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Development of Authentic Science Assessment Media Century skills-based for Elementary School Students

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Abstract

The development of technology makes students have many soft skills in facing the demands of the 21st century. These soft skills are better known as century skills, where students expect to develop the potential of these soft skills as preparation for the future. Progress of these soft skills can train using authentic science assessment media. Media contains material sketches, skill literacy, competency tests, and follow-up programs. Each content can develop children's soft skills in cooperation, communication, creativity, and students' critical thinking. This research includes research and development research. The initial stage of this research was to analyze the content needs of the authentic science assessment media, and a limited trial carried out if deficiencies improvements were made. This study's subjects were students, elementary school teachers, linguists, media experts, material experts, and assessment experts. Purpose the research aims to develop media authentic science assessment-based Century skills for elementary school students and know the quality of authentic science assessment media. The mean validation results from media experts, material experts, linguists, and assessment experts were 84.5%, 84.5%, 84.5%, and 82.5%. Based on these results, authentic science assessment media are good in content, language, and presentation.

Keywords: Science, authentic assessment media, century skills, elementary school

Pengembangan Media Penilaian Otentik IPA Berbasis Keterampilan Abad 21 untuk Siswa Sekolah Dasar

Abstrak

Perkembangan teknologi membuat siswa harus lebih memiliki softskills dalam menghadapi tuntutan abad 21. Softskills ini lebih dikenal dengan century skills, dimana siswa diharapkan dapat mengembangkan potensi dari softskills tersebut sebagai persiapan dimasa mendatang. Pengembangan softskills tersebut dapat dilatih dengan menggunakan media penilaian autentik IPA. Media ini berisikan sketsa materi, literasi skill, uji kompetensi serta program tindak lanjut. Masing-masing konten mempunyai potensi dalam mengembangkan softskills anak dibidang kerjasama, komunikasi, kreatifitas serta pemikiran kritis siswa. Penelitian ini termasuk penelitian riset dan pengembangan. Tahapan awal dari penelitian ini adalah analisis kebutuhan isi dari media penilaian autentik IPA, selanjutnya dilakukan uji coba terbatas, jika ada kekurangan maka dilakukan perbaikan. Subjek penelitian ini adalah siswa, guru sekolah dasar, ahli bahasa, ahli media, ahli materi, ahli penilaian. Tujuan penelitian ini adalah Mengembangkan media penilaian autentik IPA berbasis Century skills untuk siswa sekolah dasar, Mengetahui kualitas media penilaian autentik IPA. Rerata hasil validasi dari ahli media, ahli materi, ahli bahasa serta ahli penilaian adalah 84,5% , 84,5%, 84,5% serta 82,5%. Berdasarkan hasil tersebut media penilaian autentik IPA secara kualitas baik ditinjau dari segi isi, bahasa dan penyajian.

Kata kunci: IPA, media penilaian autentik, keterampilan Abad 21, Sekolah dasar

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INTRODUCTION

The 2013 curriculum aims to answer the challenges and paradigm shift development from the 20th century to the 21st century (Kunandar, 2015). The curriculum was developed by improving the mindset of student-centered learning—interactive presentation of learning, real-life based assessment in real or authentic.

An authentic assessment is all student learning outcomes both during learning and learning outcomes from various aspects, both cognitive, psychomotor, and affective aspects (Yusuf, 2015). Another source states that authentic assessment is an assessment that invites students to solve problems in everyday life based on their knowledge, skills, and attitudes (Santrock, 2010). An authentic assessment in learning is assessing students' abilities based on the actual performance they do following the competencies set by the teacher (Zulantay & Olfos, 2007). Authentic assessments play a considerable role in enhancing student learning and making them competent in every subject. An authentic assessment is applied when the assignment given has real-life value and students are competent in completing the task is following real-life (Sewagegn & Diale, 2020).

Science is a lesson related to real-life. Through learning science, students' abilities in conducting experiments, observations, and theories can explain everyday life symptoms (Indriati, 2012). According to Chopra (2013), the positive influence of science subjects obtained from the material taught, the teacher's methods and media in teaching to support students in enjoying the live lessons. Science is one of the subjects in elementary schools that requires assessment because science is real science that students can get from observing the natural surroundings. However, occasionally, what seems different from the theory that teaches. Assessment here serves as a tool to improve their understanding obtained employing inquiry with the theory taught. The assessment science itself tends to complex because its assets consist of cognitive but psychomotor and affective.

