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Expert Validation of Ethnoscience-Based Teaching Materials to Develop Student Competence in Critical Thinking and Caring Attitudes

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Abstract: The aim of this research is to describe the results of expert validation of ethnoscience-based teaching materials to develop student competence in critical thinking and caring attitudes. Expert validation in this research is part of the development of ethnoscience-based teaching materials to develop student competence in critical thinking and caring attitudes using the 4D model. This model includes stages, namely Define, Design, Develop, Disseminate so that it will produce ethnoscience-based teaching materials that are valid, practical and effective in developing students' competence in critical thinking and caring attitudes. Expert validation is included in the Develop stage. Validation of ethnoscience-based teaching materials to develop students' competence in critical thinking and caring attitudes was carried out by 3 experts, namely material experts, media experts and language experts. The research results show that the assessment from material experts is 96.7, media experts are 90.5, and language experts are 100. Thus, the average value of expert validation assessments is 95.7, including the Very Valid criteria. The product, in the form of ethnoscience-based teaching materials to develop students' competence in critical thinking and caring attitudes, was revised based on input from validators. The results of product revisions before and after validation are divided into 5 things, namely: 1) Adding indicators and numbering to Basic Competencies; 2) Improvements to tables that were previously scanned from source or reference books were revised by creating tables manually. The table has also been assigned a sequential number; 3) Addition of photos and videos related to ethnoscience; 4) Ethnoscience-based investigative activities; 5) Changes in the appearance and form of the formative tests available at the end of each chapter.

Keywords: teaching materials, ethnoscience, critical thinking, caring attitude.

Introduction

The development of teaching materials can be carried out through various models, namely the development model according to Kemp, the Dick & Carey model, and the 4D model. Research into the development of teaching materials needs to be carried out to produce innovative teaching materials in accordance with the analysis of student needs and characteristics. It is hoped that the successfully developed teaching materials can increase student motivation and learning outcomes (Putra et al., 2021).

Teaching material innovation needs to consider various aspects, namely material, media and language. Experts will provide an assessment of these three aspects so that the validity of the teaching materials can be measured. In the material aspect, experts will provide an assessment of learning and content. In the media aspect, experts will provide an assessment of the presentation, appearance and programming. In the language aspect, the expert will provide an assessment of the student's usability, communicativeness, readability and level of development (Utari et al., 2021).

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One innovation in compiling teaching materials is to integrate ethnoscience, namely knowledge possessed by a group of people that is not possessed elsewhere. Ethnoscience is a contextual phenomenon because it is related to what students see and experience themselves in the environment where they live (Utami & Efendi, 2018).

Packaging ethnoscience-based teaching materials by paying attention to TPACK can stimulate students to think critically and care about the surrounding environment (Chai et al., 2020). Critical thinking and a caring attitude are very important competencies for students to achieve a bright future. Students can process and conclude information well in the current digital era because they have good critical thinking skills (Cihad, 2021). Students can also filter out various cultures that do not match their character values and can preserve their culture because they have the ability to have a good caring attitude (Suprapto et al., 2021).

This research aims to describe the results of expert validation of ethnoscience-based teaching materials to develop student competence in critical thinking and caring attitudes. Description of expert validation results reviewed from 3 aspects. This article also describes revisions to teaching materials based on input from experts.

Method

Expert validation is part of the development of ethnoscience-based teaching materials to develop student competence in critical thinking and caring attitudes using the 4D model. This model includes stages, namely Define, Design, Develop, Disseminate (Thiagarajan et al., 1974), so that it will produce ethnoscience-based teaching materials that are valid, practical and effective in developing students' competence in critical thinking and caring attitudes (Plomp & Nieveen, 2010). Expert validation is included in the Develop stage. Validation of ethnoscience-based teaching materials to develop students' competence in critical thinking and caring attitudes was carried out by 3 experts, namely material experts, media experts and language experts. Aspects assessed by validators can be seen in Table 1.

