Developing Innovative Learning Methods in Improving Student's Learning Interest: Instrument Validity

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Abstract. Limited laboratory facilities are an important factor causing the low quality of chemistry learning. Therefore, the necessity to develop innovative media is evitable, in particular in the form of simple practical tools made from materials that are easily found in everyday life. If the quality of learning can be improved, then it may encourage students' interest in learning in chemistry. This article reports on the development of an instrument (questionnaire) of students' interest in chemistry lessons at school. The development begins with an analysis of the factors that influence interest in learning from the available literature; and the analysis resulted in 4 (four) indicators of interest, namely (1) happy feeling, (2) interest in performance, (3) attention, and (4) involvement. These four indicators then were developed into relevant questionnaire statements to determine students' perceptions of chemistry learning at school. To test the validity of the contents of the questionnaire, expert validation was carried out by 3 experts in the field of educational psychology. The results of expert validation were then analyzed with the Aiken V formula after previously converting the data into interval data. The results of the analysis show that the value of V ranges from 0.72 to 0.82 which means in the good category for all indicators of interest. In conclusion the student learning interest questionnaire is feasible and ready to be used to determine the effect of innovative learning on student learning interest.

Keywords: Student Learning Interest · Innovative Learning · Questionnaire Validity · Learning Quality

1 Introduction

The Minister of National Education of the Republic of Indonesia Decree No. 41, states that the learning process in each primary and secondary education unit must be interactive, inspiring, fun, challenging, and motivating students to participate actively and provide sufficient space for initiative, creativity, and independence in accordance with talents, interests, and physical development as well as student psychology. In each educational unit, teachers not only play a creative role in providing innovation in the learning

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process, but they should also be able to make students creative. Creative teachers and students, especially in the application of science learning, will produce interesting learning, because science learning is easy to find in everyday life [1].

Altun et al. [2] stated that practicum activities in the laboratory are part of the chemistry learning process. Practical activities make concepts that are originally abstract become more concrete and easier to learn. Students can find their own facts with their senses and can relate experiences full of symbols and calculations obtained in the learning process through practical work in the laboratory. The knowledge and experience obtained are directly processed according to their cognitive abilities [3].

There are at least four reasons put forward by science education experts regarding the importance of practicum activities. First, the practicum raises the motivation to learn science. Second, practicum develops basic skills in carrying out experiments. Third, practicum becomes a vehicle for learning scientific approaches. Fourth, practicum supports understanding of the subject matter [4].

The function of the laboratory is not a place to just check or match the truth of the theory that has been taught in class. Activities in the laboratory are not only about the final result, but how the inquiry process can develop. Studies with experimental methods assisted by simple practicum tools have been carried out indicate that these methods improving learning outcome signicantly [5]. Clearly, based on these results it can be said that simple practicum tools as learning aids can be used as alternative solutions to support learning success.

Latifah et al. [6] states that practicum activities can create a more interesting learning atmosphere and provide direct experience to students so as to make learning more meaningful. Therefore, it is hoped that the teacher's efforts to apply practicum methods more often in learning so that they can trigger and improve students' interest in learning. The results of research by Umar et al. [7] who examined the effect of science edutainment-based plant smart card media on students' interest in learning and understanding of the concept of plant movement themes, the percentage of interest in learning (post observation), students' interest in learning in the experimental class increased more than the control class. The difference between the control class and the experimental class ranged from 1%-7%. The assessment of students' interest in learning in this study was measured from four aspects, namely willingness, interest, attention, and involvement. These four aspects are translated into ten indicators for assessment.

Saregar [8] examined introductory learning in quantum physics by using Phet Simulation and LKM media through a scientific approach: Impact on students' interest and mastery of concepts, stated that scientific learning is intended to increase students' interest and mastery of concepts. This research was conducted in three cycles. In general, students' interest in learning is in high category. There was a significant increase, i.e. the percentage of student interest in learning from cycle I to cycle II increased by 13.33%. While in the third cycle only increased by 3.33%.

Wahyudin [9] in his research examined the effectiveness of multimedia-assisted learning using the guided inquiry method to increase students' interest and understanding, giving positive results to increasing student interest which was marked by increased individual learning outcomes of students who achieved learning mastery increasing from 13 students to 38 students. In addition, the average student response increased

after the action was 76.81%, while before the action the average student response was 72.90%. Overall, the scores obtained for each indicator in the interest questionnaire have increased. This increase in average student responses occurred because during teaching students were actively involved and felt happy when invited to discuss and ask questions.

Experimental-based learning accompanied by learning aids or media is indeed considered more effective to support the success of learning objectives. The results of the research by Putra et al. [10], the use of audio-visual media gave effective results with an increase in the average student learning outcomes in the experimental class (using learning media) which was 85.00, while the average student learning outcomes in the control class (without learning media) is 80.04. In addition, the use of learning media also improves learning outcomes in the psychomotor aspects of students.

The process experienced by students while carrying out learning activities using the practicum method is in line with indicators of interest in learning, namely student involvement, happy feeling, attention, and student interest. So, if the simple practicum method is carried out repeatedly, it is expected to have positive impact and increase student learning interest.

