

## Development of Instruments for The Feasibility of Instructional Media on General Biology Material

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### ABSTRACT

*Purpose:* produce a valid research instrument to measure the feasibility of instructional media on general biology material.

*Methodology:* This research and development uses the Thiagarajan model, which consists of define, design, and develop. The research subjects were two lecturers out of 10 lecturers in the department of Biology Education at IKIP Budi Utomo. The research instrument is a questionnaire on the validity of the instructional media instrument given to two lecturers. The research data is the instrument validity score and comments from experts. The data analysis technique is descriptive qualitative.

*Results:* The results of the study indicate that the instrument of eligibility for instructional media that has been developed is valid (99.36%, very valid criteria), so that it can be used as a measuring instrument for the validity of instructional media on general biology material.

*Applications/Originality/Value:* In the case of existing development research, researchers often rule out testing the validity of the instrument, meaning that here it is necessary to emphasize that the researcher must first test the validity of the instrument. This is important for researchers in the field of formal education and researchers in the instructional media industry so that the research instruments are unquestionable and the research data obtained can be accounted for. So that the instructional media developed will be effective in overcoming learning problems. Thus, the development of this research instrument could be a valuable guide for researchers to use research instruments that have been declared valid by experts.

**Keywords:** development, research instruments, instructional media

### INTRODUCTION

Instructional media have an important role in the current learning process (Aflalo & Gabay, 2013; Sambodo et al., 2018). The form of instructional media that is often used during a pandemic is multimedia which includes a combination of text, images, audio, and video (Khasanah & Muflihah, 2021; Huwaidi et al., 2021). The use of multimedia in learning provides a valuable experience for students (Maria et al., 2019; Sukarini & Manuaba, 2021; Habib et al., 2021). The importance of instructional media as a supporter of the learning process is one thing that needs to be considered in the development process. Some development products are not developed through a development procedure according to the existing theory or the existence of the instrument used does not meet the accuracy aspect.

Instruments are vital in educational research (Md Ghazali, 2016). It is through these instruments that data can be obtained and interpreted. Some media development products were developed using less specific instruments. Based on the validity of an instrument, it must pay attention to aspects of construct validity and content validity. Research by Sari & Iza (2018) and Setiawan & Arifin (2017) shows that the media feasibility instrument has the same aspects or question items even though the assessors have experts in different fields. This is not appropriate because each expert or expert assesses aspects according to their expertise on the product to be developed. If this continues, the credibility and accuracy of the media developed will be inappropriate. Therefore, it is necessary to compile a valid media feasibility instrument to produce instructional media that can be accounted for in terms of concepts, media technicalities, and usability in learning.

In this study, the development of media feasibility instruments focused on content and construct validity. Content validity consists of relevance and representation, correct use of grammar, and conformity with theory. Construct validity contains the suitability between the aspects measured by the theory by experts (Yusoff, 2019; Taherdoost, 2018). The media feasibility instrument by material experts focuses on the truth and accuracy of the material concept. The media feasibility instrument by media experts contains question items related to media design and components. The media feasibility instrument by practitioners contains aspects of the suitability and usefulness of the media in the learning process. The media feasibility instrument by students contains the interest and meaning of the media in learning.

## RESEARCH METHOD

This type of research is research and development with the Thiagarajan development model consisting of define, design, and develop. The subjects of this study were two lecturers from 10 lecturers in the Biology Education Department of IKIP Budi Utomo who were competent in the field of educational evaluation. The research instrument used was a questionnaire validation instrument for the feasibility of instructional media. The research procedure begins by compiling the instrument of the feasibility of instructional media based on the established indicators. Next, compile a questionnaire to test the validity of the instrument for the feasibility of instructional media and give the questionnaire to two lecturers in the biology education department of IKIP Budi Utomo. Research data are instrument validity scores and information in the form of comments from experts. The research data analysis technique was carried out by calculating the validity score from the experts through the formula below. Furthermore, the calculation results will be converted in the form of validity criteria (Hidayati, Pangestuti, et al., 2019) as shown in Table 1.

