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DEVELOPMENT OF INSTRUMENT FOR UNDERSTANDING THE CONCEPT OF WRITING SCIENTIFIC ARTICLES FOR LECTURERS USING THE ADDIE MODEL: EMPIRICAL VALIDITY AND RELIABILITY

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Abstract. This study aims to develop an instrument to assess lecturers' conceptual understanding of scientific article writing using the ADDIE model (Analyse, Design, Develop, Implement, Evaluate). The instrument is designed to evaluate lecturers' comprehension of key aspects of scientific writing, including structure, methodology, publication ethics, and the use of academic language. Adopting a research and development approach, the study involves expert validation and empirical testing with 275 respondents from variousregions across Indonesia. The findings indicate that the instrument exhibits high content validity, with an average Scale Content Validity Index (S-CVI/Ave) of 0.968, and robust internal reliability, as evidenced by a Cronbach's Alpha of 0.852. Item-total correlation analysis confirmes the validity of all items, with Corrected Item-Total Correlation values exceeding 0.3044. The instrument functions both as an evaluative tool for assessing lecturers' scientific writing skills and as a learning resource to enhance their competencies. The study concludes that the instrument is a valid and reliable measure of lecturers' conceptual understanding of scientific article writing. Its implications highlight its potential as a vital resource in training and professional development programs for lecturers in higher education institutions.

INTRODUCTION

Writing scientific articles is one of the essential skills that must be possessed by academics, researchers, and students. Scientific articles are not only a medium for conveying research results to the academic community, but also serve as an indicator of the author's academic ability in understanding and applying relevant concepts. However, various studies show that the ability to write scientific articles is still a major challenge among academics and students, especially in developing countries, including Indonesia (Lubis et al., 2019; Udil, 2021). These problems include limited understanding of the structure of scientific articles, lack of mastery of research methodology, and minimal evidence-based argumentation skills. This condition creates an urgent need for training and mentoring programs that can help academics improve the quality of their writing, so that the resulting research can be more easily published and have a positive impact on the development of science. These programs must be designed comprehensively, covering theoretical and practical aspects, and involving experts in the field of scientific writing to provide effective guidance (Yusuf et al., 2022).

The importance of writing scientific articles for university lecturers not only functions as an indicator of academic productivity, but also as a form of responsibility in carrying out the tridharma of higher education, namely education, research, and community service. Based on Law Number 12 of 2012 concerning Higher Education, lecturers are required to conduct research and disseminate the results in the form of scientific publications as a form of developing science and technology. Furthermore, the Regulation of the Minister of Education, Culture, Research, and Technology Number 39 of 2021 concerning Academic Integrity emphasises that every lecturer must comply with ethical and integrity standards in producing scientific works, including writing scientific articles. Thus, the ability to write scientific articles is one of the competencies that cannot be ignored by lecturers to meet the demands of professionalism and make a real contribution to the development of science (Yasa et al., 2023).

The Guidelines for Scientific Journal Accreditation Dikti (2024) firmly places the assessment of the substance of scientific articles as one of the main criteria. This emphasises that lecturers, as the main pillars in the academic world, have a great responsibility to contribute to the development of science through the publication of scientific works. By producing quality articles, lecturers not only improve the reputation of higher education institutions, but also encourage the birth of innovation and solutions to various problems faced by society. In improving the ability of lecturers to write scientific articles, the Directorate of Research, Technology, and Community Service of the Directorate General of Higher Education, Research, and Technology of the Ministry of Higher Education, Research, and Technology also plays a role in facilitating lecturers through organising scientific article writing training held in 17 cities. In the 2024 Scientific Article Writing Training Guide (DRTPM, 2024) it is stated that the program's target is to increase the ability of lecturers to publish scientific articles from their research in accredited journals and reputable journals, which can be used to fulfill the requirements for academic promotion and research output.

