


Sundanese ethnoastronomy-based Astronomy bulletin as an alternative to Astronomy learning: A feasibility test

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ABSTRACT

This study aims to determine the feasibility of independently developing a Sundanese ethnoastronomy-based astronomy bulletin as an alternative astronomical learning media. This research uses the ADDIE method, which consists of five stages, namely (1) Analysis, (2) Design, (3) Development, (4) Implementation, (5) Evaluation. However, this research only reached the determination of the feasibility of the bulletin, so the *implementation* and *evaluation* stages still needed to be carried out. The subjects of this study were one physics education lecturer and one physics teacher. The results of the feasibility test on the three indicators include (1) content validation tests obtained an average value of 81.25%, (2) language validation tests obtained an average value of 81.25%, and (3) presentation validation tests obtained a value of 80%, and the overall indicators showed reliable results. Therefore, the bulletin learning media developed is feasible and can be used as an alternative learning media for Sundanese ethnoastronomy-based astronomy.



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INTRODUCTION

Astronomy is one of the branches of the National Student Competition, where interest increases yearly. According to kalderanews.com by Britto (2022), the 2022 District-level National Student Competition in Astronomy with 19,612 participants increased compared to the 2021 District-level National Student Competition with 12,880 participants. However, education in astronomy in Indonesia still needs to be improved to channel the interests and talents of students. This is seen when we examine the astronomical content in the School Curriculum. This school's curriculum has no special lessons in Astronomy (Paramitasari et al., 2023). In addition, more astronomical facilities and mentors are needed for equitable distribution of astronomical knowledge and skills (Elzulfiah et al., 2015). This resulted in the need for special attention related to Astronomy material in schools.

The presence of astronomy, which has a vital role in natural knowledge, cannot be separated from the life part of a culture. Indonesia, which consists of several cultures, is undoubtedly familiar with natural sciences, including science related to the astronomy of a culture, such as the sky and

stars. Astronomy in culture is associated with the material of the astronomical Olympiad in schools. Some of the things discussed by ethnoastronomy related to the fabric of the Astronomical Olympiad in schools include cosmology, the concept of time and calendar, the movement of the moon, the direction of the sun, and the motion of stars (Suherman, 2017). However, along with the times, ethnoastronomy is less widely known by modern society, especially students. Previous research conducted by Suherman (2017) stated that of the 72 respondents in the West Bandung area, 13.9% answered knowing Sundanese ethnoastronomy, and 86.1% responded not knowing Sundanese ethnoastronomy. This shows that students' trust in ethnoastronomy is still low.

According to the main news of UAD, according to Putri (2019), the Indonesian state's wealth and local wisdom have a unique potential. This unique potential was able to give hope for the popularization of astronomy. However, there needs to be more in-depth research on knowledge about astronomy in the wisdom and richness of the local culture of the archipelago. Then, as reported by news. Permana (2021), Dr. Hakim said that in this era of modern science, local wisdom about astronomy has an excellent opportunity to be developed, one of which is through learning at the education level. Dr. Hakim and his team developed a program based on IAU-Network for Astronomy School Education (NASE) guidelines such as workshops, classroom learning, and excursions related to Astronomy (Pratiwi, 2021). Therefore, it is necessary to develop an alternative learning media related to Astronomy in ethnoastronomy-based high schools, especially for participants in the Astronomy Olympiad.

NASE programs in the form of classroom learning can be implemented with the help of alternative learning media that are independent and interesting. Bulletin is one of the exciting learning media that can be used in the learning process independently in class and outside the classroom (Wahyuni, 2019). Previous research on newsletter learning media has been conducted by Utami et al., (2022), with the results of research validation of material experts by 97% and media experts by 95.2% with excellent qualifications so that the bulletins developed can be categorized as feasible and tested in the learning process. Then, research conducted by Mikraj et al., (2019) regarding the physics bulletin in the form of a pocketbook shows that there is a significant influence on improving student learning outcomes when using bulletin learning media. This indicates that magazines influence the learning process, so they are suitable for use in a learning activity at school.

