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Measuring Instrument for Self-Regulated Physics Learning at High School Level in Sungai Penuh

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Abstract

Self-regulated learning in physics at school is essential and can influence self-regulated learning in following the learning process. An instrument is needed to find out self-regulated learning. It is tough to find self-regulated learning assessment instruments for physics subjects. Therefore, development research was conducted to develop a student self-regulated assessment instrument for Physics subjects. This type of research is research and development (R&D), which Sugiyono (2016) developed. The sample for this research is students selected using the cluster random sampling method, namely samples from randomly chosen classes, namely class XII MIPA for the 2023/2024 academic year at SMAN 2 Sungai Penuh. The analysis involved four expert lecturers who acted as validators. After it was valid, a trial of the instrument was carried out and distributed to 114 students. Next, a trial test is carried out to determine the validity and reliability of the questionnaire. The results of the questionnaire trials that were distributed to students were analyzed using SPSS. Based on research and development from 30 statements, 28 valid questionnaire statements were obtained. Based on the analyzed questionnaire data, good validity was obtained for each question item. The reliability value obtained was ($\alpha = 0.9749$).

Keywords: Validity, Reliability, Self Regulated Learning

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INTRODUCTION

Students' self-regulated learning abilities will increase both in emotional and social regulation if students can regulate themselves in the learning process (Abdullah, 2016). To achieve what they want, students can make learning plans and targets, measure independent abilities, target learning outcomes, carry out learning activities well, and evaluate learning outcomes (Darsani, 2019). Self-regulated learning is increasing one's ability to generate self-regulation and self-monitoring of thoughts, feelings, and behavior in achieving goals (Ahmad, 2016; Alafghani, 2019; El-adl, 2020)

Self-regulated learning can determine the success of the learning process (Aprilianti, 2022; Anugraheni, 2023). The more students' learning independence increases, the better the support for student-centered learning (Derang et al., 2023; Hajijah, 2023). Self-regulated learning is influenced by several factors, one of which is within the students themselves, which consists of five aspects, namely initiative, self-confidence, responsibility, discipline, and motivation (Sholikhan & Kusnandi, 2021; Parantika et al., 2022; Safitri et al., 2022). These five aspects can be seen in the ongoing teaching and learning activities. Self-regulated learning, or what is known as self-regulation, refers to the human ability to organize and implement learning. (Dinata et al., 2021). Self-regulated learning is a process of student participation that includes metacognitive, active behavior, and aspects of student motivation in learning. (Setiani.et al., 2021; Tanti et al, 2020; Simanungkalit.et.al., 2021; Putri et.al., 2022). Self-regulated

learning is a feeling, thought, and behavior that is created by oneself, regulated and planned in a learning cycle, not only related to the knowledge that students must understand but also related to how they organize their learning (Pratama, 2017; Hamonangan & Widyarto, 2019; Ghimby, 2022).

The existence of self-regulated learning will help students control their impulses and use their reasoning abilities before doing something; therefore, what they do does not lead to other harmful actions. When students develop independent learning skills, their goals will be achieved (Wijaya, 2020; Suearti et al., 2022). Someone who can self-regulate their learning will have a more specific direction, use a particular scheme, and be more aligned in their learning activities. Students who can self-regulate their learning activities will be proactive in carrying out their learning activities (Winarso & Supriady, 2016; Sari & Satwika, 2018; Rozaini et al., 2022). Self-regulated learning is essential in the learning process and certainly requires a tool to determine students' self-regulated learning to maximize their potential.

The problem is that it is rare to find instruments to test the level of self-regulated learning that can be used in secondary schools. Suppose there is no standard tool for testing with valid and reliable criteria. In that case, the data obtained will not be able to describe the level of self-regulated learning in high school (Audhiha et al., 2022), even though the existence of instruments is essential for measurement or assessment. The instrument is a questionnaire containing several well-structured statements by theoretical reference. Respondents only need to answer the questions in the form of several well-structured statements using theoretical references, so they only need to answer questions according to the circumstances. Questionnaires that can be used as measuring tools are questionnaires that have proven levels of validity and reliability (Sugiyono, 2014). The questionnaire developed used a Likert scale with answer criteria: strongly agree (SS) with point 4, agree (S) with point 3, Disagree (TS) with point 2, and strongly disagree (STS) with point 1. Based on the explanation above, a questionnaire is an excellent option to measure students' ability to self-regulate their physics learning activities. Therefore, it is necessary to develop a self-regulated learning instrument to determine the level of self-regulated learning of high school physics students. Therefore, the objectives of this research are: (1) to develop a physics questionnaire to measure self-regulated learning in physics learning and (2) to measure the validity and reliability of a questionnaire that will be measured.

