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DEVELOPMENT OF VISUALIZATION, AUDITORY AND KINESTHETIC BASED STUDENT WORKSHEETS IN PHYSICS LEARNING TOWARDS COGNITIVE ABILITIES

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ABSTRACT

This study aims to produce based worksheets on Visualization, Auditory and Kinesthetic (VAK) learners who are valid and practical on the cognitive abilities of Physics class XI high school students. Learner worksheets are prepared in accordance with the demands of differentiated learning in the independent curriculum. The development method used is Research and Development (R&D) with the Plomp model which includes three stages, namely: preliminary research stage, prototype development stage, and assessment stage. The instruments used in this research are validity questionnaire, practicality questionnaire, and observation sheet. The results showed that the interactive learning media had validity with an average score of 89.34% with a very valid category. And practicality with an average score of 93.5% with a very practical category on the cognitive abilities of high school physics students grade XI. While the level of implementation of Visualization, Auditory and Kinesthetic (VAK) based student worksheets in learning is in the "partially implemented" category. Percentages of agreement are in the Good Agreement criteria. So it can be concluded that the student worksheets developed are valid and practical, so they can be used as teaching materials in the learning process.

Keywords **:** *Student worksheets, cognitive abilities, Visualization Auditory and Kinesthetic (VAK)*

A. INTRODUCTION

Generational differences present new challenges and opportunities in the world of education. In the world of education, it is important to understand the characteristics of each generation (Deswita & Zamista, 2021). However, the current curriculum changes cannot immediately maximize and improve the quality of student learning. The reason is because of the lack of identifying learning styles *because* students have different learning styles when absorbing teacher explanations . This matter in accordance with differentiated learning which is how to understand and provide knowledge according to the talents and learning styles of students who have many characters (Fauzia & Ramadan, 2023). There are various models of learning styles developed by experts. Of all these models, the *VAK model* is the easiest to observe because this model can be seen from the senses used by someone when learning. The *VAK model* divides students' learning styles into 3 types. Some learn by seeing, listening and some learn by being active. (Kusadi, 2022).

Based on the results of interviews with educators at SMAN 2 Sawahlunto in class XI, Mrs. Indri Isnaini, S.Si learning has implemented an independent curriculum but the methods used in learning still lack the concept of a differentiated curriculum in adjusting student characteristics. The teaching materials used also sometimes use tools available in the laboratory and student worksheets are used only in laboratory activities. And the results of the interview showed that the aspect of students' cognitive ability levels was still relatively low.

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Lack of cognitive abilities of students is caused by several factors, namely internal factors and external factors. Internal factors include physical factors, psychological factors (intelligence, attention, interest, talent, motivation and readiness) and fatigue factors while external factors include family environmental factors, schools (teaching methods, curriculum, teacher and student relations, school discipline, teaching tools, learning methods) and society (Wulandari, Puspita Septim et, al, 2015).

Various studies have been conducted to overcome this cognitive ability problem, including by using teaching materials in the form of Student Worksheets (LKPD) and recognizing student learning styles. The basis for the development carried out by researchers is seen from things that have been done by previous studies to overcome the problem of low cognitive abilities of students, namely by "Developing LKPD Based on *Visualization, Auditory And Kinesthetic* (*VAK*) Student Cognitive Abilities". The shortcomings in the basis of LKPD development are still in the 13th curriculum and at present the curriculum has changed to the independent curriculum (Aprilia, et al., 2022). The cognitive aspects tested were only C1 to C4 and the adjustment of the characteristics of the students' learning styles was considered to be still lacking. (Yulianti, 2021). The innovation of the researcher is to develop LKPD using the independent curriculum, testing all cognitive aspects and adjusting student characteristics according to the differentiated curriculum.

B. RESEARCH METHODS

The research method used is the *Research and Development* (*R&D*) method using the Plomp model which includes three stages, namely *Preliminary research* (stage) introduction) , *prototype* or *development or prototyping phase* (development phase), and *assessment phase* (research phase) (Sari, 2018).

In the first stage *p reliminary research* (stage) introduction) , aims to apply and define the learning requirements needed in developing *Visualization, Auditory, and Visualization -based LKPD. Kinesthetic (VAK).* Meanwhile, the stages, done a number of activity At this stage it is done analysis need, review literature.