Table 1. Validators and Assessed Aspects

Validator	Aspect
Material	Learning and content
Media	Learning and content
Language	Usability, communicativeness, readability, and level of development of students

The data collection technique for declaring ethnoscience-based teaching materials to develop students' competence in critical thinking and valid caring attitudes is carried out by providing validation sheets to experts (media experts, material experts and language experts) to determine the validity of ethnoscience-based teaching materials to develop competence students in critical thinking and caring attitudes. The validation instrument used is in the form of an expert validation sheet.

Data obtained from experts is in the form of an assessment of ethnoscience-based teaching materials to develop student competence in critical thinking and caring attitudes in the form of scores and comments. Comments provided by validators will be used as material for revising ethnoscience-based teaching materials to develop student competence in critical thinking and developing caring attitudes.

The weighting of scores on the expert validation sheet in this study uses a Likert scale (Likert, 1932). The Likert scale is a scale used to measure attitudes, opinions and perceptions of a person or group of people about social phenomena, shown in Table 2.

Table 2. Likert scale for assessment

Alternative Answer	Scores
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

The percentage of validity of ethnoscience-based science teaching materials to develop student competence in critical thinking and caring attitudes is calculated using the equation: $P = \frac{f}{N} x100\%$, where P is the validity percentage number, f is the score obtained from the assessor, and N is the maximum number of scores. The validity criteria for ethnoscience-based teaching materials to develop student competence in critical thinking and caring attitudes developed in this research are shown in Table 3 (Solihudin, 2018).

Table 3. Validity criteria for teaching materials

Percentage (%)	Validity Criteria
0 - 25	Very invalid
26 - 50	Invalid
51 - 75	Valid
76 - 100	Very Valid

Result and Discussion

The assessment results from material experts were 96.7, media experts were 90.5, and language experts were 100. Thus, the average expert validation assessment score of 95.7 was included in the Very Valid

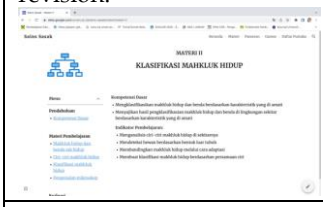
criteria. A recapitulation of product assessment results from validators is shown in Table 4.

Table 4. Recapitulation of teaching material assessment results from validators

No	Validator	Value	Validity Criteria
1	Material	96,7	Very Valid
2	Media	90,5	Very Valid
3	Language	100,0	Very Valid
Average value		95,7	Very Valid

The product, in the form of ethnoscience-based teaching materials to develop students' competence in critical thinking and caring attitudes, was revised based on input from validators. The results of product revisions before and after expert validation are as follows.

1) Add indicators and numbering to basic competencies

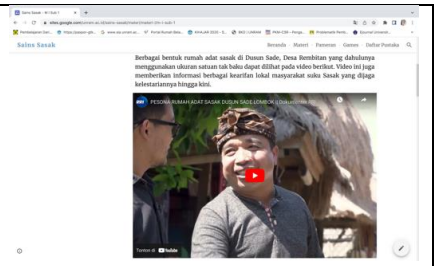
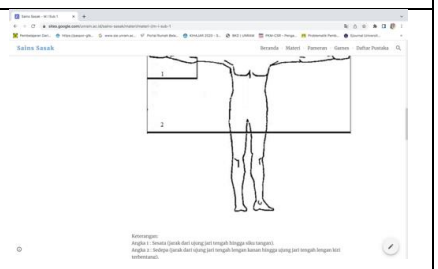
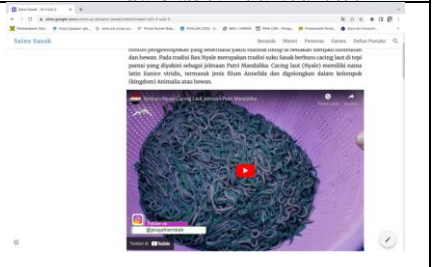
Product on Measurement material before revision: 	Product on Measurement material after revision: 
Products on the Classification of Living Creatures material before revision: 	Products on the Classification of Living Creatures material after revision: 
Products on Substances and Characteristics before revision: 	Products on Substances and Characteristics after revision: 