One important aspect in writing scientific articles is understanding the basic concepts underlying the preparation of the article. This understanding includes the structure of scientific articles, the use of academic language, and mastery of the rules for compiling references and citations. According to Swales & Feak (2012), the structure of a scientific article consists of several main components, such as introduction, methods, results, and discussion (IMRAD), which each have their own role in conveying information logically and systematically. Therefore, mastery of these concepts is a primary prerequisite for lecturers to be able to produce scientific articles that meet quality standards. Day & Gastel (2006) emphasise the importance of a systematic and logical writing structure to produce good scientific articles. Day & Gastel's writing cycle theory provides a comprehensive framework for scientific article writers. This model describes the writing process as a series of interrelated stages, starting from planning, writing the initial draft, revision, to final completion. In the context of writing scientific articles, each stage has a crucial role.

The conceptual theory of scientific article writing can be referred to the CARS (Create A Research Space) model introduced by Swales (1990). This model emphasises the importance of building a research context in a systematic manner through three main steps, namely (1) establishing a research space by presenting relevant and important topics, (2) identifying gaps in previous research, and (3) explaining the purpose or contribution of the research conducted. This approach provides a clear conceptual framework for writers to compose an effective introduction to a scientific article. In addition, the writing process theory of Flower and Hayes (1981) is also relevant in understanding the dynamics of writing scientific articles. This theory describes the writing process as a cognitive activity involving three main components, namely the rhetorical situation, the writer's cognitive processes (writing processes), and long-term memory. In the context of writing scientific articles, writers need to combine the planning, translating, and revising processes iteratively to produce quality writing. This approach emphasises the importance of reflection and evaluation during the writing process, because writing is an iterative and non-linear process.

However, based on research conducted by Budhyani & Angendari (2021), many novice writers have difficulty integrating various elements in writing scientific articles. This difficulty is often caused by the lack of instruments that can be used to measure the extent of their understanding of these concepts. Existing instruments often only focus on evaluating the final results of the article without providing adequate guidance in the writing learning process itself (Fajaruddin et al., 2021). The difficulty experienced by novice writers in writing scientific articles is certainly the inability to understand the concept of writing scientific articles Zaden & Meedya, (2024). Conceptual understanding is one of the initial knowledge that must be possessed by lecturers because conceptual understanding is the basis for formulating principles. Cognitive processes in the aspect of understanding include interpreting, exemplifying, classifying, summarising, drawing inferences, comparing and explaining (Anderson & Krathwohl, 2001).

The development of a concept understanding instrument in writing scientific articles is a strategic step to overcome this problem. The instrument must be able to measure the author's understanding of various important components in scientific articles, including structure, substance, and presentation. A good instrument must have high validity and reliability in order to measure what should be measured accurately and consistently (Nunnally & Bernstein, 1994). The urgency of developing this instrument is increasing along with the global demand for scientific publications. In recent decades, the number of scientific publications from Indonesian authors has increased significantly. However, this increase in quantity has not been fully balanced by an increase in quality (Arsyad & Adila, 2018). Many articles are rejected by internationally reputable journals because they do not meet writing standards, such as clarity of research objectives, appropriateness of methodology, and accuracy of data presentation. Therefore, the development of an instrument that can help authors understand and apply these concepts is very relevant.

In addition, the literature shows that the development of a concept understanding instrument can also function as a learning tool. For example, research by Kolb (1984) on experiential learning shows that learning based on experience and reflection can improve understanding and skills. In the context of writing scientific articles, this instrument can be used as a medium to provide constructive feedback to authors during the learning process (Widana & Ratnaya, 2021). Thus, this instrument not only functions as an evaluation tool, but also as a means to strengthen the learning process.

The novelty offered in the development of this instrument is a more comprehensive and contextual approach. Most of the instruments that currently exist only focus on certain aspects, such as mastery of grammar or article structure, without paying attention to the integration between elements. In fact, in writing scientific articles, each element is interrelated and affects the overall quality. For example, the clarity of the research objectives in the introduction will affect how the author compiles the methodology and presents the results. Therefore, the instrument developed must be able to measure the integration between these elements.

On the other hand, instrument development must also be based on a data-based approach. According to Brown (2014), the instrument development process must go through a series of stages including needs analysis, design, testing, and validation. Each stage must be well documented to ensure that the resulting instrument has a strong and reliable scientific basis (Nunnally & Bernstein, 1994). This data-based approach allows researchers to systematically collect and analyse empirical evidence that supports the validity and reliability of the instrument (Messick, 1989). By considering these various aspects, this study aims to develop a valid, reliable, and contextual instrument for understanding concepts in writing scientific articles. This instrument is expected to be a practical solution for academics, researchers, and students in improving their ability to write scientific articles. In addition, this study is also expected to provide theoretical contributions in the field of instrument development and higher education, especially in the context of Indonesia.