At the development stage, the development phase (*prototype* or *development or prototyping phase*) aims to produce a prototype of the LKPD based on *Visualization, Auditory, Valid Kinesthetic (VAK)* . At this stage, there are repetitions to improve LKPD. The activity stage is to conduct a formative evaluation carried out by experts to see whether a product is valid or not. At this phase, what is assessed is construct validity, material/content validity and language validity using validation instruments given to 3 experts/validators (Sari, 2018).

The final stage is *Assessment phase* (Stage) assessment). At this stage activities are carried out summative to conclude whether the LKPD has met the specified specifications assessed from the readability and implementation of the LKPD. The readability of the LKPD is seen from the use of a practicality questionnaire given to 1 educator and 20 students. And to see the implementation, the researcher used an observation sheet given to two observers who assessed the implementation of the

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LKPD based on *Visualization, Auditory, Kinesthetic (VAK)* during the teaching and learning process in class.

For know level consistency And stability between two observers in observe implementation *Visualization, Auditory, Kinesthetic (VAK)* from meeting to meeting used *percentages of agreements* (Sugiono, 2010). And to state that *the Visualization, Auditory, Kinesthetic (VAK)* LKPD was developed nature practical If fulfil criteria that have been set .

C. RESULTS AND DISCUSSION

The process of results development development to obtain results in this study using the *Plomp model* and development stages, namely: *Prelimary research* (preliminary research stage), *development of prototype phase* (development or *prototype), assessment phase* (assessment phase).

1. *Preliminary Research* (Preliminary Stage)

At the needs analysis stage, the results of the interview showed that in physics learning, the teaching materials were less varied and less interesting and in the LKPD teaching materials, the LKPD used was only how to use the equipment in the laboratory. For students, the desired teaching materials must be interesting, contain more images , and can be accessed by electronic media such as mobile phones. And Also style Study Kinesthetic Also own many fans Students consider that *Visualization, Auditory and Kinesthetic based LKPD* can trigger students' motivation and curiosity so that it can improve students' cognitive abilities.

This is in accordance with Jannah's statement (2019) which states that LKPD which facilitates students to be able to solve problems with assistance in the form of providing examples, instructions for completing tasks, procedures for completing tasks and so on can improve students' thinking skills through a series of instructions given by providing the assistance needed by students on certain materials. (Jannah, Miftahul, et al, 2019). Research conducted by Trianto (2010) LKPD is a student guide used to develop cognitive aspects as well as a guide for developing all aspects of learning in experimental or demonstration guides. in (Lase & Zai, 2022).

On analysis results from analysis literature / study library is For Results from analysis need from study This is observation at SMAN 2 Sawahlunto with educators namely Mrs. Indri Isnaini, S.Si. and participant educate class XI. And the results from analysis literature / study library is For Strengthening LKPD based on *Visualization, Auditory and Kinesthetic (VAK)* towards ability cognitive participant developed education can seen on table 1.

Table 1. Literature analysis/library study

Aspect	Theory Supporters	References
Stage development	*Primary research, prototyping, and assessment ase*	*Nieeven & Plomp* in Sari 2018

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Ability Cognitive	1. *Remember* (Remember) 2. *Understand* (Understand) 3. *Apply* (Apply) 4. *Analyze* (Analyze) 5. *Evaluate* (Evaluate) 6. *Create* (Create)	(Anderson, 2023)
Visualization, *Auditory and* Kinesthetic *(VAK)*	1. Stage preparation (activity) introduction) 2. Stage delivery And training (activity) core on exploration And elaboration) 3. On stage end	(Mulabbiyah, et al, 2018)
Curriculum Independent	1. Achievements Learning (CP): participants educate lamp apply draft And principle fluid 2. Objective Learning (TP): a. Can identify hydrostatic b. Can explain Application Archimedes principle c. Can identify voltage surface And viscosity zar liquid 3. Channel Objective Learning (ATP) : Analyzing law fluid static For finish problem life daily	1) Book participant educate class XI curriculum independent 2) Book educator class XI curriculum independent
Worksheet	vering a series experience Study Which arranged in a way systematic aiming help participant educate Study with Good .	(Mukti, et al, 2018).