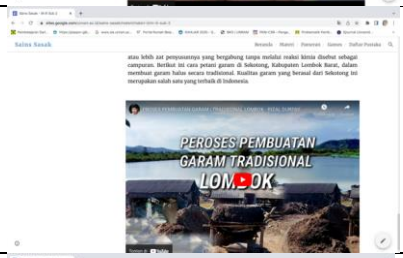
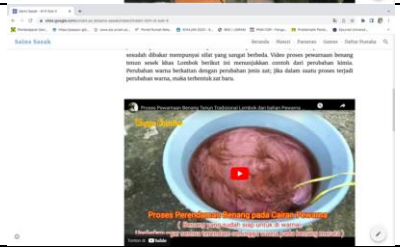
2) Improvements to tables that were previously scanned from source or reference books were revised by creating tables manually. The table has also been given a sequential number.

Scanned table and no table number yet	Manually created tables are equipped with table numbers
	

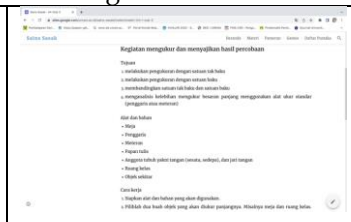
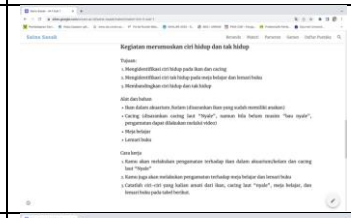
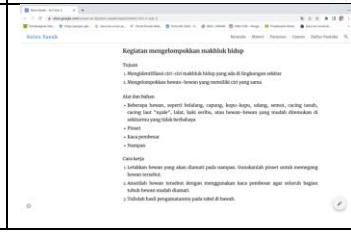
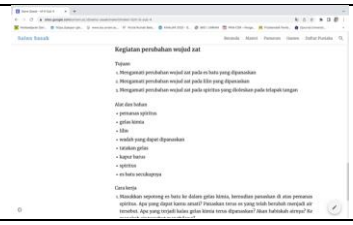
3) Addition of photos and videos related to ethnoscience

Some videos added according to validator input are as follows.

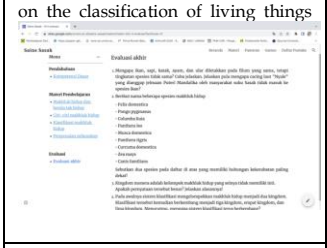
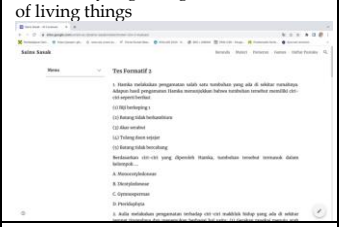
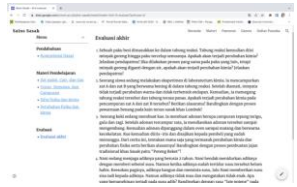
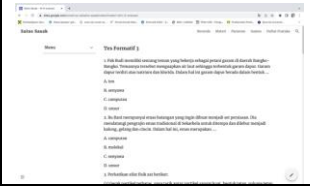
Video presenting the Sasak Sade village which was designated by the government as a tourist village. From the video you can learn various local wisdom about traditional house buildings which were previously built using non-standard units. The video also shows various unique traditions, including the traditional musical instrument gendang beleq.	
Photo containing the definition of non-standard units. These non-standard units have been used by the Sasak tribe since ancient times, namely sesata, sedepa, sprunjung. The activity of measuring basic quantities of length using non-standard units and standard units can be given an apperception through this photo.	
Photo of the Bau Nyale tradition that can be integrated into material on the classification of living things.	
The video explains how to catch sea worms ("bau nyale") in the bau nyale tradition, the characteristics of sea worms "nyale", including food preparations that come from "nyale". The Latin name for "nyale" is Eunice viridis, belonging to the phylum Annelida and classified in the Animalia or animal kingdom.	

