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Validity and Reliability Analysis of an Action Research Instrument

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A B S T R A C T :

Assessing student learning outcomes requires instruments that are both valid and reliable. This study assesses the validity and reliability of an Action Research Instrument, designed to evaluate the reliability of the instrument in the Expert (i.e., teachers) view and student outcome through Pilot Testing. Three analyses were used: Content Validity Index (CVI), Cronbach's Alpha, and Split-Half Reliability. CVI is used to measure the content validity of the Action Research Instrument. Cronbach's Alpha is used to measure the internal consistency of the Action Research Instrument. Split-Half Reliability is used to measure the reliability of the Action Research Instrument based on student results. The objective of the study is to validate the Action Research Instrument in terms of CVI, Cronbach's Alpha, and Split-Half Reliability. The research design is a Quantitative descriptive research method. The findings or results show that the Action Research Instrument is valid and reliable.

Keywords: Content Validity Index, Cronbach's Alpha, Split-half Reliability, Action Research Instrument

1. INTRODUCTION

Assessing student learning through an instrument requires tools that test the validity, internal consistency, and reliability. Validity is ensuring that the test measures and align with the objectives; in short, it ensures that a test measures what it is intended to measure, while reliability confirms the consistency of results. This study analyzes a 20-item multiple-choice instrument using three statistical methods to evaluate whether it is valid or not.

According to Mokkink et al. (2025), Content validity is key when developing a new outcome measurement instrument or selecting an existing measurement instrument. Without good content validity, wrong conclusions can be drawn about an outcome that is measured (Mokkink et al., 2025). One of the tools that can be used to test the content validity of a test is through Content Validity Index. According to Hakim et al. (2025c), the CVI is a globally used instrument used to check the validity of each item in a questionnaire. items.

To test the internal consistency of the Action Research Instrument (teacher view), the researcher used Cronbach's Alpha. According to Bujang et al. (2018), Cronbach's alpha is a tool that measures the internal consistency of an instrument (questionnaire).

Testing the internal consistency should not only focus on the experts (i.e., teachers) but also on the students, particularly on their results in pilot testing of the Action Research Instrument. The researcher used Split-Half Reliability to determine the internal consistency based on the scores of the students from the instrument. According to Savage, M. (2017), Split-half reliability is a tool used to measure consistency by dividing the score into two. This tool is used to see if the Action Research Instrument is reliable through the scores obtained from the respondents. The objective of the study is to validate the Action Research Instrument in terms of Content Validity (Content Validity Index), Internal consistency (Cronbach's Alpha), and Reliability (Split-Half Reliability).

2. METHODOLOGY

2.1 Research Design

The study employed a Quantitative descriptive research method. According to Unimrkt Research (n.d.) used to systematically collect and analyze numerical data to describe or summarize a population or phenomenon. It focuses on the objective measurement and statistical analysis of data to provide a clear and concise summary of the research topic (Unimrkt Research, n.d.).

2.2 Participants

Twenty-one confidential students participated in the pilot testing, and seven experts or teachers reviewed the test items.

2.3 Instrument

The Action Research Instrument consisted of 15 multiple-choice questions.

2.4 Procedures

- Content Validity Index (CVI) was computed based on expert or teachers' ratings.
- Cronbach's Alpha was calculated to determine if the Action Research Instrument measures external consistency.
- Split-Half Reliability was determined by dividing the score of the student from the Action Research Instrument.

3. RESULTS AND DISCUSSION

Experts View

3.1 Validation Tool

Name of Validator: _____

Position: _____

Validator's Signature: _____

Date of validation: _____

Direction: this tool asks for your evaluation of the questionnaire to be used in the data gathering for the investigation stated above, to establish its validity. You are requested to give your **honest** assessment using the criteria stated below; please check (√) only one from the selection.

Rating Scale:

4 =very much valid
3 = very valid
2 = not so valid
1 = not valid

INDICATOR	4 Very much valid	3 Very valid	2 Not so valid	1 Not valid
1. The language is easy for the target students to understand.				
2. The question directly measures what it tends to measure.				
3. The question directly measures a student's learning				
4. The direction is clear and easy to understand.				
5. The questionnaire's items are clearly stated.				

Comments/ Suggestions:

_____
_____
_____
_____
_____
_____
_____

At the top of the Validation Tools are the validator's name, position, signature, and the date of validation. After that is the direction that contains the instructions on how to answer the validation tool. Then, below it is the rating scale. The researcher used a 4-point scale validation tool. The corresponding value for 1 is not valid, for 2 is not so valid, for 3 is very valid, and for 4 is very much valid. On the left side of the table is the indicator, and on the right side is the 4-point scale, and below it are the comments or suggestions of the expert or validator.