METHOD

This research is included in research and development which is a research method used to produce certain products (creations), and test the effectiveness of the product Sugiyono, (2017). The intended development product is an instrument for understanding the concept of writing scientific articles designed with the aim of being a measuring tool for understanding the concept of students, in this case lecturers as participants in scientific article writing training.

This study adapts the ADDIE model research steps which consist of five stages, namely: a. analyze, b. design, c. develop, d. implement, and e. evaluate Branch, (2009). In this study, it is only carried out up to the fourth stage, namely the implementation stage. At the analysis stage, the main focus is to identify the needs and problems that underlie the development of the instrument. The steps taken by analysing and identifying the needs of academics, lecturers, and students in understanding important concepts in writing scientific articles, as well as collecting data through literature studies. Literature analysis reveals that training is a commonly used intervention to improve scientific article writing skills. Previous studies, such as those conducted by Rakhman, Surur, and Darmawati (2021), Nandiyanto et al. (2023), and Budiwan & Suswandari (2021), have empirically proven that training can increase lecturers' publication productivity. In addition, studies by Wardoyo et al (2022) highlight the importance of a practical training approach in improving the technical skills of writing scientific articles.

However, the development of standardised instruments to evaluate the understanding of the concept of writing scientific articles in depth is still very rare. The focus of research so far has been more directed at the final results in the form of publishable articles, without measuring participants' conceptual understanding of the structure, scientific methodology, ethics, and use of academic language that underlies the writing. This is an important basis for research that aims to develop evaluation instruments to strengthen basic competencies in writing scientific articles. The results of this analysis are the basis for formulating development objectives and determining the initial specifications of the instrument to be developed.

The second stage is the design stage which aims to formulate the instrument design conceptually and technically. The main activities at this stage include designing specific instrument objectives that cover aspects of understanding the concept of writing scientific articles consisting of seven dimensions, namely understanding the research topic, literature analysis and synthesis skills, understanding research methodology, data analysis and interpretation skills, ability to present research results and discussions, understanding templates and scientific writing ethics, and language skills and data presentation. After that, the instrument blueprint was prepared by developing the instrument framework from seven dimensions into 21 indicators and 84 questions in a Likert-based questionnaire.

Table 1. Blueprint of Scientific Article Writing Concept Understanding Instrument and Item Details Questions that Represent It

No.	Dimension	Indicator	Number	
			Positive	Negative
1.	Understanding of the research topic	a. Ability to identify and understand existing research gaps.	1.2	3.4
		b. Understanding of basic theories relevant to the topic.	5.6	7.8
		c. Understanding of basic concepts in the topic being researched.	9.10	11.12
2.	Literature analysis and synthesis skills	a. Ability to identify relevant studies or literature.	13.14	15.17
		b. Ability to compile literature reviews systematically and critically.	17.18	19.20
		c. Ability to present literature synthesis to demonstrate research relevance.	21.22	23.24
3.	Understanding of research methodology	a. Understanding the concept of appropriate research methods to answer research problems.	25.26	27.28
		b. Ability to explain research design, population, sample, data collection techniques, and selected analysis tools.	29.30	31.32
		c. Understanding the advantages and limitations of the methods used.	33.34	35.36
4.	Data analysis and result interpretation skills	a. Ability to analyse data using appropriate techniques.	37.38	39.40
		b. Skills in presenting data analysis results clearly and concisely.	41.42	43.44

No.	Dimension	Indicator		Number	
				Positive	Negative
		c.	Ability to interpret research results according to the literature used.	45.46	47.48
5.	Ability to present research results and discuccion	a.	Ability to compare research results with previous literature.	49.50	51.52
		b.	Ability to build logical arguments supported by data.	53.54	55.56
		c.	Ability to identify research limitations and suggest further research.	57.58	59.60
6.	Understanding templates and ethics of scientific writing	a.	Understanding of article templates applicable to certain international journals.	61.62	63.64
		b.	Understanding of publication ethics, including plagiarism and compliance with codes of ethics.	65.66	67.68
		c.	Ability to write abstracts, introductions, methods, results and discussions, and conclusions according to standards.	69.70	71.72
7.	Language Skills and Data Presentation	a.	Ability to write articles in good and correct English (academic language).	73.74	75.76
		b.	The ability to construct clear, concise and precise sentences.	77.78	79.80
		c.	Skills in presenting tables, graphs, or data visualisations that are informative and appropriate to the research context.	81.82	83.84