**Tabel 1.** Validation criteria

Validity value (%)	Validity criteria	Description
81-100	Strongly valid	No revision
61-80	Valid	No revision
41-60	Fairly valid	Revision
21-40	Less valid	Revision
0-20	Strongly not valid	Revision

## RESULT AND DISCUSSION

Define, at this stage information is obtained about the use of feasibility instruments used by researchers in the Budi Utomo IKIP environment. The instrument for validating the feasibility of instructional media is usually obtained from various sources from the internet that are suitable and used to measure the validity of the developed instructional media. There are no lecturers who have developed a feasibility instrument specifically tailored to the needs. We also found the use of the same instrument to measure aspects that actually differed clearly in terms of expertise. An example is an instrument given to the material expert is exactly the same as the instrument given to the media expert. The feasibility instrument given to the material expert should contain question items about the correctness of the material concept in the instructional media, while the feasibility instrument given to the media expert focuses more on aspects of the media component as appropriate teaching materials. The results of the task and concept analysis show that the instrument for the feasibility of instructional media must be developed according to the domain of each expert so that the assessment can be carried out correctly and in accordance with the characteristics of the user. A summary of the aspects that must exist in each instrument of instructional media feasibility is presented in Table 2 below.

**Table 2.** Summary of aspects developed for each instrument of instructional media feasibility

Instruments for each expert	Aspects of assessment that must exist
Eligibility instrument for materials expert	The truth and accuracy of the concept of the material presented, the integrity of the material and the systematics of writing, conformity to the curriculum, and conformity of the concept to theory.
Eligibility instruments for media experts	Completeness and accuracy of component elements as learning media, visualization and display, ease of operation, security and privacy, technical quality of media, main menu design and typography and submenu details, and appropriateness of the language used
Eligibility instrument for practitioners	The accuracy of the learning media with the material and students, the suitability of the design and presentation on the media, the accuracy of the selection of activity elements and forms of evaluation, the completeness of the media as supporting learning activities, and the suitability of the level of knowledge development of students
Eligibility instrument for students	Usefulness and meaningfulness of media for students, security and ease of access, independence and flexibility of media use, contribution in developing student knowledge and skills,

Design, the result of this stage is the distribution of question items on each instrument of the feasibility of instructional media to each expert which is adjusted to the results obtained at the define stage. There are 52 items of questions about concepts developed to be assessed by material experts, 45 items of questions about the elements of media accuracy to be assessed by media experts, 41 items of questions about the implications of media in learning activities, and 32 items of questions about student responses to the media developed. The four instruments developed were then selected in an appropriate format to form a feasibility instrument that is ready to be used to validate instructional media on general biology material. The selection of this format is done to facilitate the assessment by experts with clear instructions for filling out, detailed expert identities, question items are presented in table form and can be filled in using a Likert scale, and there are suggestions and comments columns to improve the developed instrument, as well as sections available. signature as validity in filling out the instrument. The media chosen in this case is print media to accommodate the needs of filling the instrument properly.

Develop, the instrument for the feasibility of instructional media that has been designed, is tested for validity by experts. The results of this activity are the data in the assessment of the distribution of indicators for the development of instructional media feasibility instruments by experts (Table 3) and data on the validation results of instructional media feasibility instruments by experts (Table 4).

**Table 3.** Assessment data on the distribution of indicators for the development of instructional media feasibility instruments by experts

Instruments for each expert	Indicators on each aspect	Question number	Criteria
Eligibility instrument for materials expert	Material equipment	1f, 1g, 1j	Eligible
	The suitability of the material with the curriculum	1a, 1b, 1d, 1e, 1h	Eligible
	Material accuracy	2a, 2d	Eligible
	Systematic presentation of material	3a, 3b, 3c	Eligible
	The truth of the material concept	2e	Eligible

