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Development of a Creativity Assessment Instrument for Prospective Biology Teachers in the Bioedutainment Course

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Abstract

Biology Education students, as prospective biology teachers, must be equipped with the knowledge and skills to deliver biology lessons in an engaging and enjoyable manner. In the context of the JAS (Exploration of the Surrounding Environment) approach, Bioedutainment is a teaching strategy that aligns well with the JAS approach. Bioedutainment is a course within the curriculum of the Biology Education programme at FMIPA UNNES. The aim of this study is to develop a valid and reliable instrument to assess the creativity of students enrolled in the Bioedutainment course, specifically in designing and implementing engaging biology lessons based on the Bioedutainment strategy. This research utilises the ADDIE R&D model. The developed creativity instrument is described in terms of its characteristics, validated through expert judgment, and its reliability is measured using construct reliability coefficients (Cronbach's Alpha). The findings indicate that the three developed creativity assessment instruments align with the creativity aspects of fluency, flexibility, elaboration, and originality. Expert evaluations show that the instrument is suitable for use, and the reliability coefficient (CR) calculation yielded a score of 0.9, indicating that the developed creativity assessment instrument is reliable. In conclusion, the developed creativity assessment instrument, aligned with the established creativity assessment characteristics, is both valid and reliable for measuring the creativity of students in the Bioedutainment course.

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INTRODUCTION

Bioedutainment is one of the course subjects in the Biology Education programme at FMIPA UNNES. This course aims to equip students of the Biology Education programme with an understanding of the importance of delivering enjoyable biology lessons to students. Prospective teachers are trained to become visionary edutainers, possessing strong self-confidence, able to plan and organise biology teaching materials, and capable of communicating effectively so that the information conveyed is easily understood by students.

The term "bioedutainment" derives from the words biology, education, and entertainment. Literally, bioedutainment is defined as enjoyable biology learning. In the context of biology education, bioedutainment is part of the Jelajah Alam Sekitar (JAS) learning approach, which emphasises the exploration of learning resources in the students' surroundings. These environments include not only the physical surroundings but also the social, technological, and cultural environments. Phenomena are studied through scientific work (Mesra, 2021). Bioedutainment is a strategy that synergises with the JAS learning approach. The bioedutainment strategy is designed to facilitate biology learning processes that have unique characteristics compared to other sciences.

Biology education requires a different approach from other sciences because the objects of study differ. Biology studies living organisms, so it focuses on events that occur to these organisms and the consequences of these events, making it a subject deeply concerned with life itself. This has implications for the learning process. Biology is part of science, which functions as a body of knowledge. As such, the essence of biology is as a science that produces laws, theories, postulates, and principles (Alimah & Marianti, 2021) . As a process, biology uses the scientific method to generate this body of knowledge. And as a set of values, biology contributes to shaping the character and values embraced by students. The nature of biology as a product, process, and value has implications for its teaching. The paradigm of teaching biology textually should shift towards a contextual approach that utilises the students' natural and surrounding environments as learning resources.

A paradigm shift in biology teaching requires the use of appropriate strategies. The wrong strategy can make biology a boring subject, filled with memorisation and unfamiliar terminology, leading to complaints from students. This situation demotivates students from studying biology or biology-based sciences. A fun learning process (edutainment) increases students' motivation to learn. The spirit of edutainment lies in creating an enjoyable, comfortable, and exciting learning experience, characterised by close, friendly, and harmonious communication between teachers and students, similar to that of friends. In this way, students do not feel restricted or fearful and can interact freely and joyfully (Feiyue, 2022).

Biology Education students, as future biology teachers, need to be equipped with the knowledge and skills to teach biology in an engaging and enjoyable manner (Lasala, 2022; Lasala, 2023; Cai et al., 2006; Soratia, 2012). They must be provided with materials and skills that help them understand why enjoyable learning is necessary, based on scientific and pedagogical foundations. They must also learn how to become teachers capable of creatively and innovatively designing and implementing enjoyable learning while also acquiring the skills to practise these methods.

To achieve these objectives, students must be trained to develop designs for enjoyable biology lessons through the bioedutainment course. This course involves both theory and practice. Lectures use a team-based project method. After being equipped with knowledge related to bioedutainment strategies, students are tasked with designing biology lessons that apply the JAS approach and the bioedutainment strategy in an innovative and highly creative way. To assess students' creativity in their lesson designs and implementations, it is necessary to develop valid and reliable creativity assessment instruments, focusing on general creativity indicators and specifically on indicators of enjoyable learning.

RESEARCH METHOD

This research was conducted at Biology Study Programme, Mathematics and Natural Sciences

Faculty, Universitas Negeri Semarang. This research is a Research and Development (R&D) study aimed at producing a product in the form of an instrument to measure students' creativity in the Bioedutainment course. The product is developed by referring to the ADDIE model (Analyse, Design, Development, Implementation, Evaluation). The steps of the research and development process using the ADDIE model are presented in the Figure.