The third stage is the development stage. In this study, the instrument for understanding the concept of writing scientific articles is tested for validity and reliability. Content validation is carried out by involving experts from universities to assess the relevance of each item to the concept to be measured, as well as providing input on the dimensions, indicators, and questions developed. Each question item is then tested through empirical validation to ensure that the questions can measure conceptual understanding accurately. This process aims to produce an instrument that is not only valid and reliable, but also representative of important aspects in understanding the concept of writing scientific articles. An instrument is said to be valid if it is truly able to measure what should be measured by the instrument (Candiasa, 2010). Validity is related to the accuracy of a measuring instrument. Sugiyono (2005) said that validity is an index that shows that the measuring instrument truly measures what is intended to be measured. Validation from the Expert Team was analyzed using Content Validity Ratio (CVR) analysis (Lawshe, 1975) with the following formula: CVR = (2ne/n)–1

After identifying each item of the instrument question using CVR, the next stage is to calculate the Content Validity Index (CVI). CVI is used to measure how valid the contents of an item are in measuring the construct to be measured. CVI is the average of the CVR values for all items in the instrument. The CVI formula is as follows: CVI = $(\sum CVR)/n$ (Lawshe, 1975).

After completing the content validity test, the instrument development process is continued by revising the instrument based on the validation results and input provided by the expert team. This revision aims to ensure that the developed instrument has good quality and is able to measure the desired concept accurately. After the revision stage is complete, the next step is the implementation stage which involves empirical validity testing. This test aims to test the extent to which the instrument is able to produce valid and reliable data in the context of its use. Empirical validation was carried out using Google Forms on participants in the scientific article writing training from 17 training location cities, namely Bandar Lampung, Bandung, Banyuwangi, Cirebon, Denpasar, Gorontalo, Jambi, Jakarta, Majene, Makassar, Manado, Palembang, Palu, Pekanbaru, Solo, Tegal, and Ternate. This validation process serves to ensure the validity and reliability of the questions. The validity of the questions is analysed using the calculation of the correlation coefficient between the essay question score and the total formulated essay questions. Test items are said to be valid if $r_{it} > r_t$

After the validity test is carried out, the next stage of testing is to test the reliability of the instrument. Reliability is calculated only for items that are not dropped (valid). In other words, invalid items are not included in the test or calculation of reliability (Koyan, 2011). The reliability of the instrument will be tested with the Cronbach's Alpha coefficient to measure the internal consistency of the items in the instrument (Azwar, 2010; (Sekaran & Bougie, 2016).

To determine the reliability of the instrument for understanding the concept of writing scientific articles, Cronbach's Alpha is used with the following formula: $\alpha = (K / K\text{-}1) * (1 - \Sigma si^2/s^2)$. Cronbach's Alpha formula is used to measure the internal reliability of an instrument, such as a questionnaire. Internal reliability measures how consistently the items in an instrument measure the same construct.

RESULTS AND DISCUSSION

This research and development begin with determining the research objectives, namely developing an instrument for understanding the concept of writing scientific articles and determining the validity and reliability of the test. Based on an in-depth study of various scientific writing theories, including the CARS model, the Day and Gastel writing cycle, and the Flower and Hayes writing process theory, the authors develop an instrument designed to measure participants' conceptual understanding of various aspects of writing scientific articles. This instrument measures participants' ability to apply good writing principles, from planning to final revision.

Content validation in this study is conducted through an expert judgment approach, where a number of experts who have expertise and experience in related fields are asked to assess the relevance of each item to the concept to be measured, as well as provide input on the dimensions, indicators, and questions developed. Experts involved in this validation include the following fields: educational evaluation, instrument measurement/construction, and research methodology. This process aims to ensure that the instrument used can accurately measure the desired variables and meet academic quality standards. The results of this validation are used to revise and improve the instrument, so as to improve the reliability and validity of the measurements carried out in the study. The results of content validation are shown in Table 2.

