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The Validity of Educational Games Kahoot as Learning Assessment Tools for Prospective Biology Teacher Students

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Abstract: The rapid development of technology today requires development in the field of learning media in order to integrate technology in its process. One of strategy that can be used is integrating the technology as assessment tools. In this research, the platform that used is Kahoot. The objective of this research was to determine the validity products as assessment tool. This research used a modified 4D development model that only implemented till expert validation. Based on the expert validity test shows in terms of content/material aspect the product obtains 93.75% score with very valid criteria, then 97.50% score with very valid criteria also in media aspect, and 98.75% score with very valid criteria in language aspect. Based on this expert validity test, the product obtained overall validity score with a high percentage with a 96.67% value which meets the very good validity criteria. This study shows that the integration of technology can be combined as an assessment tool for prospective biology teacher students. This study is still limited to the validity test only, then this validated product can be used for further research to measure the level of effectiveness and practicality of its use.

Keywords: Assessment tools; Biology; Kahoot; Learning innovation; Validity

Introduction

The Biology course in the Biology Education Study Program at PGRI University of Kalimantan covers various basic concepts of biology that are important for students to understand more complex principles of biology. However, the challenge in teaching this course is making learning interesting and interactive so that students can understand the material better and feel motivated to learn (Guaña-Moya et al., 2024; Jasman et al., 2024; Wibawa et al., 2024). Interesting and interactive learning need a specific strategy or approach (Barnett-Itzhaki et al., 2023; Chen et al., 2025). Conventional learning methods such as lectures and discussions are sometimes not effective enough to explain concepts related to learning materials (Kozanitis & Nenciovici, 2023; Utami et al., 2021). Therefore, a more interactive and enjoyable learning method is needed to facilitate better understanding so that learning will be more effective.

Effective learning in the digital era requires innovation and variation in the method of delivering material to attract students' interest and attention (Subhash & Cudney, 2018; Sulistyanto et al., 2023). This is one of the challenges for an educator. Learning in higher education requires an innovative and interactive approach to facilitate deep and sustainable understanding in students (Ramaila & Molwele, 2022; Samin et al., 2022). Innovation in learning methods and media is one solution to overcome this challenge (Gani et al., 2022). The use of varied learning methods is natural for teachers as educators. Interesting learning methods can have a positive impact on learning outcomes and also learning motivation for the students (Alika & Radia, 2021; Fitriyadi & Wuryandani, 2021). A learning method that can be an innovation in the learning process is the educational game method

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(Indiaka et al., 2025; Tan et al., 2025; Satari et al., 2024; Usman et al., 2024; Wali et al., 2025). Educational games have been proven to be an effective method in increasing student engagement and motivation to learn. Several previous studies that used the game method in learning activities showed satisfactory results (Jarrah et al., 2024; Lampropoulos et al., 2023; Mursalin et al., 2024). To implement the educational game method, of course, requires a learning media to makes students active, intrested, and curious during learning process (Dirman & Mufit, 2022; Dunggio et al., 2024). The use of good media will guide the implementation of quality learning according to expectations, especially a good process can improve good learning outcomes (Jadmiko & Setiawan, 2024; Suryadi et al., 2025).

Educational game media is a game tool that is specifically designed for educational purposes (Özmen, 2025; Rahma & Suratno, 2024). In the context of learning carried out by students, they are currently accustomed to fast access to information and entertainment on the internet so learning media that follow technological trends are more successful in attracting their attention (Fajri et al., 2024; Guaña-Moya et al., 2024; Julio et al., 2026; Pancawardhani et al., 2022; Sitinjak et al., 2025). Through educational game media, teachers can combine learning activities with playing activities.

The educational game learning media developed in this study is a Kahoot! Platform. Kahoot! is a educational online page, that can be used to provides features that can be used as media in the learning process (Irwan et al., 2019; Özdemir, 2025). One of the uses of information technology that can be done by lecturers is to use Kahoot! Application as an evaluation tool in learning process (Dyanti et al., 2022; Munawati et al., 2022; Okoth, 2025; Pathoni et al., 2023). By weaving Kahoot! into core biology lessons, teachers can convert one-way lectures into lively, game-style exercises that amplify learner participation and reinforce memory retrieval (Andriani et al., 2023; Daryanes & Ririen, 2020).

Therefore, the development of this product is expected to be one of the solutions to overcome the challenges in learning general biology courses. This study output is to produced a validated kahoot!-based educational learning assessment as an innovative digital evaluation media, which specifically designed in general biology classroom for prospective biology teachers that can be used later to facilitated improving students' learning outcomes and motivation. In addition, the result of this research are expected to contibuted to the learning media development in Universitas PGRI Kalimantan.