A video about traditional gold craftsmen in Sekarbela, Mataram City, depicts physical changes, and is an example of an element.	
Video of making fine salt by traditional farmers in Sekotong, West Lombok, explaining the concept of the mixture.	
Video of making palm sugar in Narmada, West Lombok, explaining the changes in the state of the substance.	
Video of the process of dyeing threads on sesek woven cloth typical of the Sasak tribe, illustrating an example of chemical changes	

4) Ethnoscience-based investigative activities

Activities measure lengths and present experimental results. This activity helps students compare standard and non-standard units, namely sesata, sedepa, sprunjung	
The activity of formulating the characteristics of living and non-living using the object of observation, namely the sea worm "nyale" which is considered by the community to be the incarnation of Princess Mandalika.	
Student activities in grouping or classifying living creatures around students.	
Student activities in investigating changes in the form of substances by integrating local wisdom contexts in the data analysis and discussion sections	

5) Formative Test

The formative test display before revision is in the form of an essay and there is no answer key for the material on the classification of living things	The Formative Test display after revision is in the form of multiple choice (multiple choice) equipped with an answer key regarding the classification of living things
	
The display of the formative test before revision is in the form of an essay and there is no answer key about substances and their characteristics	The Formative Test display after revision is in the form of multiple choice (multiple choice) equipped with an answer key about substances and their characteristics
	

Ethnoscience-based teaching materials to develop students' competence in critical thinking and caring attitudes which have been revised according to expert input will then be tested in class to obtain data about the practicality of the teaching materials (Puspita Hadi et al., 2020). If the test results are declared practical, then the next stage is to test the effectiveness of the teaching materials to develop students' competence in critical thinking and caring attitudes (Nurhayati et al., 2021).

Innovation in ethnoscience-based teaching materials is not only able to improve students' abilities in critical thinking and caring attitudes towards culture (Hikmawati et al., 2024), but also creativity (Hikmawati & Suastra, 2023), social attitudes, communication skills, scientific and digital literacy, even an entrepreneurial attitude (Hikmawati & Sutajaya, 2021), as well as positive character values that are in accordance with Pancasila values (Wagiran, 2012). Facilities in the form of investigative activities in ethnoscience-based teaching materials also train students as little scientists so that they can get used to thinking and acting scientifically (Utari et al., 2020). These various competencies are provisions for students to face 21st century competition (Hikmawati et al., 2021).

Preparing ethnoscience-based teaching materials requires planning, implementation and evaluation activities from a teacher so that he can carry out follow-

up actions or improvements to teaching materials that are in line with the demands of the times (Utami et al., 2019). Ethnoscience-based teaching materials can be packaged digitally (Khoeriah et al., 2023), or example in web form, or used in learning with a STEM approach (Busyairi et al., 2023), even teaching materials can also be modified to be more interactive using applications such as Augmented Reality (Mohamad & Husnin, 2023).

The use of Android as a device to provide teaching materials also needs to be considered in the use of technology, information and communication in the education sector (Ismatulloh et al., 2023). Ethnoscience-based teaching materials can also be packaged in the form of conventional or digital comics (Feka et al., 2023). Increasing digital literacy through the use of ethnoscience-based teaching materials will certainly strengthen the character of 21st century learning (Syahidi et al., 2023). The important thing when preparing ethnoscience-based teaching materials is to carry out a needs analysis (Nurpatri et al., 2023).

Conclusion

Expert assessment of ethnoscience-based teaching materials to develop students' competence in critical thinking and caring attitudes is in the "Very Valid" category. Aspects assessed by experts include material, media and language. Ethnoscience-based teaching materials have been revised based on validator (expert) comments so that the next development step, namely practicality testing, can be carried out.

