization (Trianto, 2013). The learning received by students is only the emphasis on the level of memorization of various topics or subjects, but not followed by deep understanding or understanding, which can be applied by students when dealing with new situations in student life (Zulkifli et al., 2022). The teacher is the main agent of the educational process because he is the most responsible in transferring knowledge to his students (Azhar, 2013). In addition, physics teachers at school often discuss theories from the handbooks used, then give formulas and then give examples of problems. As a result, physics is reduced to reading and students can only imagine (Wardhany, 2014).

Learning models that are often used by teachers are: Expository. The expository model emphasizes the delivery of material in the form of lectures. The lecture model more often makes students swallow the information conveyed by the teacher, without distinguishing whether the information is false or true, understood or not, thus hampering students' critical power (Mayub. A, 2005). Therefore, there is a need for other alternatives to support the learning process by applying an effective learning model. (Eggen. P and Kauchak. D, 2012)said the learning model is a specific approach in teaching that has three characteristics, namely Objectives, Phases and Foundations.One of the learning models that make students active in learning is the learning model Inquiry. Learning Inquiry will maximize all students' abilities in depth to search and investigate something systematically, critically, logically, analytically which results in students being able to formulate their findings more confidently (Iif Khoiru Ahmadi, 2011) Inquiry Training Model (ITM) is one of the inquiry learning models that is centered on student activities.

This learning model was developed by a character named Richard Suchman (Siddiqui, 2013). Type inquiry training (Joyce. B, 2011) Learning Model inquiry training Designed to bring students directly into the scientific process through exercises that can condense that scientific process into a short period of time. The inquiry learning process contributes both to improving the curriculum and to building an infrastructure in which the educational science community can emphasize dynamic aspects of science in open inquiry learning (Brumer. M, 2004). Learning model Inquiry Training Referring to the independent learning model, it means that in learning students are required to be active and creative so that they are able to find concepts independently including observing, questioning, conducting experiments, associating, and communicating (Wena Made, 2009). Based on the background above, the author wants to conduct research on the development of learning tools based on inquiry training models.

2 Research Methodology

The method used in this study is Research and Development Research and Development (R & D), with a 4D model, namely the Define stage, Design, Development, and Dissemination (deployment). This research was conducted at the Physics Education Laboratory of FKIP Universitas Riau. The research was conducted from September 2022 to February 2023. The subject of this research is the Inquiry Training model-based physics learning tool developed including the Learning Implementation Plan (RPP), Student Worksheets (LKPD), and Concept Understanding tests on class X High School Harmonious Vibration material and experts in the field of material, namely validators or teams / experts or Physics education lecturers who validate Physics learning tools based on Inquiry Training.

The data collection instrument in this study was carried out by providing learning tools that had been prepared along with validation assessment sheets to validators for assessment. The data analysis technique

used in this study is descriptive analysis, namely by calculating the validity score of each indicator of the validity of learning devices. The validity of learning tools is determined by the score of the validation results by expert lecturers, namely both supervisors and one of the examining lecturers.
Determine the score given by validators against each validation questionnaire indicator (r). The questionnaire assessment category uses the Likert scale presented in Table 1.

Table 1. Categories Likert Scale

Score	Category
4	Totally agree
3	Agree
2	Disagree
1	Strongly Disagree

(Taluke, 2019)

To find the average of the entire instrument grading sheet (x) with the formula:

$$\bar{x} = \frac{jumlah\ skor\ yang\ diperoleh}{banyaknya\ aspek\ yang\ dinilai}$$

(Sugiyono, 2010)

To determine the validity category of a device is obtained by matching the average of the total with the validity category as Table 2.

Table 2. Category Instrument validity

Average Score	Category
$3.25 \leq x \leq 4$	Highly Valid
$3.00 \leq x \leq 3.25$	Valid
$x \leq 3.00$	Invalid

(Ulfah et al., 2021)

3 Results and Discussion

The products that have been developed in this study are in the form of learning tools consisting of RPP, LKPD, and Learning Outcome Tests based on Inquiry Training, on the Pressure material of grade VIII Junior High School. This research is a type of Research and Development (R&D) research with a 4D development model that has 4 stages.