3.2 Content Validity Index (CVI)

Experts rated each item on a 4-point scale. The researcher used Hakim et al. (2025b) research as a guide to know the Content Validity Index (CVI) of the Action Research Instrument. Below are the data and the result of Content Validity index.

Raw Data from Experts

Indicator	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7
Indicator 1	4	4	4	4	4	3	3
Indicator 2	4	4	4	4	4	3	3
Indicator 3	4	4	4	4	4	3	3
Indicator 4	4	4	4	4	4	3	3
Indicator 5	4	4	4	3	4	3	3

This is the data taken from Expert 1, Expert 2, Expert 3, Expert 4, Expert 5, Expert 6, and Expert 7 according to each indicator. As you can see, Expert 1, Expert 2, Expert 3, Expert 4, Expert 5, give 4 points on indicator 1, which is interpreted as "Very Much Valid" based on the Validation Tool seen above. While Experts 6 and 7 give 3 points, which is interpreted as "Very Valid" based on the Validation Tool seen above. In indicator 2, Experts 1, Expert 2, Expert 3, Expert 4, and Expert 5 agree that the indicator is "Very Much Valid", and both Experts 6 and 7 agree that indicator 2 is very valid. Expert 1, Expert 2, Expert 3, Expert 4, and Expert 5 agreed that indicator 3 is "Very Much Valid." While Expert 6 and Expert 7 agreed that indicator 3 is "Very Valid". In indicator 4, Experts 1, Expert 2, Expert 3, Expert 4, and Expert 5 agree that the indicator is "Very Much Valid", and both Experts 6 and 7 agree that indicator 4 is very valid. Expert 1, Expert 2, Expert 3, Expert 5 agreed that indicator 5 is "Very Much Valid". While Expert 4, Expert 6, and Expert 7 agreed that indicator 5 is "Very Valid".

Table 1 - Categorization of 4-point Scale Ratings for CVI Calculation

4-point scale	Expert Ratings Categorized
1,2	0 (Not Valid)
3,4	1 (Valid)

The researcher categorized the data as shown in Table 1.

The table below is the table created in Microsoft Excel to calculate the content validity index:

Indicator	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Expert in Agreemen	I-CVI	Decesion	UA
Indicator 1	1	1	1	1	1	1	1	7	1	Valid	1
Indicator 2	1	1	1	1	1	1	1	7	1	Valid	1
Indicator 3	1	1	1	1	1	1	1	7	1	Valid	1
Indicator 4	1	1	1	1	1	1	1	7	1	Valid	1
Indicator 5	1	1	1	1	1	1	1	7	1	Valid	1
Total evry Expert	1	1	1	1	1	1	1				
S-CVI/Average	1										

Sum of -CVI	5	Sum of UA	5
S-CVI/ Average	1	S-CVI/UA	1
Category	Valid	Category	Valid

The S-CVI/Average is 1, and S-CVI/UA is 1, indicating strong content validity, and it surpasses the acceptable CVI values of 0.83, as shown in Table 2. This means that Expert 1, Expert 2, Expert 3, Expert 4, Expert 5, Expert 6, Expert 7 are all in agreement that the Action Research Instrument is valid in terms of the following indicators: The language is easy for the target students to understand; The question directly measures what it tends to measure; The question directly measures a student's learning; The direction is clear and easy to understand and The questionnaire's items are clearly stated.

3.2 Cronbach's Alpha

Experts	Q1	Q2	Q3	Q4	Q5	Total of Each Expert
Expert 1	4	4	4	4	4	20
Expert 2	4	4	4	4	4	20
Expert 3	4	4	4	4	3	19
Expert 4	4	4	4	4	4	20
Expert 5	3	3	3	3	3	15
Expert 6	3	3	3	3	3	15
Expert 7	4	4	3	4	4	19
Variance of Each Item	0.238095	0.238095	0.285714	0.238095	0.285714	

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} \sigma_y^2}{\sigma_x^2}\right)$$

Cronbach's Alpha	0.943182
# of items (k)	5
Summed Variance of each item ($\Sigma\sigma^2y$)	1.285714
Variance of total score (σ^2x)	5.238095

Cronbach's Alpha results are 0.943182, which means excellent internal consistency. This suggests that the Action Research Instrument has excellent internal consistency. This concludes that the Action Research Instrument is reliable.