	Details of the concept of each material	III, II2, II3, II4, II5, II6, II7, II8, II9, III0	Eligible
	Material presentation	2b, 2c, 3d	Eligible
Eligibility instrument for media experts	Multimedia components	1a, 1b, 1c, 1d, 1e	Eligible
	Multimedia display	2a, 2b, 2c, 2d	Eligible
	Multimedia technical quality	3a, 3b, 3c, 3d, 3e	Eligible
	Visualization accuracy	4a, 4b	Eligible
	Multimedia design	5a, 5b, 5c, 5d	Eligible
	Typography	6a, 6b	Eligible
	Illustration / drawing	7a, 7b	Eligible
	Content design	8a, 8b, 8c, 8d, 8e, 8f, 8g	Eligible
	Typography of each submenu	9a, 9b	Eligible
	Illustration of each material	10a, 10b, 10c	Eligible
	Language Accuracy	11a, 11b, 11c, 11d	Eligible
Serving equipment	12a, 12b, 12c, 12d, 12e	Eligible	
Eligibility instrument for practitioners	The accuracy of multimedia design as a learning medium	1a, 1b	Eligible
	Multimedia equipment	2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j, 2k, 2l	Eligible
	Concept presentation	3a, 3b, 3c, 3d, 3e	Eligible
	Activity accuracy	4a, 4b, 4c, 4d, 4e, 4f, 4g, 4h	Eligible
	Evaluation instruments	5a, 5b, 5c, 5d, 5e, 5f, 5g, 5h, 5i, 5j	Eligible
	The accuracy of practical activities	6a, 6b, 6c	Eligible
Compatibility with user development	7a	Eligible	
Student response instrument	Convenience and safety	2, 3, 4	Eligible
	Complete features	5, 10	Eligible
	Systematics and material completeness	6, 7	Eligible
	Integration with science and technology	12, 13, 15, 17, 30	Eligible
	Usefulness	8, 11, 16	Eligible
	Evaluation presentation	20, 21	Eligible
	Usage response	18, 19	Eligible
	Interest and meaningfulness	26, 27, 28	Eligible
	Implications for knowledge	23, 24	Eligible
	Independence	22, 31, 32	Eligible
Interactive evaluation form	25, 29	Eligible	

Table 3 shows that the distribution of indicators of the developed instrument has met the eligibility criteria, meaning that the question items match the indicators and there are no errors. To compile the instrument for the feasibility of a learning medium, accuracy is needed so that the instrument developed is appropriately and as needed. The pattern of thinking in compiling this instrument must be systematic, where the researcher must adjust each indicator with the question item (Sriadhi et al., 2019). The number of questionable items must adjust to the level of the breadth of the instrument indicators specified. The instrument developed must be relevant to the aspect to be measured (Fatimah et al., 2016). Researchers should not make mistakes in arranging question

items, where a case was found that the same question items were given to material experts and media experts. Questions should be structured with a good sentence structure so that the raters can easily give their assessment.

**Table 4.** Data from the validation of the instrument for the feasibility of instructional media from experts

Aspects of assessment	Description of each aspect	Validator 1	Validator 2	Percentage	Criteria
Relevance and representation	Conceptual definition of the instrument	4	4	100	Strongly valid
	Operational definition used	4	3	87.5	Strongly valid
	Scale on the instrument	4	4	100	Strongly valid
	Instrument function accuracy	4	4	100	Strongly valid
	Instructions / instructions for respondents	4	4	100	Strongly valid
	Representation of the number of items	4	4	100	Strongly valid
	Instrument answer format	4	3	87.5	Strongly valid
	Scoring on the instrument	4	4	100	Strongly valid
Grammatical accuracy of sentences	Grammar on the instrument of eligibility for material experts	4	4	100	Strongly valid
	Use of language in the instrument of eligibility for media experts	4	4	100	Strongly valid
	The language used in the instrument of eligibility for practitioners	4	4	100	Strongly valid
	Language on the instrument of eligibility for students	4	4	100	Strongly valid
Eligibility Instrument for Material Expert	Completeness of the material on the media	4	4	100	Strongly valid
	The suitability of the material with the curriculum used	3	3	75	Valid
	The accuracy of the developed material	4	4	100	Strongly valid
	Systematic presentation of material	4	4	100	Strongly valid
	The truth of each material concept	4	4	100	Strongly valid
	Concept details presented in each material	4	4	100	Strongly valid
	Presentation of material on the media	4	3	87.5	Strongly valid
Eligibility Instrument for Media Experts	Completeness of media components	3	4	87.5	Strongly valid
	General media view	4	4	100	Strongly valid
	Media technical quality is met	4	4	100	Strongly valid
	Visualization accuracy	4	4	100	Strongly valid
	Media design in general	4	4	100	Strongly valid
	Media typography	3	4	87.5	Strongly valid
	Illustration/image accuracy	3	4	87.5	Strongly valid