Table 2. Results of Calculation of Content Validity of Understanding the Concept of Writing Scientific Articles

No	Panelist			ne	CVR	Min Value CVR	Description
	1	2	3		(2ne/n)–1		
1	1	1	1	3	1	0.6	Valid
2	1	1	1	3	1	0.6	Valid
3	1	1	1	3	1	0.6	Valid
4	1	1	1	3	1	0.6	Valid
5	1	1	1	3	1	0.6	Valid
6	1	1	1	3	1	0.6	Valid
7	1	1	1	3	1	0.6	Valid
8	1	1	1	3	1	0.6	Valid
9	1	1	1	3	1	0.6	Valid
10	1	1	1	3	1	0.6	Valid
11	1	1	1	3	1	0.6	Valid
12	0	1	1	2	0.333333	0.6	Not Valid
13	0	1	1	2	0.333333	0.6	Not Valid
14	1	1	1	3	1	0.6	Valid
15	1	1	1	3	1	0.6	Valid
16	1	1	1	3	1	0.6	Valid
17	1	1	1	3	1	0.6	Valid
18	1	1	1	3	1	0.6	Valid
19	1	1	1	3	1	0.6	Valid
20	1	1	1	3	1	0.6	Valid
21	1	1	1	3	1	0.6	Valid
22	1	1	1	3	1	0.6	Valid
23	1	1	1	3	1	0.6	Valid
24	1	1	1	3	1	0.6	Valid
25	1	1	1	3	1	0.6	Valid
26	1	1	1	3	1	0.6	Valid
27	1	1	0	2	0.333333	0.6	Not Valid
28	1	1	1	3	1	0.6	Valid
29	1	1	1	3	1	0.6	Valid
30	1	1	1	3	1	0.6	Valid
31	1	1	1	3	1	0.6	Valid
32	1	1	1	3	1	0.6	Valid
33	1	1	1	3	1	0.6	Valid
34	1	1	0	2	0.333333	0.6	Not Valid
35	1	1	1	3	1	0.6	Valid
36	1	1	0	2	0.333333	0.6	Not Valid
37	1	1	1	3	1	0.6	Valid
38	1	1	1	3	1	0.6	Valid

No	Panelist			ne	CVR	Min Value CVR	Description
	1	2	3		(2ne/n)–1		
39	1	1	1	3	1	0.6	Valid
40	1	1	1	3	1	0.6	Valid
41	1	1	1	3	1	0.6	Valid
42	1	1	1	3	1	0.6	Valid
43	1	1	1	3	1	0.6	Valid
44	1	1	1	3	1	0.6	Valid
45	1	1	1	3	1	0.6	Valid
46	1	1	1	3	1	0.6	Valid
47	1	1	1	3	1	0.6	Valid
48	0	1	1	2	0.333333	0.6	Not Valid
49	1	1	1	3	1	0.6	Valid
50	1	1	1	3	1	0.6	Valid
51	1	1	1	3	1	0.6	Valid
52	1	1	1	3	1	0.6	Valid
53	1	1	1	3	1	0.6	Valid
54	1	1	1	3	1	0.6	Valid
55	1	1	1	3	1	0.6	Valid
56	0	1	1	2	0.333333	0.6	Tidak Valid
57	1	1	1	3	1	0.6	Valid
58	1	1	1	3	1	0.6	Valid
59	1	1	1	3	1	0.6	Valid
60	1	1	1	3	1	0.6	Valid
61	1	1	1	3	1	0.6	Valid
62	1	1	1	3	1	0.6	Valid
63	1	1	1	3	1	0.6	Valid
64	1	1	1	3	1	0.6	Valid
65	1	1	1	3	1	0.6	Valid
66	1	1	1	3	1	0.6	Valid
67	1	1	1	3	1	0.6	Valid
68	1	1	1	3	1	0.6	Valid
69	1	1	1	3	1	0.6	Valid
70	0	1	1	2	0.333333	0.6	Not Valid
71	1	1	1	3	1	0.6	Valid
72	1	1	1	3	1	0.6	Valid
73	1	1	1	3	1	0.6	Valid
74	1	1	1	3	1	0.6	Valid
75	1	1	1	3	1	0.6	Valid
76	1	1	1	3	1	0.6	Valid
77	1	1	1	3	1	0.6	Valid
78	1	1	1	3	1	0.6	Valid
79	1	1	1	3	1	0.6	Valid
80	1	1	1	3	1	0.6	Valid
81	1	1	1	3	1	0.6	Valid
82	1	1	1	3	1	0.6	Valid
83	1	1	1	3	1	0.6	Valid