METHODS

Research methods using development methods or Research and Development (R&D). The research was designed by creating an instrument as a statement. Furthermore, Sugiyono (2016) explains that this method is used to create specific products and test their feasibility.

Products made in the form of assessment instruments. The steps in the Research and Development procedure, according to Sugiyono (2016), are identifying problems, collecting data, designing products, validating products, revising designs, testing products, and final products—drafting revised questionnaire statements based on suggestions and assessments obtained from validators. Next, the questionnaire was refined so that, in the end, a questionnaire was obtained that could be used for testing. Then, questionnaire validation was carried out in the form of content validity. Content validity of the self-regulated learning instrument using the CVR formula from Lawshe. This research used four validators, namely Mr. Prof. Dr. Usmeldi. M. Pd; Dr. Yulkifli, S.Pd, M. Si; Dr. Fuja Novitra, S.Pd., M.Pd; Dr. Emiliannur, M.Pd. The next stage is the

dissemination stage. The aim is to disseminate self-regulated learning measurement instruments.

The research subjects were class XII high school students at SMA Negeri 2 Sungai Penuh. The sampling technique is cluster random sampling, with samples from a class taken at random. The researcher randomly chose the test subjects, namely class XII students, from four classes. The trial was carried out on 114 students.

The types of data for this research are quantitative data and qualitative data. Qualitative data was obtained from validation sheets containing suggestions and improvements by expert lecturers or validators regarding instruments for measuring the level of self-regulated learning in the form of questionnaires. Data analysis uses descriptive statistics.

Meanwhile, quantitative data was obtained from validation sheets filled in by validators and also obtained from questionnaires distributed to students to determine the validity and reliability of the questionnaire. Quantitative data was carried out using SPSS.

Table 1. SRL Instrument Validity Criteria

No	Indicator	Category
1	81 - 100	Very Valid
2	61 - 80	Valid
3	41 - 60	Sufficient Valid
4	21 - 40	Less Valid
5	- 20	Invalid

The product-moment correlation formula equation obtains empirical validity:

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y - (\sum Y)^2]}} \quad (1)$$

Information :
X = Item score
N = Number of Respondents
r_xy = Correlation coefficient between variables X and Y
Y = Total score

$$r_{11} = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum s_i^2}{\sum s_t^2}\right) \quad (2)$$

Information :
$\sum s_t^2$ = Total score variance
N = Number of items
r_{11} = Reliability coefficient
$\sum s_i^2$ = Total variance score for each item
to find the variance using Equation 3.

$$s_i^2 = \sum x^2 - \frac{\sum x_i^2}{n} \quad (3)$$

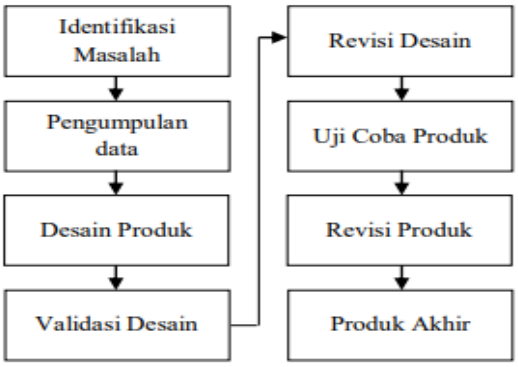
Tabel 2. Reliability Criteria

No	Koefisien Korelasi	Kriteria
1	$0.90 < r \leq 1.00$	Sangat Tinggi
2	$0.70 < r \leq 0.90$	Tinggi
3	$0.40 < r \leq 0.70$	Sedang
4	$0.20 < r \leq 0.40$	Rendah
5	$r < 0.20$	Sangat Rendah

RESULTS & DISCUSSION

Results

The steps for developing self-regulated learning instruments in physics subjects are shown in Figure 1 by the Sugiyono (2016) model. Results are the central part of scientific articles, containing final results without data analysis process and hypothesis testing results. Results can be presented with tables or graphs to clarify the results verbally.