Students' interest in learning in this study was measured using a questionnaire or interest questionnaire. The development of the questionnaire begins with an analysis of the factors that influence interest in learning from the available literature [11]; and the results of the analysis resulted in 4 (four) indicators of interest, namely (1) happy feeling, (2) student interest, (3) student attention, and (4) student involvement. Furthermore, the four indicators were developed into relevant questionnaire statements to determine students' perceptions of chemistry learning. Before the instrument was used, the instrument was validated to guarantee the validity and reliability of the instrument.

2 Methods

2.1 Stage of Instrument Development

The instrument used in the study was a student learning interest questionnaire. The stages of developing a learning interest questionnaire in this study are as follows.

2.1.1 Determining Aspects of Interest in Learning

The first stage in the process of developing an interest in learning questionnaire is to determine aspects of interest in learning based on the operational definition of interest in learning itself. After conducting theoretical studies and analyzing aspects of interest in learning based on several sources of research journals, the results of the analysis of aspects of interest in learning were obtained, namely (1) happy feeling, (2) interest, (3) attention, and (4) involvement.

2.1.2 Formulating the Instrument Grid

This stage aims to make it easier to compile indicators and questionnaire statement items on every aspect of interest in learning. The formulation of the instrument grid was developed based on the literature on learning interest questionnaires that have been used in previous studies [11]. The formulated questionnaire grid can be seen in Table 1.

Table 1. Student Learning Interest Questionnaire Grid

Variable	Indicator	Descriptor	Item Number
Student's interest in learning	Happy feeling	First stage in learning	1, 2, 3, 4
		Main learning process	
		Final stage in learning	
	Interest in performance	Performance chemistry teacher	5, 6, 7, 8
		Materials/resources for studying chemistry	
		Media/learning tools used by the teacher	
		Class atmosphere when learning chemistry	
	Attention	Teacher Performance when teaching chemistry	9, 10, 11, 12
		Chemistry learning materials/resources	
		Media/learning tools used by the teacher	
		Class atmosphere when learning chemistry	
	Involvement	At the beginning of learning	13, 14, 15, 16
		In the process of learning	
		At the end of learning (evaluation	

2.2 Instrumen Validation

The next stage is the validation of the learning interest questionnaire which has been developed based on the grid that has been formulated to 3 (three) expert validators in the field of educational psychology. Before validating, the validator is first given a research synopsis about the description of the research to be carried out to further clarify the research questionnaire to be validated.

2.3 Improvements to the Interest Questionnaire According to the Validator's Comments

The validation of the learning interest questionnaire is carried out in approximately 3 (three) weeks. During this validation stage, the previously developed questionnaire was checked by the validator then the validator provided comments and suggestions on how to prepare the correct questionnaire grid and appropriate statements in each

Table 2. Results of Validation Sheet by Validator

Validator's Score	Aspects of Interest in Learning																			
	Happy Feeling					Interest in Performance					Attention					Involvement				
	Item Number					Item Number					Item Number					Item Number				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
I	4	4	5	5	4	4	4	4	5	4	4	4	5	4	4	4	4	4	5	5
II	5	5	4	5	4	5	5	4	4	4	5	5	4	5	4	5	5	4	4	4
III	5	4	4	4	4	5	4	4	4	4	5	4	4	5	4	5	4	4	4	4

aspect. After revision/improvement of the questionnaire on suggestions/comments from the three validators, the developed learning interest questionnaire has been validated to be used in research data collection. The results of the validation by the validator are presented in Table 2.

2.4 Transformation of Ordinal Data to Interval Data

The data obtained from validation sheet filled out by the 3 (three) validators are ordinal scale data. Therefore, the ordinal scale data is first converted into interval scale data using the Method of Successive Interval (MSI), an additional application to Ms. Excel.

2.5 Calculation of Validity and Reliability of the Questionnaire

The data that has been transformed into data with interval scale is then used for statistical analysis, namely the validity test and reliability test. The questionnaire validity test aims to determine how much validity the questionnaire will use, with the intention of knowing whether the questionnaire is feasible to be distributed or there are still shortcomings. One of the statistics that show expert validity is the Aiken's V formula to calculate the content-validity coefficient which is based on the results of the assessment of the expert panel of n (3 validators) on an item in terms of the extent to which the item represents the construct being measured. The assessment is carried out by assigning a number between 1 (i.e. very unrepresentative or very irrelevant, for example lo = 1) to 5 (i.e. very representative or very relevant, for example c = 5).

$$V = \sum s/[n(c-1)] \tag{1}$$

The resulting value is then interpreted using Aiken's V assessment criteria.

The questionnaire reliability test aims to determine whether the developed questionnaire is reliable or not. It is said to be reliable if the same questionnaire is used repeatedly at different times but can produce the same data. Reliability test used is Cronbach's Alpha formula.

$$\mathbf{r}_{11} = \left(\frac{\boldsymbol{k}}{\boldsymbol{k}-1}\right)\left(1 - \frac{\Sigma\,\boldsymbol{\sigma}_{\boldsymbol{b}}^2}{\boldsymbol{\sigma}_{\boldsymbol{t}}^2}\right) \tag{2}$$

The value of r11 obtained is then consulted with the value of r on the reliability criteria of the question.