An authentic assessment involves various performance measurement forms that reflect student learning, achievement, motivation, and attitudes to activities relevant to learning (Azim & Khan, 2012). Therefore, it important to develop authentic science assessment media. This media development was integrated with Century Skills to collaborate according to the curriculum's demands. Century skills or better known as 21st Century Skills help students succeed in all fields of formal schooling, and these skills are important in helping students adapt and develop to change the world for the better. Century skills consist of knowledge construction, real-world problem solving, skilled communication, collaboration, information and communication technology for learning, and self-regulation (Partnership for 21st Century Learning, 2016).

Important to develop a science assessment media following several previous studies. Research Charoenchai, Phuseeorn, & Phengsawat (2015) shows that primary school teachers in Sakhonakhon Province, Thailand, have not used authentic assessment in learning. Data from authentic assessment results have not been utilized to maximize student development and classroom learning. Another study by Enggarwati (2015) states that an authentic assessment media has not been optimal for each.

Based on that problem, it is necessary to develop media authentic science assessment based century skills. Taking into account the availability of authentic assessment based century skills in elementary schools is still limited. The objectives of this study are to address research questions as follows: (1) How is the media design an authentic science assessment based century skills preposition elementary school students; (2) How is the quality authentic science assessment media-based century skills according to the experts?

METHODS

This research uses research and development methods to find, develop, and validate a product. The research model chosen was research and development of brog and gall with ten stages with several adjustments due to the COVID-19 pandemic. These stages

consisted of (1) analysis and information gathering, (2) planning, (3) development of preliminary product forms. Next stages (4) Expert product trials, (5) Revision 1, (6) Small-scale trials, (7) Revision II. Three stages last (8) Medium-scale trials, (9) final revision, (10) Dissemination and implementation. Research design can see in the [Figure 1](#).

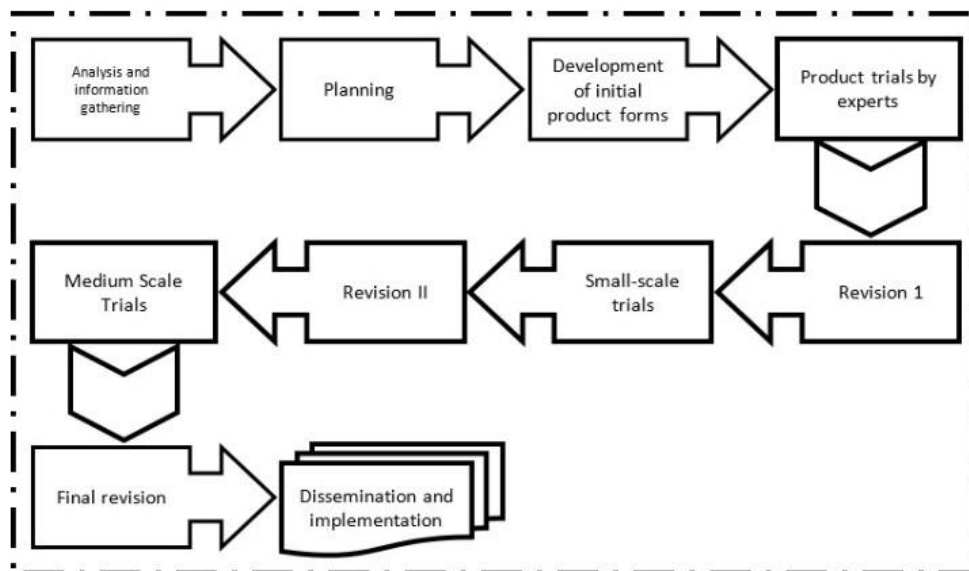


Figure 1. Research design

Analysis and information gathering

This stage consists of a literature review form an assessment of authentic assessment, century skills that can apply in authentic assessment, and relevant science material. Step two is Material analysis. At this stage, the activity carried is analyzing natural science material, which can develop with century skills. Action three is collecting information. At this stage, the information collected is a syllabus, four-grade teacher books, four-grade student books, assessment books. Material reference books other than teacher books and four-grade student books, century skills criteria can integrate into assessment media authentic.

Planning

The formed product made is an authentic science assessment media, the main content framework consisting of 1 beautiful theme diversity in My country divide into 3 sub-themes. Each sub-theme is equipped with a century skill approach.