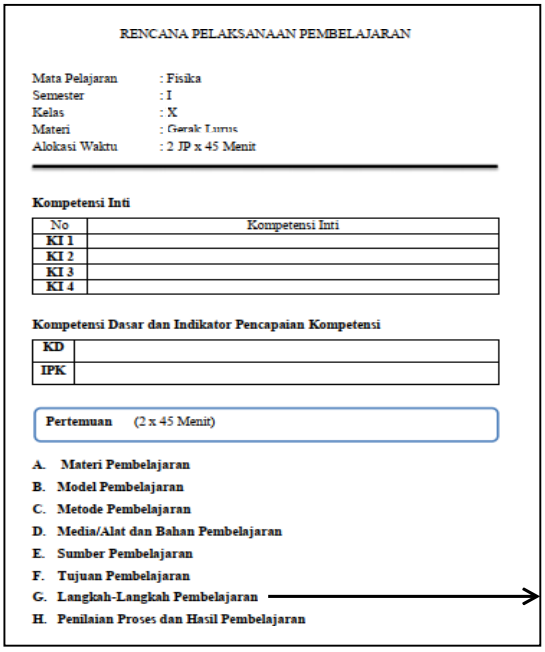
3.1 Defining Stage (Define)

The initial analysis of this study was taken from the 2013 curriculum. The curriculum used is the revised 2013 curriculum. The basic competencies to be achieved in the Pressure material by students are KD 3.11 and KD 4.11. The subject of discussion in the Harmonic Vibration material is to analyze the relationship between force and vibration in everyday life, and conduct harmonic vibration experiments on simple swings and / or spring vibrations along with their presentation and physical meaning.

3.2 Design Stage

3.2.1 initial design of RPP

Figure 1 shows the design of RPP with a structure starting from lesson identity, KI, KD and GPA and for each meeting contains: learning materials, learning approaches, learning models, learning methods, learning strategies, learning media / tools, learning resources, learning objectives and learning steps as well as assessment of learning processes and outcomes.



RENCANA PELAKSANAAN PEMBELAJARAN

Mata Pelajaran : Fisika
Semester : I
Kelas : X
Materi : Gerak Lurus
Alokasi Waktu : 2 JP x 45 Menit

Kompetensi Inti

No	Kompetensi Inti
KI 1	
KI 2	
KI 3	
KI 4	

Kompetensi Dasar dan Indikator Pencapaian Kompetensi

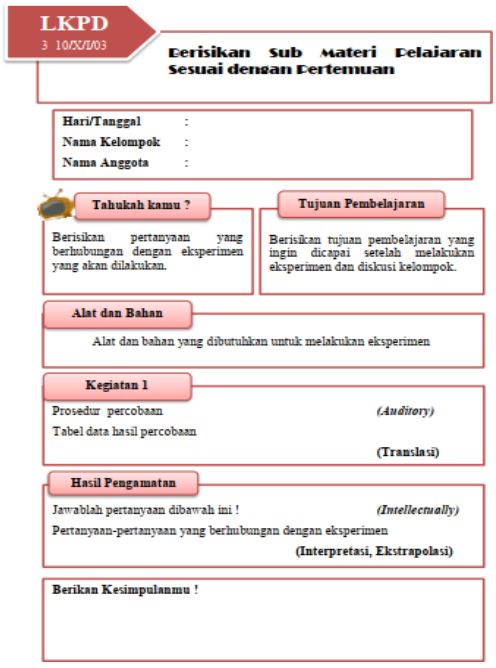
KD	
IPK	

Pertemuan (2 x 45 Menit)

A. Materi Pembelajaran
B. Model Pembelajaran
C. Metode Pembelajaran
D. Media/Alat dan Bahan Pembelajaran
E. Sumber Pembelajaran
F. Tujuan Pembelajaran
G. Langkah-Langkah Pembelajaran
H. Penilaian Proses dan Hasil Pembelajaran

Figure 1 Initial RPP Design

3.2.2 initial design of LKPD



LKPD
3 10/XI/03

Berisikan Sub Materi Pelajaran Sesuai dengan Pertemuan

Hari/Tanggal :
Nama Kelompok :
Nama Anggota :

Tahukah kamu ?
Berisikan pertanyaan yang berhubungan dengan eksperimen yang akan dilakukan.

Tujuan Pembelajaran
Berisikan tujuan pembelajaran yang ingin dicapai setelah melakukan eksperimen dan diskusi kelompok.

Alat dan Bahan
Alat dan bahan yang dibutuhkan untuk melakukan eksperimen

Kegiatan 1
Prosedur percobaan *(Auditory)*
Tabel data hasil percobaan
(Translasi)

Hasil Pengamatan
Jawablah pertanyaan dibawah ini ! *(Intellectually)*
Pertanyaan-pertanyaan yang berhubungan dengan eksperimen
(Interpretasi, Ekstrapolasi)

Berikan Kesimpulanmu !