No	Panelist			ne	CVR	Min Value CVR	Description
	1	2	3		(2ne/n)–1		
84	1	1	1	3	1	0.6	Valid

Each question item in this research instrument has been adjusted based on suggestions and input from experts involved in the content validation process. Validation is carried out using the Content Validity Ratio (CVR) method, in which experts assess the level of relevance of each question item to the research objectives. The results of the CVR analysis show the values used to determine the eligibility of each question item based on the critical CVR value that corresponds to the number of experts. Question items that do not meet the content validity criteria are revised or removed, while items that are considered essential are retained to ensure that the instrument has adequate content validity.

Based on the content validity analysis, the calculation results show that the instrument has a very good level of content validity. This is indicated by the average value of the level of agreement of experts on each item in the instrument or S-CVI/Ave (Scale Content Validity Index/Average) of 0.968 and is supported by the results of the proportion of items in the instrument that have a level of agreement by all experts or S-CVI/UA (Scale Content Validity Index/Universal Agreement) of 0.905. A good S-CVI/UA value indicates a high level of agreement among experts on the relevance of the instrument items to the construct being measured. Meanwhile, the overall index of the instrument's content validity or CVI value of 0.937 further strengthens this finding. These results provide strong evidence that the instrument has met the content validity standards that are very adequate for use in research or measurement.

Based on the results of content validation, revisions were made to the test items. Although 76 items were declared good based on content validation, this is not strong enough to conclude that the items are valid and reliable to measure the understanding of the concept of writing scientific articles. The content validation is only limited to the suitability of the material with the understanding of the concept of writing scientific papers. The results of the content validation could not yet show how the lecturers responded to the items. Therefore, further validation is needed to determine the level of validity and reliability of the items that have been developed and to determine the lecturers' responses to the items.

Empirical validation aims to ensure that the data obtained through the instrument is in accordance with the concept being measured. The empirical validity test in this study was conducted online by utilising the Google Forms platform which facilitates the distribution of questionnaires and reaches respondents from various regions efficiently. This study involved participants in scientific article writing training from 17 training location cities, namely Bandar Lampung, Bandung, Banyuwangi, Cirebon, Denpasar, Gorontalo, Jambi, Jakarta, Majene, Makassar, Manado, Palembang, Palu, Pekanbaru, Solo, Tegal, and Ternate. The selection of participants as respondents is based on the diversity of their geographical backgrounds and experiences as participants in scientific article writing training, so that it is expected to provide a more comprehensive representation of the reliability and relevance of the instruments being tested.

This validation process involves statistical analysis of the responses of 275 participants to evaluate the overall quality of the instrument. A total of 84 questions developed in the initial stage of this study are simplified into 42 questions after going through a content validation process by a team of experts. This simplification was carried out to ensure that only questions that have high relevance and the best quality were retained for further testing. Each selected question item includes both positive and negative statements to ensure a balance of perspectives in measurement and prevent bias in participant responses. Furthermore, the 42 questions are tested through empirical validity testing involving 275 respondents who participate online.