Preliminary product form development

This stage consists of two activities, namely pre-writing in the form of collecting material to use, namely theme 7 The Beauty of Diversity in My Country. The integrated aspects of the century skills are 4c-based material sketches and literacy skills. After draft writing is done to make a media frame, making authentic assessment media's initial product.

Experts tested

The draft of authentic assessment media products tested by media experts, linguists, assessment experts, and science material experts. An assessment was conducted based on the BSNP. Each expert's measurements include content. Presentation and language. This line related to research [Puspitasari, Haryani, & Widiarti \(2014\)](#) revealed that the

measurement of the media rubric's quality could carry the aspects of content, language, and presentation. The determination of this measurement aspect research of [Nufus, Gani, & Suhendrayatna \(2017\)](#) aspects of content, language, and presentation.

Revision I

The results of the expert's assessment use as reference material in improving authentic assessment media products. After this stage, a small-scale trial was carried out.

Small scale trial

Since the product revised accord input experts, The product tries on a small scale by 1 teacher and 1 elementary school student. Limitation of trials carried considering the research carried during a pandemic.

Revision II

Following small-scale trials, revision II carried in the form of improvements if errors and input from teachers and students found, The media repaired according to input and suggestions. If input and suggestions are nothing next stage is a medium-scale trial.

Medium Scale Trial

To get a valid and reliable product, it is necessary to try again using many subjects. In this trial, it involved 3 teachers and 5 students. As few subjects as possible because this research conducted during a pandemic. Banyumas District is a yellow zone. Researchers must be careful in sampling. The number of samples used is nothing as much as in studies in ordinary circumstances

Final revision

The final revision carries based on the medium-scale test. If the input and suggestions from teachers and students improvements made

Dissemination and implementation

The dissemination process of authentic science assessment media is giving to the University Nahdlatul Ulama Al Ghazali Cilacap Library and 20 elementary schools in Banyumas Regency, both public and private. This study's subjects were four-grade teachers, four-grade elementary school students, media experts, linguists, and material experts. The research conduct in Banyumas.

Data collection methods and instruments used were non-tests. The data collection technique carried the study using a questionnaire in the form of a validation sheet and a questionnaire for student and teacher responses. A validation sheet uses to determine the validity of the authentic assessment media product. Student and teacher response questionnaires determine student responses to the development of authentic science assessment media based on Century skills. Data analysis technique uses research and development is quantitative descriptive to process data in the form of scores from expert assessments, teacher, and student responses. While qualitative descriptive is to describe data in comments and suggestions for improvement from experts, teachers, and students.

FINDINGS AND DISCUSSION

Initial Products and Development of authentic science assessment media

Results obtained were century-based authentic science assessment media. The first stage is to analyze and collect information. After that, planning, what materials will uses in authentic assessment media. The planning stage determined that the science material to developed was the theme of the beauty of my country's diversity, which consists of 3 themes (see [Figure 3](#)). Either theme will describe science material concerning the style in everyday life. Sub-theme 1 will describe muscle force, sub-theme 2 will explain electric force, sub-theme 3 will explain the magnetic force and friction force. Each discussion will equip with a 4c-based material scheme, skill literacy, competency testing, and follow-up programs. The 4c-based material scheme contains descriptions of material integrated with everyday life and has descriptions of material that integrate with Communication (2) Collaboration, (3) Critical Thinking and problem solving, and (4) Creative and Innovative.

Next, literacy skills will contain examples of applying styles that exist in everyday life. Competency tests include cognitive tests with questions are following everyday life. Skills tests include project tests, performance, and so on. Affective tests include attitudes that must possess by fourth-grade elementary school students. A follow-up program is part of the competency test. This program contains an enrichment program, remedial program, and communication with parents. This design adapted to authentic assessment and century skills (Supardi, 2016). Figure 2, Figure 3, and Figure 4 are the illustration of the development of an authentic IPA assessment media based on century skills.