Based on previous problems and research, this article aims to develop an alternative learning media in the form of a bulletin related to Astronomy material in Sundanese ethnoastronomy-based high schools so that students can learn independently. This alternative is an astronomical magazine, which contains ethnoastronomy in Sundanese culture and explanations according to astronomy. The preparation of alternative learning media in the form of this bulletin can produce something new as reading material for students independently. Also, more attractive packaging and light language will increase students' confidence in ethnoastronomy. This research contributes to developing bulletin-based learning media with local wisdom, especially Sundanese, regarding astronomy so that it is easily understood by students who often use Sundanese.

METHOD

The method used in this study is ADDIE. ADDIE is an acronym for Analyze, Design, Develop, Implement and Evaluate. Model ADDIE is an instructional development design centered on individual learning, has immediate and long-term phases, is systematic, and uses a systems approach to human knowledge and understanding. The ADDIE model concept is applied to build essential performance in education, namely developing a learning product design. However, in this research article, there is no Implementation and Evaluation stage because the research in this article only aims to test the feasibility of newsletter products. The results of the feasibility test of this bulletin can later be used for further testing so that it can be used for alternative learning media.

Analysis Phase

At this stage, an analysis of problems related to the topic is taken through literature studies or relevant previous research. The search for the best solutions related to the issues that have been

analyzed is carried out. Apart from that, pre-planning is thinking or deciding about the subjects or courses that will be given.

Design Phase

Design is a systematic process that starts from setting learning objectives, designing teaching and learning activities, designing learning tools, and designing learning materials and tools for evaluating learning outcomes. Efforts to design the learning process to become a compelling and exciting activity: At this stage, it is carried out by designing products to be developed that contain astronomical material based on Sundanese ethnoastronomy. Alternative astronomy learning media in the form of a bulletin is designed to support the independent learning process by students who are attractively designed using a combination of colors, layouts, letters, and images by the material. The stages carried out in designing alternative astronomical learning media in the form of this bulletin are (1) determining the theme to be published in the bulletin, (2) determining the content to be poured in the bulletin, (3) collecting information and content from each content in the bulletin, and (4) making alternative designs of astronomy learning media in the form of bulletins.

Development Phase

In this last stage, a product feasibility test was carried out to determine the feasibility of alternative learning media developed as an astronomical bulletin. One physics education lecturer and one high school physics teacher conducted the feasibility test. Due diligence data was taken using Microsoft Word documents for feasibility test assessment with a Likert scale of 1-4, which contained three indicators: content indicators containing four statements, language indicators having two ideas, and presentation indicators containing five words. The weight of value one on the indicator of content, language, and presentation indicates a significantly lower value, the importance of value two on the indicator of content, speech, and expression suggests a value of less, the importance of value three on the indicator of content, address, and expression offers a good deal. The importance of value four on the content, address, and presentation indicator shows an excellent value.

To determine the level of feasibility of the developed newsletter, two stages are carried out, namely by analyzing validity and reliability using the Likert Scale. The validity analysis of the designed newsletter is used with the [Formula 1 Sugiyono \(2013\)](#):

$$P = \frac{f}{n} \times 100\% \tag{1}$$

P is Percentage earned, f is Score obtained, and n is Ideal maximum score. Score 4 for excellent, score 3 for good, 2 for enough, and 1 for very lacking ([Sugiyono, 2017](#)).

Table 1. Qualify for Validity Level Based on Average Percentage

No.	Achievement Level	Qualification
1	80% - 100%	Highly Valid
2	60% - 79.9%	Valid
3	50% - 59.9%	Less Valid
4	0% - 49.99%	Invalid

Source: ([Latifah, 2016](#))

Furthermore, for the analysis of the reliability of learning media. Reliability indicates the extent to which the tool's measurement results can be trusted. The percentage of agreement (PA) method is [Formula 2 \(Arsanty & Wiyatmo, 2017\)](#).

$$PA = \left(1 - \frac{A-B}{A+B}\right) \times 100\% \tag{2}$$

A is a greater validator score. B for more miniature validator score. Learning media is said to be reliable if the percentage of agreement (PA) value is produced significantly $\geq 75\%$.

RESULTS AND DISCUSSION

Results

Based on the direction of the research method used, the research results obtained include media suitability from media experts, content validity, language, and appearance.