	Content design	4	4	100	Strongly valid
	Typography of each submenu	3	4	87.5	Strongly valid
	Illustration of each material serving	4	3	87.5	Strongly valid
	Elements of Language accuracy	4	4	100	Strongly valid
	Serving equipment	4	4	100	Strongly valid
Instruments of Eligibility for Practitioners	The accuracy of multimedia design as a learning medium	4	4	100	Strongly valid
	Multimedia equipment	3	4	87.5	Strongly valid
	Concept presentation	4	4	100	Strongly valid
	Activity accuracy	4	4	100	Strongly valid
	Evaluation instruments	4	4	100	Strongly valid
	The accuracy of practical activities	4	4	100	Strongly valid
	Compatibility with user development	4	4	100	Strongly valid
Eligibility Instrument for Students	Convenience and safety	4	4	100	Strongly valid
	Complete features	4	4	100	Strongly valid
	Systematics and material completeness	4	4	100	Strongly valid
	Integration with science and technology	4	4	100	Strongly valid
	Usefulness	4	4	100	Strongly valid
	Evaluation presentation	4	4	100	Strongly valid
	Respon penggunaan	4	4	100	Strongly valid
	Interest and meaningfulness	4	4	100	Strongly valid
	Implications for knowledge	4	4	100	Strongly valid
	Independence	4	3	87.5	Strongly valid
Interactive evaluation form	4	4	100	Strongly valid	
	Mean			99.36	Strongly valid

Table 4 shows that the developed instructional media feasibility instrument is declared valid with a valid value of 99.36%. This instrument was declared valid from the aspect of relevance and representation, grammatical accuracy of sentences, a feasibility instrument for material experts, a feasibility instrument for media experts, feasibility instrument for practitioners, and feasibility instruments for students as respondents using instructional media. The developed instrument is ready to be used to measure the validity of the instructional media because it fulfills the elements as an independent and appropriate measuring tool (Van Lankveld et al., 2017). The description of each aspect of the assessment of the instrument has been explained precisely so that the feasibility instrument developed is considered valid by the expert. A good instrument must meet the feasibility aspect of validation, both constructs validation and content validation (Walid et al., 2019). Instruments are also developed based on a specific purpose in order to measure accurately in order to avoid instruments that have not been standardized (Kereh et al., 2015).

The relevance and representation of the instrument explain the concept and operational definition of the instrument, the use of the instrument's scoring scale, the accuracy of the instrument's function, instructions for respondents, representation of the number of questionable items, the answer format, and the scoring of the instrument. Conceptual and operational definitions of the instrument must be written out precisely. The scoring scale of the instrument must be determined appropriately based on the aspect of effectiveness. The function of the instrument must be adjusted to the needs. Instructions

for respondents must be explained in detail so that respondents will be easy to give an assessment. The number of questionable items must be adjusted to the breadth of the instrument's indicators. The answer format must be provided properly and easily understood by the respondent. The scoring of the instrument is done by using the right formula so that the correct score is obtained. These aspects are a description of the content validity that must be owned by a research instrument (Yusoff, 2019; Hidayati & Irmawati, 2020).

The number of questionable items must be adjusted to the breadth of the instrument's indicators. The answer format must be provided properly and easily understood by the respondent. The scoring of the instrument is done by using the right formula so that the correct score is obtained. These aspects are a description of the content validity that must be owned by a research instrument (Ihsan, 2015).