Method

The type of research used is research and development (research & development). In this case, the research will develop a product in the form of educational game media based on Kahoot! as a learning evaluation tool in General Biology courses. The procedure for developing educational game media based on Kahoot! in this study used the modified 4D development model (define, design, develop, and disseminate) from Thiagarajan (1974). This study was only carried out till expert validation stages without testing in limited trials, field trials and dissemination stages. This research excluded the dissemination stage due to the limitation scope, which focused on product development and validation.

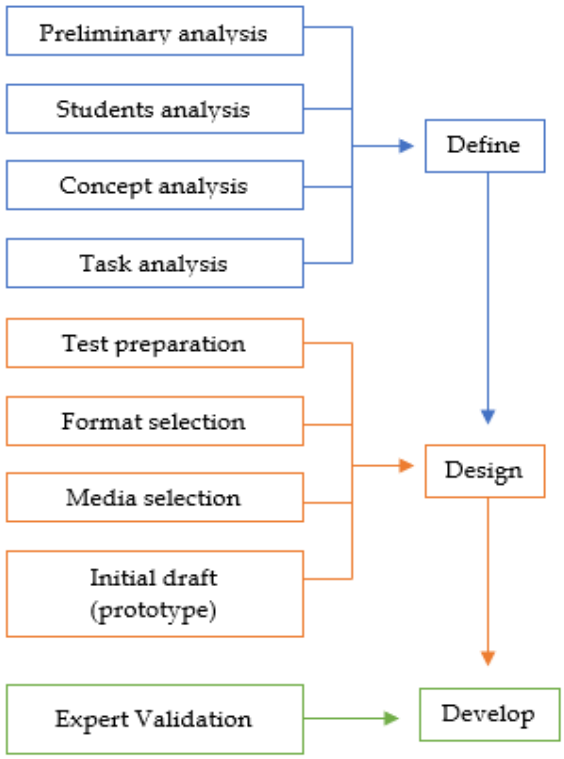

Figure 1. The research flowchart

The subjects of this research and development is an expert validator. In this study there's 4 expert validators, which consist of 3 expert validators biology education lecturers and 1 expert validation science education lecture. The data in this study consist of media validity data of the developed media. The collected research data will be analyzed descriptively.

Validation data was collected through a validation sheet instrument that using a 4-point likert scale score which modified from Sugiyono (2013) 5-point scale, this modification aim is to avoid the central tendency bias. The descriptions of each score can be seen as follows.

Table 1. Validity test scale

Score	Category
4	Very good
3	Good
2	Enough
1	Invalid

(Sugiyono, 2013)

The results of the validation score calculation was analyzed to find the percentage of the score so that the level of validity can be known. The percentage of the validation score is then calculated using the following formula.

$$\text{Percentage score} = \frac{\text{Total score obtained}}{\text{Maximum score}} \quad (1)$$

(Huda et al., 2025)

The percentage of product development validation scores is then interpreted based on the Criteria Table 2.

Table 2. Validity test percentage criteria

Score percentage (%)	Category
85–100	Very valid
70–84	Valid
50–69	Enough
< 50	Invalid

(Riduwan, 2012)

Result and Discussion

The figure above showed the sample from the developed product. The development product which is interactive media kahoot as assessment tools, consist a 40 questions in general biology courses for a prospective biology teacher students. Before the Kahoot!-based educational game media are able to implemented in the learning situation as assessment tools, validation is needed to ensure its quality and feasibility.

This validation process involves three main aspects: content/material, design, and language. It is carried out to evaluate the feasibility of the product based on various aspects. The indicator of content aspect contains are focused to measure how valid the product substance such as conformity of questions with course learning outcomes, the conformity of questions with question indicators, the level of difficulty of questions, the variation of difficulty level, and the accuracy of the information or concepts used.

Meanwhile, the indicator of media aspect indicator are focused on attractive and interactive appearance, ease of use by students, adequate time limits, suitability of images to learning materials, and features to view scores or evaluation results. Then, the language aspect indicator are focused to measure the quality of language in the product, that includes criteria such as the suitability of the language to the level of students, consistency of terms and grammar, clarity and absence of ambiguity, and the use of effective and interesting sentences. The details of each validity aspect result and recapitulation will be explained in the following the subseqtion.