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References

Busyairi, A., Harjono, A., A, S., Taufiq, M., Ardhuha, J., & Hasan, Y. (2023). Development of Physics Learning Tools Based on the STEM-Creative Problem Solving Model to Increase Students' Scientific Literacy and Creativity. *Kappa Journal*, *7*(3), 443–450. https://doi.org/10.29408/kpj.v7i3.24197

Chai, C. S., Rahmawati, Y., & Jong, M. S. Y. (2020). Indonesian science, mathematics, and engineering preservice teachers' experiences in stem-tpack design-based learning. *Sustainability (Switzerland)*, *12*(21), 1–14. https://doi.org/10.3390/su12219050

Cihad, Ş. (2021). Effects of the blended learning model on preservice teachers ' academic achievements and twenty-first century skills. *Education and Information Technologies*, *26*, 35–48.

Feka, M. G., Donuata, P. B., & Koten, F. P. N. (2023). Pengembangan Komik Fisika Materi Kemagnetan Sebagai Media Pembelajaran Siswa SMPN 1 Maumere. *Kappa Journal*, *7*(3), 438–442. https://doi.org/10.29408/kpj.v7i3.21226

Hikmawati, & Suastra, I. W. (2023). Local wisdom-based learning to develop student's creativity in high school physics studies course. *AIP Conference Proceedings*, *2619*(1), 90016. https://doi.org/10.1063/5.0122572

Hikmawati, Suastra, I. W., & Pujani, N. M. (2021). Local wisdom in Lombok island with the potential of ethnoscience for the development of learning models in junior high school. *Journal of Physics: Conference Series*, *1816*(1). https://doi.org/10.1088/1742-6596/1816/1/012105

Hikmawati, Suastra, I. W., Suma, K., & Sudiatmika, A. A. I. A. R. (2024). Online lectures with local wisdom context: efforts to develop students' higher-order thinking skills. *International Journal of Evaluation and Research in Education* , *13*(2), 943–941. https://doi.org/10.11591/ijere.v13i2.25744

Hikmawati, & Sutajaya, I. M. (2021). Science learning based on the sasak tribe tradition to develop student entrepreneurial attitudes. *Jurnal Ilmiah Profesi Pendidikan*, *6*(3), 360–366. https://doi.org/10.29303/jipp.v6i3.222

Ismatulloh, K., Kholiso, Y. N., Arianti, B. D. D., & Ropikoh, R. (2023). Analisis Implementasi Si Black Berbasis Android Sebagai Upaya Peningkatan Prestasi Belajar Fisika. *Kappa Journal*, *7*(3), 411–415. https://doi.org/10.29408/kpj.v7i3.24196

Khoeriah, I. A., Permana, I., & Pursitasari, I. D. (2023). STEM-AR Based Ecology and Biodiversity E-book Development for Increasing Students' Scientific Reasoning. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8837–8845. https://doi.org/10.29303/jppipa.v9i10.5214

Likert, R. (1932). "Technique for the Measurement of Attitudes, A." In *Archiver of Psychology*. https://doi.org/10.4135/9781412961288.n454

Mohamad, S., & Husnin, H. (2023). Teachers' Perception of the Use of Augmented Reality (AR) Modules in Teaching and Learning. *International Journal of Academic Research in Business and Social Sciences*, *13*(9), 9–34. https://doi.org/10.6007/ijarbss/v13-i9/18319

Nurhayati, E., Andayani, Y., Hakim, A., Mataram, U., Studi, P., Kimia, P., Mataram, U., Barat, N. T., & Semmel, S. (2021). Development of Stem-Based Chemical E-Modules with Etnoscience Approach. *Chemistry Education Practice*, *4*(2), 106–112. https://doi.org/10.29303/cep.v4i2.2768

Nurpatri, Y., Maielfi, D., Indrawati, E. S., Widya, W., & Yusmanila, Y. (2023). Analisis Kebutuhan Pengembangan Modul Pembelajaran Fisika Materi

Lapisan Bumi Terintegrasi Mitigasi Bencana Berbasis Kearifan Lokal. *Kappa Journal*, *7*(3), 451–457. https://doi.org/10.29408/kpj.v7i3.24312

Plomp, T., & Nieveen, N. (2010). *An Introduction to Educational Design Research*.