The instrument of eligibility for the material expert explains the completeness of the material in the instructional media, the suitability of the material with the curriculum, the accuracy of the material, the systematic presentation of the material, the truth of each material concept, the detailed concepts presented in each material, and the presentation of the material on the media. The completeness of the material in the media must be adjusted to the development of the user's cognitive level. The material in the media must be by the curriculum used and must not deviate from the curriculum. The material on the media must have a systematic presentation that makes it easier for users to understand the material. The material in the media must have the accuracy and correctness of the concept to save users from misconceptions or misconceptions and failures in learning (Mahanal et al., 2016; Azizah et al., 2018). Presentation of material on the media must be attracted by combining text, images, and videos so that users are motivated and enthusiastic to learn. The feasibility instrument for the material expert contains aspects related to theoretical truth which is one indicator of construct validity. If the aspects developed in the instrument are valid, the construct validity of the instrument is also achieved (Kumar et al., 2016; Hidayati & Irmawati, 2019). Aspects of the material that are not described in full on the instrument will affect the accuracy of the concepts in the instructional media (Hidayati, Pangestuti, et al., 2019).

Eligibility instruments for media experts explain the completeness of media components, media appearance in general, technical quality of media are met, visualization accuracy, media design in general, media, typography, the accuracy of illustrations or images, design of material content, the typography of each submenu, illustration of each material presentation, elements language accuracy, and completeness of presentation. The components of instructional media must be complete by providing menus for easy user access. The display of the media must be attracted and not impressive so that users are motivated to learn independently. The layout of the media content must be good and harmonious so that it attracts users. The accuracy of the selection of illustrations or images must be considered so that users become clearer in understanding the contents of the media when viewing the illustrations or images provided. The buttons on the media menu must be ensured to function so that users can easily access the media. The language used in the media must be good so that it makes it easier for users to understand the content of the media. Question items on the media feasibility instrument by media experts have covered the entire function of the media as a supporter of learning activities (Munir, 2012). All aspects of the media expert instrument become a benchmark for the feasibility of a instructional media developed, as in the research by Prayitno & Hidayati (2017); Prayitno & Hidayati (2020) that media must be assessed from all its components so that it can be used in learning.

The feasibility instrument for practitioners explains the accuracy of instructional media design, media completeness, presentation of concepts, the accuracy of activities, evaluation instruments, the accuracy of practicum activities, and conformity to the development of media users. The design of instructional media must be attractive and easily accessible to users. The completeness of the media must be adjusted to the needs in achieving the learning objectives that have been set. The presentation of the concept in the media must be clear so that it will not cause misconceptions

for users. Activities that support the learning process must be available on media such as student activity sheets and practicum activities so that users can learn in their entirety when using the media. Evaluation questions must be provided to the media so that they can be used to measure user competence and user success in learning. Aspects developed in this instrument are carried out to determine the usability and usefulness of media in learning activities so that they can achieve learning objectives (Preeti, 2014). The question items in this section are used as indicators of the accuracy and success of using instructional media in the classroom (Maimunah, 2016; (Hidayati et al., 2019).

The instrument of eligibility for students explains the ease and safety of media, completeness of media features, systematics and completeness of material, integration with information technology, usefulness, evaluation, presentation, response to use, interest and meaningfulness, implications for knowledge, independence, and forms of interactive evaluation. The instructional media developed must be easily accessible to users. The media display should be attractive and the buttons on the media features should function properly. The material in the media must be presented in a systematic and appropriate manner. Media must be integrated with information technology so that users can access media anywhere and anytime. Instructional media must be able to increase user motivation so that users are enthusiastic in learning either classical or independently. The form of evaluation of the media must be interactive so that users can measure their competence after knowing the results of working on evaluation questions. The contents of this instrument meet valid aspects so that later it can be used to measure student responses to the developmental media (Walid et al., 2019; Buzi et al., 2019).

The results of this study provide an illustration that in order to produce a good learning media, you must first go through the instrument feasibility stage. A valid and appropriate instrument will be the right measuring tool for assessing the developed learning media. In contrast to previous research by Setiawan & Arifin (2017), Qomariyah & Prayitno (2018), dan Firdaus et al. (2020) about the development of learning media with assessment instruments that have not been validated. So that this condition causes the resulting learning media to still have shortcomings.

## SUMMARY

The instrument for the feasibility of the instructional media developed was declared valid with a valid value of 99.36% so that it could be used as a measuring tool to test the validity of instructional media on general biological material. Research findings can provide valuable input to researchers that they must test the validity of the instrument for the feasibility of learning media first before using it in validating learning media.

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