Figure 2 LKPD Design

Based on Figure 2 to design LKPD refers to the RPP that has been made before. LKPD must also use the Inquiry Training learning model and Constructivism learning theory. LKPD also uses the same material, namely Harmonic Vibration material. The learning objectives in LKPD must be in accordance with the RPP that has been made before.

3.3 Development Phase

This stage aims to produce learning tools that have been revised based on expert input/suggestions and obtained valid learning tools. On the first validation, validators check and suggest improvements. After revision of the first validation suggestion, a second validation will be carried out, until all validators give a minimum score of 3 on each assessment item. If the assessment score given by all validators is at least 3 per item, then the data will be processed in order to see the validity index and category of each device developed. After being given input by the validator, the researcher will revise the learning tool until a valid learning device is obtained.

3.3.1 second stage validation

No	Assessment Indicators	Average Validation RPP 1	RPP 2	RPP 3
1	Identity in School, Subject, and Class/Semester.	3,78	3,73	3,80
2	KD Conformity, Indicators and Time Allocation.	3,33	3,44	3,33
3	Learning Objectives.	3,33	3,78	3,55
4	Learning Materials.	3,50	3,41	3,33
5	Learning Methods.	3,33	3,00	3,33
6	Learning Resources.	3,00	3,17	3,00
7	Learning Activities.	3,60	3,51	3,63
8	Research Table.	3,33	3,33	3,44
	Average RPP	3,41	3,42	3,43
	Category	SV	SV	SV

Based on the results of the RPP validation above, it can be seen that the assessment that has been given by the three validators to the developed RPP shows an average validity score of 3.41 for RPP (first meeting) with a very valid category (SV), for RPP (second meeting) shows an average validity score of 3.42 with a very valid category (SV). As for the RPP (third meeting) showed an average validity score of 3.43 with the very valid (SV) category.

3.3.2 student worksheet (LKPD) validation results

The tabulation of LKPD validation results can be seen in Appendix 7. Briefly, the results of LKPD validation can be seen in Table 2.

Table 2 LKPD Validation Results

No	Assessment Indicators	Average Validity LKPD 1	LKPD 2	LKPD 3
1	LKPD activities that use characteristics inquiry training and indicators of understanding concepts are presented in accordance with the syllabus and RPP.	3,33	3,33	3,33
2	Activities in accordance with indicators and learning objectives.	4,00	4,00	3.66
3	Contains steps to find what you want to	4,00	3,66	4.00

	achieve.			
4	The images used are in accordance with the topic of discussion.	3,00	3,00	3,00
5	Provide activities for the development of social relations.	3,00	3,33	3,33
6	The sentences used are simple and clear	3,33	3,33	3,33
7	Questions have been compiled to be answered by information processing.	3,33	3,33	3,66
8	Available room that It is enough to write down answers or draw.	3,66	4,00	4,00
9	Help Participants educate Develop concept comprehension skills.	4,00	4,00	3,66
	Average LKPD	3,52	3,55	3,55
	Category	SV	SV	SV

Based on Table 2. It can be seen that the assessment that has been given by the three validators to the LKPD that has been developed shows an average validity score of 3.52 for LKPD-1 with a very valid category (SV), and for LKPD-2 shows an average validity of 3.55 with a very valid category (SV). Meanwhile, LKPD-3 shows an average validity score of 3.55 with a very valid category.

3.3.3 concept comprehension test validation results

Table 3. Learning Outcomes Test Validation Results

No	Assessment Indicators	Concept Comprehension Test	
		Average	Category
1	Material	3,33	SV
2	Construction	3,33	SV
3	Language	3,41	SV
Average Concept Comprehension Test		3,36	SV

Based on Table 3, it can be seen that the assessment that has been given by the three validators to the Concept Understanding Test that has been developed shows an average validity score of 3.36 with the category of very valid (SV).

4 Conclusion

Learning tools using the Inquiry Training model on class X SMA Harmonious Vibration material are declared valid. This learning tool in the form of RPP, LKPD and concept understanding tests is suitable to be used as a learning tool that helps teachers and students in understanding Harmonious Vibration material, and can be used as teaching material in the learning process at school. Based on the results of the study, the average validity-2 Learning Implementation Plan (RPP), Student Worksheet (LKPD), and learning outcome test was 3.43 very high categories with valid criteria. The results of validity-2 RPP are 3.42 very high categories with validity criteria are valid, the results of validity-2 LKPD are 3.52 very high categories with validity criteria are valid, and the results of validity-2 learning outcome tests are 3.36 very high categories with validity criteria are valid.

The Inquiry Training model-based learning tool in this research only reaches the development stage. Therefore, the authors suggest that this research can be continued in the application of learning in schools.

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