Figure 1. Sundanese Ethnoastronomy-Based Astronomy Bulletin Design

The results of the feasibility test assessment for the development of learning media in this study have been carried out by one physics teacher and one physics education lecturer at the development stage. Then, the results of the feasibility test assessment in the form of validation have been analyzed by referring to the validation test [Sugiyono \(2013\)](#) so that the results of the validation test for the development of learning media related to the national Astronomy student competition material at Sundanese ethnoastronomy-based high schools were obtained as follows:

Table 2. Qualification Test Validation of Sundanese Ethnoastronomy-Based Astronomy Bulletin on each Indicator

No.	Indicators	Average Indicators	Qualification
1	Fill	81.25%	Highly Valid
2	Language	81.25%	Highly Valid
3	Serving	80%	Highly Valid

Based on the results of the analysis listed in [Table 2](#), the average assessment of indicators shows that the qualifications are very valid for all hands. The qualification results in the table show that the Sundanese ethnoastronomy-based astronomy bulletin as an alternative learning media to improve students' trust attitudes is very feasible/worthy of development. In more clarity, the following is presented for each statement on the indicator tested in the test of content, language, and presentation validity.

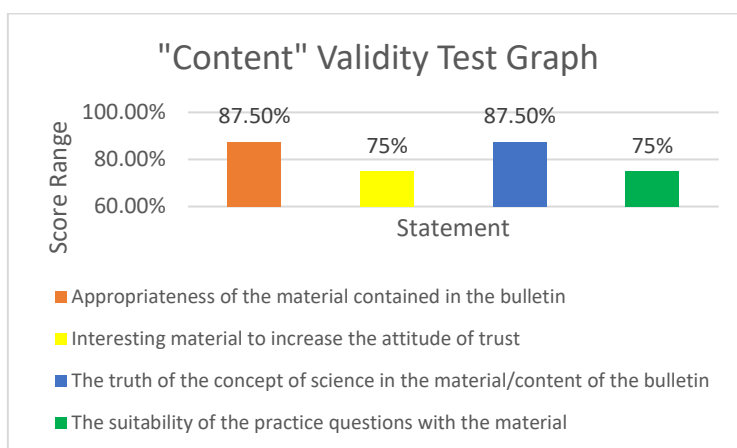


Figure 2. Validity of the Content Indicator

Based on the results of the analysis in [Figure 2](#), if reviewed thoroughly against the content indicators of each statement regarding the newsletter that has been developed, shows very valid results with an average hand of 81.25%, so the newsletter learning media that has been designed can be tested in the field. The statement of conformity of the material contained in the bulletin and the correctness of the concept of science in the publication's content obtained a value of 87.5%, which indicates very valid results. Assessment is the process of collecting data/information used to measure the achievement of a goal. Assessment shows that the material presented is based on the truth of concept science, which influences students' confidence in Sundanese ethnoastronomy. This is in line with [Firman \(2018\)](#), which states that facts accepted by the scientific community are based on empirical proof, thus producing a belief. The statement of exciting material and the suitability of the practice questions with the material obtained a value of 75%, which shows valid results. The assessment indicates that exciting material can increase participants' interest in learning about it ([Wijayanti et al., 2018](#)). Coupled with practice questions on the material, students can learn independently. This is in line with [Wahyuningsih \(2011\)](#) and [Budiarti \(2022\)](#), which state that improving learning outcomes occurs because it begins with the interest of students who can increase student interest and activity in learning the material.