Expert Validity Test Recapitulation
Content Aspect

Table 3. Content aspect validity test

Indicator	Score			
	V1	V2	V3	V4
Conformity between questions and course learning outcomes	4	4	4	4
Conformity between questions and question indicators	4	4	4	3
The level of difficulty of the questions is according to the student's level	4	4	4	3
There are variations in the level of difficulty of the questions	4	4	3	3
Accuracy of information/concepts used	4	4	4	3

As we can seen in the table 3 above the recapitulation, after gained all of validation score then by using the formula, the result obtained shows that the content/material presented in the instrument has a validity percentage of 93.75%. This indicates that the material used in the questions developed is very valid and relevant to the course learning outcome, and can support the achievement of the expected competencies.

High validity indicates that the product that has been developed in this study is suitable for use to measure student learning outcomes optimally. Content validity ensures that the questions are relevant to the material, competencies, and learning indicators that have been set by the teacher or lecturer. This is in accordance also with Biggs & Tang (2011), which stated that learning assessment tasks must be directly mapped to intended learning outcomes for valid measurement of student achievement. It also supported by Sadler (2005), which state learning outcome allignment is essential for both teacher validation and student understanding of expectations. The questions that used as assesment tools must be relevant with the students knowledge level (Anderson & Krathwol, 2001).

Media Aspect Validation

Table 4. Media aspect validity test

Indicator	Score			
	V1	V2	V3	V4
Attractive and interactive display	4	4	4	4
Ease of use by students	4	4	4	4
There is a time limit for working on and completing questions	4	4	4	4
The images used are in accordance with the questions or learning materials being tested.	3	4	3	4

Indicator	Score			
	V1	V2	V3	V4
Availability of features to view scores or evaluation results	4	4	4	4

Then, as we can seen in the table 4 above the recapitulation, after gained all of validation score then by using the formula, the result obtained shows that the media aspect obtained a validity percentage of 97.50%. This percentage indicates that the media used is very valid and supports the effectiveness of delivering material to users. This assessment includes five main indicators, which are designed to assess the quality and effectiveness of the evaluation media. The Kahoot! based evaluation media developed in this study has an attractive and interactive design with a maximum score from all validators, maintains student attention and participation, and is easy to use in accessing and working on questions. The time limit feature is considered very good because it is in accordance with the evaluation objectives, while the evaluation result feature allows students to immediately know their performance.

This findings shows that based on validity test can be a innovative learning media that attractive to used as a learning assessment tools that can led students learning motivation increase (Plass et al., 2015). The validity test also make sure to make this product features are accessible to the students, reducing extraneous through clear layout, and equal with their cognitive load (Sweller et al., 2011).

Language Aspect Validation

Table 5. Language aspect validity test

Indicator	Score			
	V1	V2	V3	V4
Use of language appropriate to the student's level	4	4	4	4
Consistency of terms and grammar	4	4	4	4
Contains no ambiguity	4	4	4	4
Questions use clear sentences, delivered briefly and concisely.	4	4	4	4
Using interesting and relaxed language	4	4	3	4

Last but not least, in the table 5 above the recapitulation, after gained all of validation score then by using the formula, the result obtained shows that the language aspect of the instrument obtained the highest validity percentage, which was 98.75%. This indicates that the use of language in the instrument is very good, communicative, easy to understand, and interesting for users. This high language validity supports the effectiveness of the evaluation media in conveying learning objectives optimally. Clear and engaging language is essential in the evaluation process to ensure that participants understand each question well without ambiguity. Good and correct written and oral delivery of information must be done without causing ambiguity in language. The ability to convey written and oral information accurately and correctly, without confusion, is also an important aspect of developing effective evaluation instruments. This findings also showed the outstanding clarity and consistency in structural and precise terminology to helps readers to navigate academic text and task without ambiguity (Redish, 2014).

This research analyzes are focused on the products that have been developed with the aim of assessing their feasibility based on the established criteria. The validity expert test score recapitulation shows that the products or instruments developed show very valid criteria or categories in terms of content, media, and language. In the following table 6 shows the overall percentage of validity score data that products obtained can be seen more detailed with the category of each aspect achived.

Table 6. Validity test overall recapitulation

Validity Aspects	Percentage (%)	Category
Content/Material	93.75	Very Valid
Media	97.50	Very Valid
Language	98.75	Very Valid

The average percentage of validity of the three aspects (content, media, and language) reached 96.67%. This result shows that the developed instrument meets very good criteria, both in terms of content, media, and language. This high validity reflects that the instrument is not only relevant to the learning material, but is also supported by interesting media and communicative and easy-to-understand language. With this very good validity, the evaluation instrument can be used as a proper and quality tool for measuring.