Gambar 1. R&D Procedures. Sugiyono (2016)

The research comes from a problem. A problem is a discrepancy between what is desired, what is expected, and the actual situation (Sugiyono, 2016). In order to find out whether this inequality occurs, a preliminary study needs to be carried out. So, researchers studied various articles related to students' self-regulated learning instruments in physics subjects. It turns out that self-regulated learning assessment instruments are complex to find for students in physics subjects, either from journals or books. Just like at SMA Negeri 2 Sungai Banyak, there is no particular instrument to determine the level of students' self-regulated learning in Physics. Therefore, it is necessary to develop self-regulated learning instruments.

When a problem can be proven empirically, various information is collected and used to plan a particular product, which is believed to solve the problem (Sugiyono, 2016). This process collects data in order to obtain information. Information was taken from book sources and relevant journals for developing instruments for assessing students' self-regulated learning in physics subjects. After the data was collected, a questionnaire product was prepared or designed. Design is a plan to create a product through a questionnaire to measure self-regulated learning. After that, a questionnaire indicator was created.

Tabel 3. Reliability Criteria

No	Indicator	Item
1	Have the initiative to learn	4
2	Responsible for his learning	4
3	Able to organize study plans, time, speed, and goals	8
4	Diligent in learning and discipline	6
5	I have great curiosity and enjoy learning	5
6	Not dependent on others	3
		30

Then, validation is carried out by an expert lecturer or validator to determine the feasibility of the questionnaire. Validators determine whether or not an instrument can be used (Sugiyono, 2016). After the validator validates the instrument, a trial is carried out. Trials were carried out to obtain the construct validity and reliability of the questionnaire. So, we get data that is processed with the help of SPSS.

Table 4. Testing results for the validity of the trial

No	Kode	r - tabel	r - hitung	Keterangan
1	SRL 1	0.1637	0.8209	V
2	SRL 2	0.1637	0.8247	V
3	SRL 3	0.1637	0.8559	V
4	SRL 4	0.1637	0,0937	TV
5	SRL 5	0.1637	0,5229	V
6	SRL 6	0.1637	0,9025	V
7	SRL 7	0.1637	0,8801	V
8	SRL 8	0.1637	0,8645	V
9	SRL 9	0.1637	0,8277	V
10	SRL 10	0.1637	0,8254	V
11	SRL 11	0.1637	0,8123	V
12	SRL 12	0.1637	0,7891	V
13	SRL 13	0.1637	0,452	V
14	SRL 14	0.1637	0,8172	V
15	SRL 15	0.1637	0,8444	V
16	SRL 16	0.1637	0,8252	V
17	SRL 17	0.1637	0,8522	V
18	SRL 18	0.1637	0,8416	V
19	SRL 19	0.1637	0,8791	V
20	SRL 20	0.1637	0,8861	V
21	SRL 21	0.1637	0,1607	TV
22	SRL 22	0.1637	0,8256	V
23	SRL 23	0.1637	0,8562	V
24	SRL 24	0.1637	0,8365	V
25	SRL 25	0.1637	0,2868	V
26	SRL 26	0.1637	0,629	V
27	SRL 27	0.1637	0,4417	V
28	SRL 28	0.1637	0,8004	V
29	SRL 29	0.1637	0,7895	V
30	SRL 30	0.1637	0,705	V

In SPSS, an item is declared valid if the calculated r-value is >.0.5-.0.8 compared to the r-table of 0.167. With these criteria, of the 30 statement items, 28 statements are valid, while two statements are invalid. Statements SRL 4 and SRL21 are invalid. Validity testing is a measurement method that aims to determine the accuracy and precision of an instrument (Purnomo, 2018).

After that, the reliability value was tested. Reliability means the extent to which a measurement instrument or method is reliable or consistent in measuring something (Siregar, 2015). The following is a table of reliability test results for students' self-regulated learning questionnaires in Physics subjects

Table 4. Testing results for the validity of the trial

Alpha Cronbach	N items
0.9726	28

The Cronbach's Alpha statistical test was used to test the reliability of this research. The results of the Cronbach's alpha test show the reliability of the questionnaire. Because the Cronbach's Alpha value must be greater than >0.60 for an instrument to be considered reliable, the assessment instrument developed must be reliable and meet stringent reliability standards. From the analysis results, a value of 0.9726 was obtained, so it can be seen that this variable can be said to be reliable or consistent in measuring.

CONCLUSION

The resulting questionnaire includes six indicators with a total of 30 statement items. The research data was analyzed with the help of the SPSS application, obtaining 28 valid questionnaires while two were invalid. The reliability value is 0.9726. With this instrument in the form of a questionnaire, it is hoped that it can be used to measure students' self-regulated learning in physics subjects. Apart from that, it is hoped that it will be used as a reference for other researchers.

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