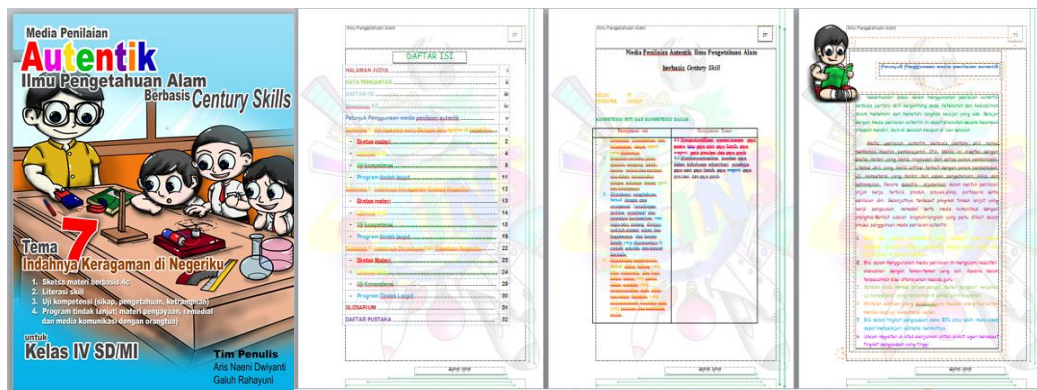


Figure 2. Desain authentic assesment



Figure 3. Subtheme

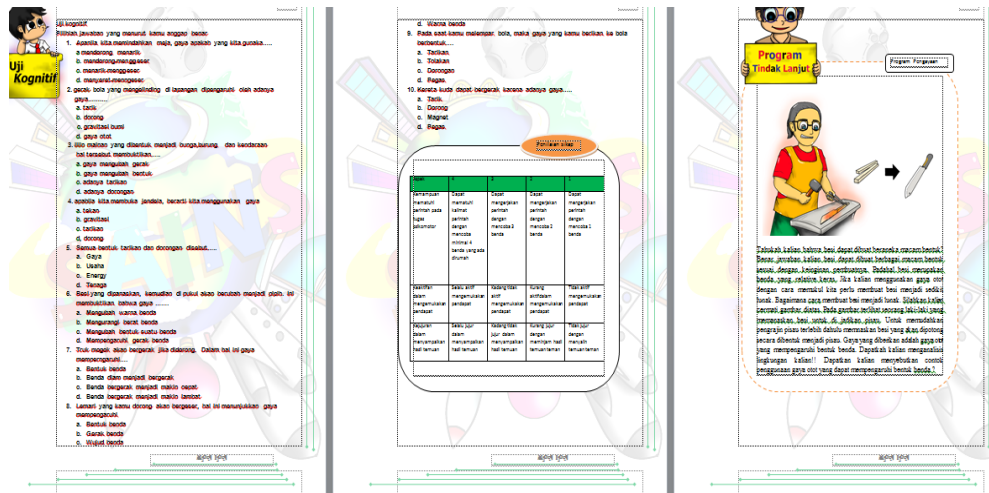


Figure 4. Authentic assesment

The development of authentic assessment media is useful for knowing the development process and student learning outcomes (see Figure 4). The essence of assessment must assess student learning processes and outcomes (Sudjana, 2011). Authentic assessment instruments can measure student learning processes and outcomes (Ilmiwan, 2019; Hindriana & Setiawati, 2018; Kurniawati & Sukardiyono, 2018). Assessment media is an assessment carried holistic at each stage of learning, measures various domains (cognitive, psychomotor, affective), and encourages students to understand science's nature comprehensively. An authentic assessment is an assessment of student learning processes that can show learning success (Mueller, 2005; Shwartz, 2006; Lombardi, 2008).

Experts tested

The next step is to test the authentic science assessment media's validation, which is to test the media's construct validity, content, and language. Validity is the extent to which a measuring device or test tool's accuracy and accuracy perform its measuring function (Azwar, 2014; Santrock, 2010; Rogier, 2014). A measuring instrument is said to have high validity if it provides precise and accurate measurement results for the measurement. According to media, language, material, and assessment experts, we will measure authentic science assessment media's validity. The following is the result of each expert's assessment (see Table 1 and Table 2).