Students' View (Result from Pilot Testing)

3.3 Split-Half Reliability

The score of the Action Research Instrument Pilot Respondents was split into two halves (odd vs. even items).

Respondent	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Half A score	Half B score	Total Score
Pre-Test (Revised) Pilot Respondent 1	1	1	1	1	1	1	1	1		1	1	1		1	1	6	7	13
Pre-Test (Revised) Pilot Respondent 2	1	1	1	1	1						1		1	1		5	3	8
Pre-Test (Revised) Pilot Respondent 3	1	1	1	1	1	1	1	1		1	1	1		1	1	6	7	13
Pre-Test (Revised) Pilot Respondent 4	1	1	1	1	1	1	1			1						4	4	8
Pre-Test (Revised) Pilot Respondent 5	1	1	1	1	1	1		1			1				1	5	4	9
Pre-Test (Revised) Pilot Respondent 6	1	1	1	1	1	1		1		1	1					4	5	9
Pre-Test (Revised) Pilot Respondent 7	1	1			1	1	1					1				3	3	6
Pre-Test (Revised) Pilot Respondent 8	1		1	1	1	1	1					1				4	3	7
Pre-Test (Revised) Pilot Respondent 9	1	1			1	1									1	3	2	5
Pre-Test (Revised) Pilot Respondent 10		1				1	1		1		1	1				3	3	6
Pre-Test (Revised) Pilot Respondent 11	1	1	1	1	1	1		1			1					4	4	8
Pre-Test (Revised) Pilot Respondent 12	1	1	1	1	1	1	1		1		1	1	1	1		7	5	12
Pre-Test (Revised) Pilot Respondent 13	1	1	1	1	1	1		1					1			4	4	8
Pre-Test (Revised) Pilot Respondent 14						1					1					1	1	2
Pre-Test (Revised) Pilot Respondent 15	1	1	1	1	1	1				1	1	1	1			5	5	10
Pre-Test (Revised) Pilot Respondent 16	1	1	1	1	1	1	1	1	1		1	1			1	7	5	12
Pre-Test (Revised) Pilot Respondent 17	1	1	1	1	1	1	1	1			1	1			1	6	5	11
Pre-Test (Revised) Pilot Respondent 18	1	1	1	1	1	1	1	1		1	1	1		1	1	6	7	13
Pre-Test (Revised) Pilot Respondent 19	1	1	1	1	1	1		1	1	1	1		1	1		6	6	12
Pre-Test (Revised) Pilot Respondent 20	1		1	1	1	1								1		3	3	6
Pre-Test (Revised) Pilot Respondent 21	1	1							1						1	3	1	4

Correlation Coefficient:	**0.82**
Spearman-Brown Coefficient:	**0.90**

A Spearman-Brown coefficient value of 0.5-0.7 is deemed moderate, a value of 0.7-0.9 is deemed good, and a value exceeding 0.9 is deemed excellent (De Vet et al., 2017)

The Correlation Coefficient between halves was = 0.82, which is interpreted as deemed good, and the Spearman-Brown Coefficient was = 0.90, which is interpreted as deemed excellent. This means that the instrument (Action Research Instrument) is reliable.

In summary of the results or findings, the CVI results confirm that the test items are relevant and appropriate for the target grade level. The results of Cronbach's Alpha and Split-Half Reliability also confirms that there is internal consistency and reliability.

4. CONCLUSIONS, AND RECOMMENDATIONS

4.1 Conclusion

Based on the findings, the following conclusions were drawn:

1. In terms of Content Validity Index (CVI), the Action Research Instrument is valid.
2. In terms of Cronbach's Alpha, the Action Research Instrument has excellent internal consistency.
3. In terms of Split-Half Reliability, the Action Research Instrument is deemed excellent.

4. It is concluded that the Action Research Instrument is valid and reliable.

4.2 Recommendation

Based on the findings and results of this study, the researcher recommends the following:

1. To the administrator, they must do Content Validity Index (CVI), Cronbach's Alpha, and Split-Half Reliability to know if the test they administer is reliable and valid, and make a program or training in which teachers can demonstrate how to use the Content Validity Index (CVI), Cronbach's Alpha, and Split-Half Reliability.
2. To the teacher, they must adapt this research to the administering of a quiz or assessment.
3. To the future researcher, the researcher recommends adapting this research to validate their instruments because these CVI and Cronbach's Alpha focus on the teacher or the experts, and the Split-Half Reliability focuses on student results.

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