Table 3. Empirical Validity Test Results

Number	*Corrected Item-Total Correlation*	*Cronbach's Alpha if Item Deleted*	Decsription
1	.431	.859	valid
2	.447	.853	valid
3	.438	.859	valid
4	.530	.852	valid
5	.427	.859	valid
6	.509	.852	valid
7	.364	.859	valid
8	.471	.853	valid
9	463	.859	valid
10	.493	.852	valid
11	.432	.860	valid
12	.486	.853	valid
13	.374	.860	valid
14	.452	.853	valid
15	.412	.859	valid
16	.498	.852	valid
17	.418	.859	valid
18	.420	.854	valid
19	.475	.858	valid
20	.334	.857	valid
21	.379	.860	valid
22	.435	.854	valid
23	.384	.860	valid
24	.511	.852	valid
25	.436	.859	valid
26	.493	.852	valid
27	.428	.859	valid
28	.521	.852	valid
29	.415	.860	valid
30	.501	.852	valid
31	.433	.860	valid
32	.557	.851	valid
33	.365	.860	valid
34	.452	.853	valid
35	.391	.861	valid

Number	*Corrected Item-Total Correlation*	*Cronbach's Alpha if Item Deleted*	Decsription
36	.373	.855	valid
37	.359	.860	valid
38	.500	.852	valid
39	.446	.859	valid
40	.428	.854	valid
41	.337	.860	valid
42	.476	.853	valid

In the table above, see the Scale Corrected Item-Total Correlation value which is the Item Validity value, while the Croncbach's Alpha if Item Deleted value is the Item Reliability value. To assess whether the values above (Item Validity and Item Reliability) are valid and reliable, compare them with the R Table at DF = N-2 and Probability 0.05.

The steps for item validity start from calculating the Corrected Item-Total Correlation for each item to measure the relationship between the item score and the total score, which is continued by evaluating the Cronbach's Alpha if Item Deleted value to determine the impact of item deletion on the reliability of the instrument. Item validation is carried out to evaluate the quality of each item in the instrument based on the analysis of the Corrected Item-Total Correlation and Cronbach's Alpha if Item Deleted. The validity of the items was tested by comparing the Corrected Item-Total Correlation value of each item with the R Table value at df= 40 (n= 42, df= n-2) with a probability of 0.05. The R Table value used was 0.3044. Based on the results of the calculation of the total item correlation for 42 questions, the analysis results showed that all 42 items had a Corrected Item-Total Correlation value greater than 0.3044, so all items were declared valid.

All items have a value of $r_{it} > r_t$, indicating that each item has a significant correlation with the total score. The item with the highest value is X32 (r_{it}= 0.557), indicating the greatest contribution to the construct being measured. The item with the lowest value is X20 (r_{it}= 0.334), but it is still valid because it is greater than the critical value. This value indicates that each item has a significant correlation with the total score of the instrument, so it can be said to be able to measure aspects of the concept of writing scientific articles that are designed accurately.

The reliability of the instrument is assessed using the Cronbach's Alpha method, which measures the internal consistency of all items in the instrument. The steps start from calculating the overall Cronbach's Alpha, then comparing the Cronbach's Alpha value with the standard value of 0.7 as the minimum acceptable reliability limit.

Based on the results of the analysis, the Cronbach's Alpha Based on Standardised Items value was 0.852, higher than the recommended minimum threshold of 0.70. This value indicates that the instrument has very good internal consistency, so it can provide stable and reliable measurement results in the same population. In other words, the items in the instrument correlate well with each other in measuring the same concept, namely the understanding of the concept of writing scientific articles so that the instrument has good reliability.

From the analysis results, the Cronbach's Alpha value of 0.852 indicates that the instrument has high internal consistency. Each subdimension is also tested, and all had a Cronbach's Alpha value above 0.7, indicating good reliability for each dimension.

CONCLUSION

This study successfully proves that the initial hypothesis regarding the importance of developing valid and reliable instruments in writing scientific articles can be accepted. Through the application of the ADDIE model, the developed instrument is able to accurately measure lecturers' ability to understand the concept of writing scientific articles.

The argument that understanding the structure, methodology, and ethics of publication is an essential element in writing scientific articles is strengthened by the results of empirical validation. All 42 instrument items showed a significant correlation with the total score, proving that each item supports the measurement of concepts consistently.

This study opens up new opportunities for the use of similar instruments in other writing training contexts, including for students or novice researchers. It also suggests that training based on valid and reliable instruments can significantly improve the quality of scientific publications.

In general, the validity and reliability of this instrument make an important contribution to academic evaluation. However, the generalization of the results needs to be further tested on a wider population or with different settings. The implication of this study is the need for policies that support the use of this instrument in academic training and evaluation to improve the quality of scientific publications in Indonesia.

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