Table 1. Quantitative Data

No	Subject	Validity category	Percent
1	Expert assessment	Relevance, Completeness, Accuracy, Clarity	82.5%
2	Media expert	Media size, cover design, content design, fonts	84.5%
3	Linguists	Completeness, Readability, Clarity, Conformity, Accuracy	84.5%
4	Expert material	Content feasibility, presentation feasibility	84.5%

Small and medium scale trials

Given the conditions during the pandemic, this study conducts according to new habitual procedures. Selection subjects small-scale trials and carried by minimizing the number of subjects used in the study. Total subjects in the small and medium scale trial were 4 teachers and 6 students. Small-scale and ongoing trials use questionnaire sheets for teacher responses and student responses to authentic science assessment media based on century skills. The form of the questionnaire used was the assessment score criteria

with 4 scales, which stated that each aspect's quality level is assessed. Scale 1 and 2 do not disagree to disagree, meanwhile, scores 3 and 4 fall into the agreement and strong category. [Rahman, Iswatiningsih, & Romdhani \(2015\)](#) have previously collected teacher responses like this, which explain that the closed questionnaire form the assessment scale format with a description of the value starting from strong agree to disagree use to obtain. The following (see [Table 3](#)) is an analysis of the student and teacher response questionnaires.

Table 2. Qualitative Data

No.	Feedback and suggestions	improvements
1	Use the same font size	Change the font size to the same
2	Improve the instructions for using the assessment media	Make corrections to the instructions for use as recommended
3	Improve the readability of cognitive questions in item 3, sub-theme 3 is used.	Do the readability of the questions according to the instructions
4	Use the font color used in the table of contents to be too flashy	Change the color of the letters in the table of contents

Table 3. Percent Score of the Student and Teacher Response Questionnaires

No	Subject	Response category	Percent score
1	Teachers	Media, material, linguists, assessment	85%.
2	Students	Media, material, linguists, assessment	86%

This research obtained two kinds of data based on the data analysis method: quantitative and qualitative. The quantitative data obtained from expert assessments and student responses. Meanwhile, qualitative data obtained from input and suggestions from experts, teachers, and students. According to Experts tested, this media linguist got 84.5% of languages, including completeness, legibility, clarity, suitability, and accuracy. Based on several previous studies, this aspect declares valid or suitable for use. The percentage of expert validation values with a value of 80% can categorize as high enough and feasible to tested ([Wicaksono, Muhardjito, & Harsiati, 2015](#)). According to media experts, media size, cover design, content design, font, media size received an assessment of 84.5%, and the category is feasible and usable. Assessment material experts consisting of content feasibility, presentation feasibility gets a value of 84.5%. This shows that authentic science assessment media is compatible with the applicable curriculum. In this case, the 2013 curriculum. The indicators and objectives developed in authentic assessment media are based on core competencies and basic competencies developed in the curriculum. Items of constructs, the instrument developed declared very feasible to record student achievement in the authentic realm (cognitive, affective, and psychomotor). In the form of presenting this media, it is developed following the development of students. Each illustration used is relevant in everyday life.

Assessment expert assesses the relevance, completeness, accuracy, and clarity of the authentic assessment media with 84.5. This means that authentic assessment media is valid and suitable for use. The questions used are relevant to core competencies and basic competencies. Authentic assessment media has completeness, accuracy, and clarity in measuring students' scientific abilities.

Media experts respond to authentic science assessment media were covering aspects of media size, cover design, content design, and letters with a value of 84.5. This assessment can state that the authentic science assessment media is valid and can uses. However, some parts need to be revised. Such as unequal font sizes. They were choosing

many font colors in the table of contents. All input from experts is used to improve authentic science assessment media based on century skills.

Student and teacher responses scored 86 and 85. This means that the authentic science assessment media can provide a strong response to students. Teachers have no difficulty in applying it in learning. The statement is under previous research, namely the number 81% to 100% classified strong (Riduwan, 2007). Input and suggestions from students stated that the interest in the illustrations presented. Because the illustration is made to resemble the original and present as a cartoon character. This is by Maidiyah and Fonda (2013) research that teachers can attract students' attention by using illustrations and a straightforward learning delivery to understand the material much easier.

CONCLUSION

The development of authentic IPA assessment media based on century skills was developed on the theme of 7 the beauty of my country's diversity. It consists of 3 sub-themes contain material and assessment of muscle force, electric force, magnetic force, gravitational force, and friction force. Each sub-theme is equipped with century skill-based explanations and authentic assessments that are suitable for everyday life. Based on the assessment of experts, the authentic science assessment media is valid and suitable for use. The teacher's response to this assessment media is easy to use in learning. Students are interested in this assessment media because the illustrations presented and the discussion is following everyday life. Researchers' implications are as follows: (1) Authentic science assessment media can make it easier for teachers to assess student abilities. (2) can be used as a reference for teachers to prepare authentic assessment media for other subjects.

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