Puspita Hadi, W., Hidayati, Y., & Rosidi, I. (2020). Respon Guru Ipa Terhadap Pembelajaran Ipa Berintegrasi Etnosains: Studi Pendahuluan Di Kabupaten Bangkalan. *LENSA (Lentera Sains): Jurnal Pendidikan IPA*, *10*(1), 46–53. https://doi.org/10.24929/lensa.v10i1.92

Putra, A. E., Jufrida, J., Pathoni, H., & Basuki, F. R. (2021). The Design of Local Wisdom-Based Science Learning on Pressure Materials in Junior High School. *Journal of Science Education Research*, *5*(2), 28–33. https://doi.org/10.21831/jser.v5i2.43505

Solihudin, T. (2018). Pengembangan E-Modul Berbasis Web Untuk Meningkatkan Pencapaian Kompetensi Pengetahuan Fisika Pada Materi Listrik Statis Dan Dinamis Sma. *WaPFi (Wahana Pendidikan Fisika)*, *3*(2), 51. https://doi.org/10.17509/wapfi.v3i2.13731

Suprapto, N., Prahani, B. K., & Cheng, T. H. (2021). Indonesian Curriculum Reform in Policy and Local Wisdom: Perspectives from Science Education. *Jurnal Pendidikan IPA Indonesia*, *10*(1), 69–80. https://doi.org/10.15294/jpii.v10i1.28438

Syahidi, K., Jufri, A. W., Doyan, A., Kosim, K., Rokhmat, J., & Sukarso, A. (2023). Penguatan Literasi Sains dan Pendidikan Karakter pada Pembelajaran IPA Abad 21. *Kappa Journal*, *7*(3), 538–542. https://doi.org/10.29408/kpj.v7i3.25036

Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). Instructional development for training teachers of exceptional children: A sourcebook. In *Indiana University*. https://doi.org/10.1016/0022-4405(76)90066-2

Utami, S. D., & Efendi, I. (2018). The Study of Local Wisdom of Ethnic Sasaks In Development of Biology Instructional Learning Program (P3Bio) Based on 21 st Century Skills. *Advances in Intelligent Systems Research (AISR), Volume 157*, *157*(Miseic), 114–116.

Utami, S. D., Efendi, I., Dewi, I. N., Ramdani, A., & Suci, I. (2019). Validitas Perangkat Pembelajaran Etnoekologi Masyarakat Suku Sasak Kawasan Taman Nasional Gunung Rinjani. *Jurnal Penelitian Pendidikan IPA*, *5*(2), 240–247. https://doi.org/10.29303/jppipa.v5i2.291

Utari, R., Andayani, Y., Rudyat, L., Savalas, T., Arian, Y., & Anwar, S. (2021). Validity of Ethnoscience Based Chemistry Learning Emphasizing Character Values and Conservation Behavior. *Jurnal Penelitian Pendidikan IPA*, *7*(1), 45–48. https://doi.org/10.29303/jppipa.v7i1.469

Utari, R., Andayani, Y., & Savalas, L. R. T. (2020). PENGEMBANGAN MODUL KIMIA BERBASIS ETNOSAINS DENGAN MENGANGKAT KEBIASAAN PETANI GARAM. *Jurnal Pijar Mipa*, *15*(5), 478–481. https://doi.org/10.29303/jpm.v15i5.2081

Wagiran. (2012). Pengembangan karakter berbasis kearifan lokal Hamemayu Hayuning Bawana (Identifikasi Nilai-Nilai Karakter Berbasis Budaya). *Jurnal Pendidikan Karakter*, *2*(3), 329–339.