In addition, each validator provided suggestions for improvement as evaluation material for future improvements. The suggestions provided include improving the quality of the interface display and refining several questions to better suit the level of student understanding. With this input, it is hoped that this evaluation media can be more effective and optimal in supporting the learning process.

Expert Validators Suggestion for Improvements

Table 7 contains suggestions for improvement provided by the validators to improve the quality of educational game media products based on Kahoot!. All validators stated that the evaluation instrument developed was in accordance with the expected criteria. This instrument is considered capable of providing a positive contribution to improving the quality of learning, especially in terms of effectiveness, relevance,

and ease of use. Thus, this instrument is worthy of being used in the learning process.

Validator 1 suggested that the illustration images used in some questions be replaced with more appropriate ones to avoid double interpretation. In addition, it is recommended that the images selected be adjusted to the level of student knowledge, so that they do not look too simples. The use of relevant and specific images can help avoid confusion for participants in understanding the questions. Images that are appropriate to the level of student knowledge can also increase the suitability of the media to the target user, making it more interesting and effective.

Table 7. Validator suggestions

Validator	Validator Suggestions
1	In general, it is good, but there are several questions that contain illustrative images that require other images to be found that are more appropriate to the question so that there is no "double interpretation". For the use of images, perhaps the images used can be adjusted to the knowledge level of "students" so that they do not look too simple.
2	For cognitive levels in questions 18 and 34, it is best to check them again.
3	The evaluation media developed is very good with an interesting and interactive presentation when accessed. The suitability of the questions with CPMK and its indicators is also very good. As for suggestions for the development of evaluation media in the future, additional variations of question types can be provided.
4	Should accommodate a variety of learning styles. Add more responsive images/videos/sounds to visual and audio media. Combine question types such as true/false, polling, etc.

Validator 2 suggested rechecking the cognitive level of questions 18 and 34, to ensure that the questions are in accordance with the expected learning objectives. The researcher has checked and improved the cognitive level of the questions before being tested. Checking the cognitive level is important to ensure that the questions cover various levels of learning taxonomy, from basic understanding to analysis and evaluation. This will help measure students' abilities more comprehensively.

Validator 3 appreciated the presentation of the media which was already interesting and interactive and the suitability of the questions with CPMK. However, for further development, it is recommended to add variations in the types of questions. Adding variations in the types of questions such as true/false, multiple choice, or polling can increase the interactivity and involvement of participants. This can also help accommodate various assessment strategies that are in accordance with learning objectives. Therefore, in further research this can be a suggestion for consideration in developing similar products.

Validator 4 suggested the addition of more responsive visual, video, or audio elements and variations in question types to enhance the learning experience. However, the question variations were not revised because this study focused on multiple-choice questions in accordance with the objectives of developing Kahoot!-based evaluation media. Nevertheless, this suggestion will be considered for future development. Meanwhile, visual and audio elements have been accommodated through the use of relevant images and interactive audio effects built into Kahoot!, although the video feature is only available on premium accounts. Thus, the media developed has fulfilled the visual and audio aspects in accordance with the platform features to support optimal learning.

Conclusion

Based on the results of this research data finding about instrument validation, it can be concluded that the validity of educational game media based on Kahoot! in the evaluation of learning in General Biology courses are valid based on expert validity test and can be used during learning process. The product validity test from expert validators shows in terms of content/material aspect the product obtains 93.75% score with very valid criteria, then 97.50% score with very valid criteria also in media aspect, and 98.75% score with very valid criteria in language aspect. Based on this expert validity score the product obtain overall validity score with a high percentage with a 96.67% value which meets the very good validity criteria. Suggestions for further development from the expert recommended to continue developing the Kahoot! Media by adding variations in question types so that the evaluation is more diverse, increases learning motivation and is more in line with student needs. Even though this research was only developed until expert validation, the data showed how promising this developed product to be implemented to support the quality of learning in higher education especially for prospective biology teacher students. The future research should be continuing the development to the practicallity and the effectivity test of this product in real learning situation. It needs to assessing its impact on students learning experience and learning outcomes, and long-term strategy.

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Author Contributions

N.C.L.: literature review, methodology, developing assessment tools; R.N.: writing original draft preparation, review, and editing; and R.A.: collecting data, data analysis.

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Conflict of Interest

The authors declare that there's no conflict of interest regarding the publication of this paper.

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