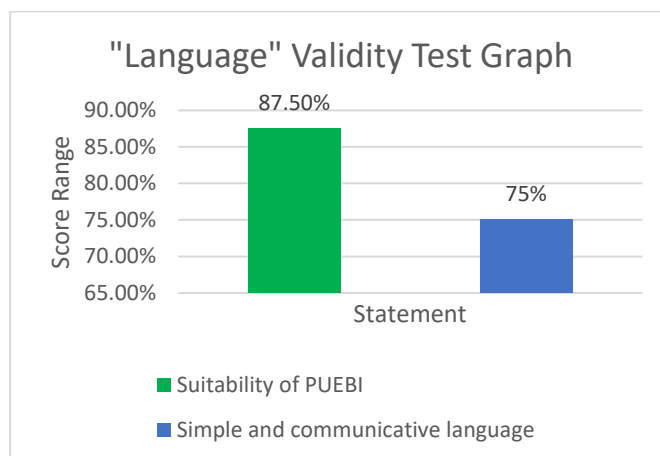


Figure 3. Validity of Language Indicators

Based on the analysis results in Figure 3, when reviewed thoroughly, the linguistic indicators of each statement in the developed bulletin show very valid results with an average hand of 81.25%, so the learning media of the developed bulletin can be tested in the field. The PUEBI (General Spelling Guidelines Indonesian) conformity statement yielded an 87.5% assessment, which showed valid results. The evaluation suggests that the use of language clarity is based on PUEBI. Using language based on PUEBI can make it easy for students to understand the material transferred by the teacher during learning activities (Putri, 2019; Wiguno et al., 2021). Then, a 75% assessment showed valid results for simple and communicative language statements. The evaluation indicates that Indonesian and Sundanese language use is simple and communicative, making it easy for students to understand the material in the developed bulletin (Wulandari, 2020).

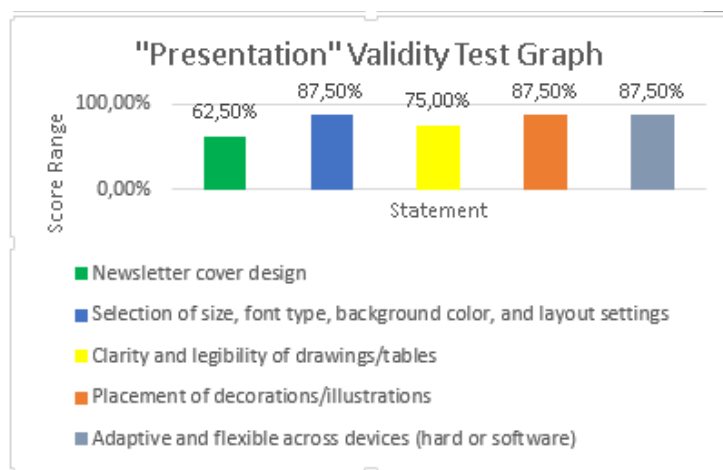


Figure 4. Validity of the Presentation Indicator

Based on the analysis results in Figure 4, when reviewed thoroughly, the presentation indicators of each statement on the bulletin learning media show very valid results with an average hand of 80%, so the newsletter learning media developed can be tested in the field. Choosing the size, font type, background color, layout settings, decoration placement, and adaptive and flexible on various devices obtained a rating of 87.5%, which showed very valid results. These results show that the alignment of the presentation and illustration arrangement used by researchers is by Sundanese ethnoastronomy-based astronomy material so that it can attract students' attention during learning

activities (Listianingsih et al., 2022). Students' attention during this learning process is included in one of the indicators of student learning interest (Istiqomah & Trilaksana, 2022).

On the statement, the newsletter cover design and decoration placement obtained 62.5% and 75%, respectively, which showed valid results. Both validators stated that the surface of the newsletter should include the name of the material to be discussed in the developed newsletter. Both validators also said that more HD images are highly recommended to support the readers' clarity of the designed newsletter.

Furthermore, the feasibility test assessment results in the form of reliability have been analyzed (Arsanty & Wiyatmo, 2017) so that the results of the reliability test of learning media development related to the national Astronomy student competition material at Sundanese ethnoastronomy-based high schools were obtained in Table 3.

Table 3. Learning Media Reliability

No.	Indicators	Percentage of Agreement (PA)	Information
1	Fill	84.62%	Reliable
2	Language	92.30%	Reliable
3	Serving	88%	Reliable

The analysis results in Table 3, Percentage of Agreement on all indicators, show reliable results. From the results of these qualifications, it can be shown that there is a match in the assessment results between the two validators in the Sundanese ethnoastronomy-based astronomy bulletin as an alternative learning media that aims to improve students' trust attitudes.