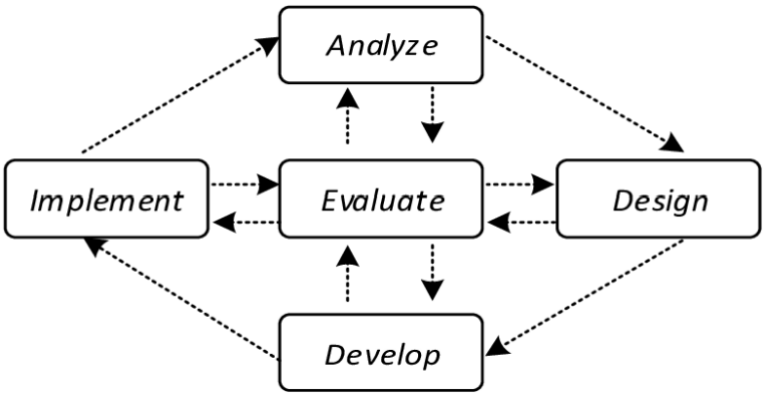

Figure 1. ADDIE Model

Analyze

The main activity at this stage is to analyse the need for the development of an instrument to measure students' creativity and to analyse its validity and reliability. The analysis stage will define the topics and skills that students must master.

Design

The design stage begins with the collection of materials, resources, and literature reviews to develop the conceptual framework for creative thinking skills, in relation to the concept of Bioedutainment learning. The material review focuses on topics such as Bioedutainment learning strategies, Neuroscience in Biology education, multiple intelligences in Biology teaching, the philosophy of science, science in society and its applications, Biology learning both inside and outside the classroom, educational tourism, as well as the practice of developing Biology lessons based on Bioedutainment.

Development

At this stage, the development of an instrument for measuring students' creativity in completing tasks is undertaken. The instrument's indicators are derived from a grid that encompasses the framework of creative thinking and the concept of Bioedutainment learning.

Implementation

The implementation stage of the student creativity instrument is carried out in the classroom on a limited basis to test its practicality, validity, reliability, and to make revisions. The practicality aspect in this research aims to assess the ease of use during the trial class.
The next stage involves testing validity and reliability. The validity and reliability tests are conducted to ensure that the instrument developed is valid and reliable for measuring students' creativity in the Bioedutainment course.

The data collection technique for testing the instrument's validity is expert judgment, using a questionnaire to assess the construct validity of the developed instrument. This involves a set of questions or statements provided in writing to expert validators. The data obtained from the validation results are then analysed descriptively using validity score ranges to determine the level of instrument validity, as Table 1.

Table 1. Validity Criteria of the Instrument

Validity Range	Validity Level
0≥1	Insufficiently valid
1≥2	Moderately Valid
2≥3	Valid
3≥4	Highly Valid

Evaluation

Evaluation is carried out in two forms: formative evaluation and summative evaluation. Formative evaluation is conducted during the process of designing and developing the instrument, while summative evaluation takes place during the implementation stage, specifically to test the practicality, validity, and reliability in the field trials. The evaluation results are used to provide feedback to users and developers. At this stage, revisions are made based on the evaluation results or any unmet needs, ensuring that the instrument is valid, practical, and reliable. Following this, the instrument is disseminated.

RESULTS AND DISCUSSION

The characteristics of Students Creativity Instruments on Bioedutainment

The data of students' interest were obtained by distributing an interest-level instrument sheet (ISM) of study. Interest in learning was measured after students were given treatment. Furthermore, after being treated, the students' learning instrument interest was analyzed to determine the increase.

The Bioedutainment course comprises 2 credits, including 1 credit for theory and 1 credit for practice. One of the primary objectives of this course is to equip prospective teachers with the skills to conduct enjoyable biology learning. Creativity is, therefore, a crucial component for students to possess, as it is one of the course's key goals. To assess students' creativity, an instrument is required to evaluate their creative abilities. The creativity assessment instrument for Bioedutainment course participants is developed based on an analysis of the course learning objectives, which are outlined in the CPMK and Sub-CPMK. This instrument is designed to facilitate lecturers in assessing students' creativity in completing course assignments that require creative input. These assignments include creating scenarios, conducting educational tourism (eduwisata) practice, designing bioedutainment learning strategies for senior high school students, and implementing the designs in mini-teaching sessions. Consequently, the developed assessment instrument consists of three creativity assessment tools to evaluate students' creativity level in the products resulting from these tasks.

The creativity assessment instrument developed in this study is based on the characteristics of creativity outlined by experts such as Torrance (1969) and Guilford (in Munandar, 2009), who stated that the indicators for measuring creative thinking skills include: (a) Fluency, which refers to the ability to generate numerous ideas; (b) Flexibility, which refers to the ability to produce a variety of ideas or use different approaches; (c) Originality, which refers to the ability to generate novel and unique ideas; and (d) Elaboration, which refers to the ability to provide detailed ideas.