2. *Development of Prototype Phase* (Development Phase)

Results from phase development aiming For produce *prototype* LKPD based products Valid *VAK* stage his activities as following :

a. Designing *prototype*

On stage This done planning towards LKPD based on *VAK* to ability cognitive . Beginning from stage designing *prototype* is do design product And furthermore stage development LKPD based products *Visualization, Auditory and Kinesthetic* (*VAK*). Results development product can seen on picture 1 :

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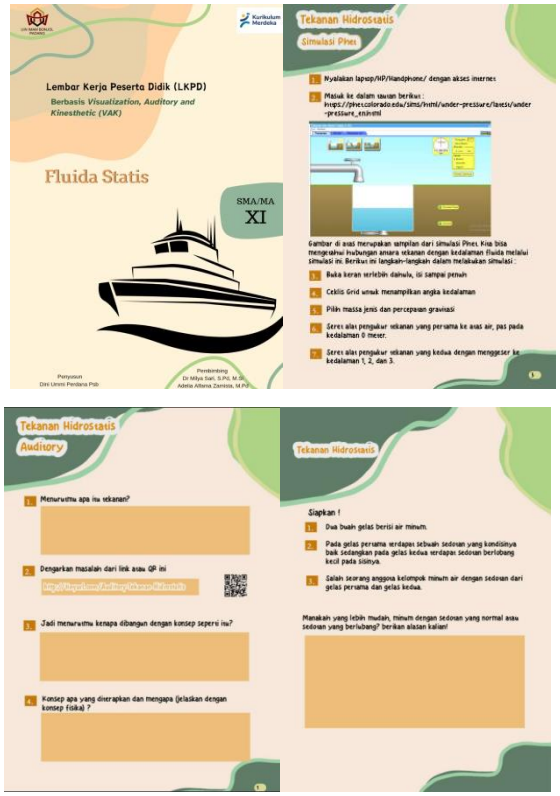

Figure 1. LKPD based display *Visualization, Auditory and Kinesthetic* (*VAK*)

b. Evaluation formative

VAK -based LKPD consists of 3 validators, namely 1 material person, 1 construction person and 1 language validator. The results of the lecturer validation are used to determine the feasibility of *VAK -based LKPD* against cognitive abilities in revising product design . The average value of the construction validation results obtained from the validator Mrs. Dewi Juita, M.Pd is 84.61 % with a very valid category. The average value of the material / content validation results obtained from the validator Mr. Allan Asrar, M.Si. The average value of the validation results of the material obtained from the validator is 91.42% with a very valid category . And the value of the language validity questionnaire results filled out by 1 validator, namely Mr. Abdul Basit, M.Pd. The average value of the language validity questionnaire results filled out by 1 validator obtained a result of 92% with a very valid category . The suggestions given by the validator are presented as guidelines in improving LKPD based on *VAK* . The average value of interactive learning media validity can be seen in table 2:

Table 2 . Validator average value

Indicator	Percentage	Category
Eligibility construction	84.61%	Very valid
Eligibility material \ content	91.42%	Very valid

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Eligibility Language	92%	Very valid
Average	**89.34%**	**Very valid**

c. Revision *prototype*

At this stage, prototype II of *VAK-based LKPD was produced.* However, there were several product revisions obtained from the product validator. Suggestions from the LKPD validator for product improvement can be seen in table 3 .

Table 3 . Results Revision Product

No.	Before Repair	After Repair
1	Appearance sentence introduction	Appearance sentence introduction after fixed
		
	Previously sentence introduction too long And No There is One picture Supporter on page sentence introduction so that very rigid And not enough interesting	Afterwards appearance sentence introduction the sentence more simple customized with which will discussed And have picture Supporter so that more help interesting attention And understanding

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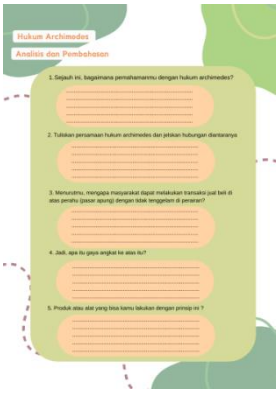
2	View of the answer column before the fix	Appearance column answer done repair
		
	Previously form box answer seen rigid And No interesting	Afterwards form column changed with more models seen interesting
3	Appearance column answer on analysis And discussion before repair	Appearance column answer on analysis And discussion after fixed
		