Based on the description above with the results of analysis related to the problem, a solution was found in the form of the development of an astronomical bulletin based on Sundanese ethnoastronomy, which further obtained an assessment that the development of an astronomical magazine based on Sundanese ethnoastronomy received very valid and valid qualifications in each indicator test, as well as in the whole Indicators show reliable results. These results are from research conducted by Utami et al., (2022), which states that the presentation of the newsletter is very well-qualified and is worthy of being used as an alternative learning media that can be tested in the learning process. The involvement of the development of the Sundanese ethnoastronomy-based astronomical bulletin can be continued to the next stage, namely the limited trial stage to determine the validity of the magazine, then the effectiveness test, which can later decide whether the developed magazine can be continued to trials in learning activities in schools.

Discussion

Education in Indonesia astronomy still needs to be improved to channel the interests and talents of students, even though the interest in the national astronomy student competition every year always increases. This is due to limited astronomical facilities and guidance, which results in an uneven distribution of astronomical knowledge and skills. The presence of astronomy, which has a vital role in natural ability, cannot be separated from the living part of a culture (Putri et al., 2015). There are many dimensions of cultural existence in ethnoastronomy and astronomy in Indonesia (Venia, 2020). However, in modern times, many learners need to learn astronomy from a cultural perspective (Hikmatiar et al., 2023). Therefore, it is necessary to develop an alternative learning media related to the national Astronomy student competition material in Sundanese ethnoastronomy-based high schools.

Limited astronomical facilities and supervisors that result in uneven distribution of astronomical knowledge and skills can be overcome with interestingly arranged independent learning media. Bulletin is one of the exciting learning media that can be used in the learning process independently in class and outside the classroom (Wahyuni, 2019). The bulletin in this study was chosen because the magazine is easy to read in the delivery of content and packaging with an attractive appearance so that students can learn independently (Afifah et al., 2022). This beautiful

display makes newsletter media not fixed just like that, and learners learn independently and better understand the content, increasing enthusiasm for reading newsletter media (Asyhari & Silvia, 2016; Putri et al., 2015).

The design of an alternative learning media related to the national Astronomy student competition material at the Sundanese ethnoastronomy-based high school consists of several stages. The first stage is to determine the theme to be published in the bulletin about astronomical material in Sundanese culture. These materials include cosmology, calendar, and constellations from the Sundanese culture's perspective and their analysis in astronomical reviews. The material for the Astronomy national student competition was chosen because the material has a relationship with the view of the Sundanese people, so students learn astronomy through the material and from a cultural perspective. This is in line with research conducted by Cotte (2016), which presents the situation on the Astronomical and Archaeoastronomical heritage related to the World Heritage Convention over the past few years to date, which states that astronomy represents a rich and significant cultural and natural indicator of world heritage. Fahrozy et al., (2022) Also believe that local culture associated with learning can shape students' character and understanding of the excellence and wisdom of local culture in their area. This can undoubtedly increase students' attitudes and beliefs towards culture.

The second stage of the design, which is to determine what content will be published in the bulletin, namely the content of astronomical material in Sundanese culture, then continued with the material content in the astronomical review so that it can be seen the relationship between astronomy from the perspective of Sundanese culture and its astronomical theory which can increase the confidence attitude of students. Then, content challenges aim to review understanding and train student skills. The last stage is to compile an astronomical bulletin design based on Sundanese ethnoastronomy. The bulletin is designed with a contemporary and colorful design and exciting letters. This aims to make interesting literature so that it can attract the attention of students to learn astronomy independently so that there are students' attitudes and beliefs in the local culture. Thus, an astronomical bulletin based on Sundanese ethnoastronomy was formed with material on cosmology, calendars, and constellations.

CONCLUSION

The Sundanese ethnoastronomy-based astronomy bulletin can be used as an alternative learning media for students who aim to increase their trust attitudes towards Sundanese ethnoastronomy. This Sundanese ethnoastronomy-based astronomical bulletin was declared feasible after feasibility tests were carried out on three indicators. The three indicators are content hands, which produce an average score of 81.25%, including very valid qualifications; which has an average score of 81.25%, including excellent capabilities; and presentation, which produces an average score of 80%, including fantastic stuff, and overall indicators show reliable results. In addition to the Sundanese ethnoastronomy-based astronomical bulletin that is already feasible, the magazine developed also needs improvement. These improvements can be in the form of adding images with more apparent quality, which, of course, are based on material to improve the quality of the developed newsletter.

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