3 Results and Discussion

The instrument of this research is an interest questionnaire consisting of independent variables, namely the practicum method with the help of simple practicum tools, and students' interest in learning as the dependent variable. This learning interest questionnaire are given to 40 high school students consisting of 20 students in the control group and 20 students in the experimental group. The experimental group was given treatment during the learning process using the practicum method while the control group implemented the conventional method.

3.1 Instrument's Validity

Following is a score distribution on validity test from validator (Table 3).

The average value for each item on the happy feeling indicator is 0.78 (good category). The average value of V for each item on the interest indicator is 0.74 (good category). The average value of V for each item on the attention indicator is 0.78 (good category). The value of V for the items on the involvement indicator is 0.78 (good category). Further analysis shows that the value of V ranges from 0.72 to 0.82 which is in the good category for all indicators of interest. So, it can be said that the student learning interest questionnaire is valid and ready to be used to measure the effect of the practicum method on student learning interest.

3.2 Questionnaire Reliability Test Results

Questionnaire reliability relates to accuracy and trustworthiness in accordance with predetermined criteria. To find the reliability of the instrument with the type of interval data whose scores are not 1 and 0, Cronbach's Alpha formula is used. The reliability test results are calculated from the data from the questionnaire validation test results as shown in Table 4.

Based on the results of the calculation and the value criteria table for r, the instrument with a value of r11 = 0.99 is said to have very high reliability. So, in conclusion the questionnaire is reliable and ready to be used to measure students' interest in learning chemistry.

Table 3. Questionaire Validity Test Results

A. Happy Feeling										
Validator	Item 1		Item 2		Item 3		Item 4		Item 5	
	Score	S	Score	S	Score	S	Score	S	Score	S
I	4,000	3,000	4,000	3,000	5,636	4,636	5,636	4,636	4,000	3,000
II	5,636	4,636	5,636	4,636	4,000	3,000	5,636	4,636	4,000	3,000
III	5,636	4,636	4,000	3,000	4,000	3,000	4,000	3,000	4,000	3,000
Σ s	12,272		10,636		10,636		12,272		9,000	
V	0,8823985		0,764754		0,764754		0,8823985		0,64710958	
ū	0,788282915									
B. Interest in Performance										
Validator	Item 1		Item 2		Item 3		Item 4		Item 5	
	Score	S	Score	S	Score	S	Score	S	Score	S
I	4,000	3,000	4,000	3,000	4,000	3,000	5,636	4,636	4,000	3,000
II	5,636	4,636	5,636	4,636	4,000	3,000	4,000	3,000	4,000	3,000
III	5,636	4,636	4,000	3,000	4,000	3,000	4,000	3,000	4,000	3,000
Σ s	12,272		10,636		9,000		10,636		9,000	
V	0,8823985		0,764754		0,6471096		0,764754		0,64710958	
ū	0,741225136									
C. Attention										
Validator	Item 1		Item 2		Item 3		Item 4		Item 5	
	Score	S	Score	S	Score	S	Score	S	Score	S
I	4,000	3,000	4,000	3,000	5,636	4,636	4,000	3,000	4,000	3,000
II	5,636	4,636	5,636	4,636	4,000	3,000	5,636	4,636	4,000	3,000
III	5,636	4,636	4,000	3,000	4,000	3,000	5,636	4,636	4,000	3,000
Σ s	12,272	10,636	10,636	12,272	9,000					
V	0,8823985		0,764754		0,7647397		0,8823699		0,64710958	
ū	0,788274331									
D. Involvement										
Validator	Item 1		Item 2		Item 3		Item 4		Item 5	
	Score	S	Score	S	Score	S	Score	S	Score	S
I	4,000	3,000	4,000	3,000	4,000	3,000	5,636	4,636	5,636	4,636
II	5,636	4,636	5,636	4,636	4,000	3,000	4,000	3,000	4,000	3,000
III	5,636	4,636	4,000	3,000	4,000	3,000	4,000	3,000	4,000	3,000

(*continued*)

Table 3. (*continued*)

A. Happy Feeling					
Σ s	12,272	10,636	9,000	10,636	10,636
V	0,8823985	0,764754	0,6471096	0,7647397	0,76473972
ū	0,764748303				

Table 4. Summary of Questionnaire Reliability Test Results

Componen	Value
Item's Variance (∑σb2)	0,00 s/d 0,89
K	20
K/K - 1	1,05
Σ σb2 /σt2	0,0491
(1 - Σ σb2 /σt2)	0,95
r11	0,99

4 Conclusion

The analysis of validity of the instrument indicates that the questionaire is valid and in a good category. Meanwhile, analysis of instrument's realibility provides strong evidence that the mention questionaire is highly reliable. In conclusion, the developed questionaire is ready to be used to measure the effect of the practicum method with the help of simple practicum tools on students' interest in learning.

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