	Previously appearance column answer No given dot, dot, dot For fill in answer And sentence question Also seen simple	Afterwards appearance column answer given dots to make it more make it easier participant educate fill in answer And sentence question more detailed Again with objective more understand participant educate with which will asked

3. *Assessment Phase*

In this phase, a prototype trial is conducted to assess whether the prototype meets the criteria of practicality. The purpose of this phase is to see the practicality of *the prototype* II LKPD based on *VAK* resulting from the development phase. The level of practicality is seen from the answers to the practicality questionnaire by 1 physics educator and 20 class XI students of SMAN 2 Sawahlunto. The results of the practicality can be seen in table 3 below.

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Table 3 . Average Value of Practicality of LKPD based on Visualization, Auditory and Kinesthetic (VAK)

Practitioner	Average percentage	Category
Educator	100%	Very practical
Participant educate	93%	Very practical
Average percentage	**96.5%**	**Very practical**

a. *VAK* -based LKPD practicality test

Practicality test was obtained from distributing questionnaires to physics educators at SMA N 2 Sawahlunto. The statement indicators for the practicality test by educators were 11 statements and students were 7 statements. The average result obtained from practitioners was 100% with a very practical category . The practicality sheet was filled out by 20 students of class XI.F.3 of SMA N 2 Sawahlunto. The results of the practicality questionnaire were ... by 20 participants educate The average value of the results of the practicality questionnaire obtained an overall average of 93% with a very practical category . Judging from the results of the analysis of educator practitioners and students, a percentage of 96.5% was obtained. It was revealed that *VAK -based LKPD* on static fluid material on students' cognitive abilities was in the very valid category.

b. *Visualization, Auditory and Kinesthetic (VAK)* implementation test

The implementation of *Visualization, Auditory and Kinesthetic (VAK)* in learning was observed by 2 observers . The assessment criteria for LKPD are based on *Visualization, Auditory and Kinesthetic (VAK)* is a score of 4 if all steps are implemented, a score of 3 if only most of them are implemented, a score of 2 if only half of them are implemented and a score of 1 if only a little is implemented. Observations are carried out by observers who focus on aspects of the implementation of learning steps accompanied by the application of social principles and reaction principles by educators during the learning process.

Table 4. Summary Results Test Practicality of LKPD based on *Visualization, Auditory and Kinesthetic* (*VAK*)

Aspect	Phase	Test try Educator	Participant educate	Average	Category
Observation implementation of LKPD *VAK*	Session look at advance	3.71	3.7	3.70	Very practical
	Percentage form of agreements	80%	83%	81.5%	*Good Agreement*
Practicality of LKPD based on *VAK*		100%	93%	96%	Very practical

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Based on the data in table 10, it shows that LKDP is based on LKPD based on *Visualization, Auditory and Kinesthetic (VAK)* which was developed very practically because it has met two predetermined criteria. And the results of research by educators and students as well stated that it is categorized as very practical. The level of implementation is in the category of "mostly implemented" and *the percentages of agreement* for face-to-face sessions are in the category of *Good Agreement* . The results of the validity and trials that have been carried out on the LKPD media based on *The VAK* developed is valid and practical. So that the LKPD is based on *VAK* can be used by educators and students as teaching materials in class XI material learning physics specifically fluid static .

Results validity And test try to do towards LKPD based on *Visualization, Auditory and Kinesthetic (VAK) which was developed is valid and practical . So that Visualization, Auditory and Kinesthetic (VAK)* used educator And participant educate as material teach in class XI material fluid static matter This in line with results study

D. CONCLUSION

Teaching materials in the form of *VAK- based LKPD have been developed* in physics learning towards the cognitive abilities of class XI.F.3 SMAN 2 Sawahlunto developed using the Plomp model . And has been produced *Valid Visualization, Auditory, and Kinesthetic (VAK)* Based LKPD *and practical* . teaching materials in the form of *VAK -based LKPD* on cognitive abilities seen from the feasibility construction , materials / contents And Language obtained 96% with category very practical . And also on level implementation of interactive media to reactivists participant educate in category " partial" implemented " and *percentages of agreement* on criteria *good agreement* . So the worksheets on Visualization, Auditory and Kinesthetic (VAK) learner that has developed can used as material teach in the learning process .

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