In addition to the aforementioned experts, the instrument is also developed based on Seidel's (1996) assertion that creativity is the ability to connect and associate, even in unconventional but impressive ways, which forms the basis for the creative utilisation of human reasoning. The instrument also refers to Munandar's (2009) statement that there are three key aspects of creative ability: (1) the ability to create new combinations based on existing data, information, or elements; (2) the ability to generate multiple possible solutions to a problem based on the available data or information, with an emphasis on quantity, appropriateness, and variety of responses; and (3) the ability to operationally reflect fluency, flexibility, originality in thinking, and the capacity to elaborate on ideas.

Based on the theories proposed by these experts, the creativity assessment instrument incorporates the indicators for its implementation as outlined by Noer (2009), which include: 1. Fluency: the ability to generate numerous ideas, answers, solutions, or questions. 2. Flexibility: the ability to produce varied ideas, answers, or questions, view problems from different perspectives, find multiple alternatives, and adapt the approach. 3. Elaboration: the ability to develop an idea, add details, or elaborate on an object, idea, or situation. 4. Originality: the ability to present one's own opinions in response to a given situation.

Validity and Reliability of the Developped Instrument

The validity test of the instrument was conducted using a descriptive quantitative method by seeking expert evaluation through a validation form. Four aspects were examined: 1) content, which pertains to the relevance of the items in measuring students' creativity; 2) construction, relating to the clarity and formulation of the sentences used in the question items; 3) language, which assesses whether the language used is communicative, clear, and does not lead to multiple interpretations. In this study, validation was sought from three experts, and the results can be seen in Table 2.

Table 2 The validity of the instrument

No	Aspect	Average Score	
		Expert 1	Expert 2
1	Content	4	4
2	Construct	4	3.9
3	Language	4	4

The reliability coefficient test results (CR) using the Cronbach's Alpha method, assisted by IBM SPSS Statistics, indicated that the Bioedutainment learning design assessment instrument achieved a CR score of 0.944. The assessment instrument for the scenario and the educational tourism guiding practice obtained a CR score of 0.980, while the assessment instrument for the implementation of the learning design achieved a CR score of 0.941. These results demonstrate that the developed instruments are highly reliable. In other words, an individual's responses to the statements within these instruments are consistent or stable over time. The reliability of a measurement tool refers to the degree of stability, consistency, predictive power, and accuracy. Measurements with high reliability consistently produce reliable data

Based on the analysis of the research findings, the developed creativity assessment instrument demonstrates the necessary characteristics to evaluate the targeted aspects of creativity. This can be observed in the statements within the instrument, which include the creativity indicators of fluency, flexibility, elaboration, and originality. The fluency indicator refers to students' ability to generate numerous ideas and solutions for problem-solving. For the flexibility indicator, students are evaluated on their ability to create various alternative learning designs, adapting them to the situations and conditions they encounter. Elaboration skills are also evident when students enrich and expand upon a concept while designing Bioedutainment learning plans, adding detailed elements through the student worksheets (LKPD), prepared media, and chosen teaching methods.

Originality, as an indicator, is assessed through students' creativity in generating unique learning designs and developing original educational tourism guiding scenarios. Uniqueness is the key criterion for evaluating originality. The challenges posed to students include how they can create and implement educational tourism guiding scenarios at a location of their choice, and how they creatively design Bioedutainment-based biology lessons for both indoor and outdoor settings. Additionally, students' creativity is further tested during the implementation of the learning designs they have created. The chosen locations for outdoor learning or guiding practice are situated within a 5-kilometre radius of the UNNES campus, allowing students to creatively utilise their immediate environment. This also reflects the implementation of

the Jelajah Alam Sekitar approach, which forms the basis of the learning strategy for this course.

Through these assignments, students are trained to develop their creativity to the fullest extent, allowing them to innovate within the knowledge framework they have gained from previous Bioedutainment classes. This includes their understanding of Bioedutainment strategies, educational neuroscience, multiple intelligences, educational tourism, guiding techniques for educational tourism, and innovations in biology education.

The developed student creativity assessment instrument has proven effective in measuring students' creativity, as it aligns with the specified creativity indicators, possesses high validity, and demonstrates perfect reliability coefficients.

However, despite the instrument's fulfilment of all creativity, validity, and reliability components, lecturers face difficulties in its application due to the detailed assessment items, which are time-consuming to evaluate and may lead to inaccuracies when calculating and converting scores. As a solution, it is suggested that a technology-based creativity assessment system be developed, which would improve the speed and accuracy of the assessment process.

CONCLUSION

Based on the results of the analysis and discussion, it is concluded that the developed creativity assessment instrument exhibits characteristics that effectively measure students' creativity, evaluated through the dimensions of fluency, flexibility, elaboration, and originality. According to expert evaluations, the instrument falls within the "highly appropriate" category. Furthermore, based on the Cronbach's Alpha analysis, the creativity assessment instrument demonstrates a "highly reliable" classification.

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