



Development of a Project-Based Comprehensive Assessment Tool Model for Integrated Mathematics Learning in Elementary School Curriculum in Wetland Environments

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Abstract

The aim of this research is to determine the initial conditions, analyze, produce elementary school mathematics learning tools based on project assessment in a wetland environment that are valid and reliable and to determine the effectiveness of primary school mathematics learning tools based on project assessment in a wetland environment simultaneously. The type of R&D research used in this research is the Borg and Gall design model with pre-field, field survey and post-field stages. The results of the assessment of project-based instruments from experts and practitioners in carrying out internal tests received good marks. The project-based comprehensiveness assessment instrument that has been formulated and tested by researchers can be said to have high validity, namely exceeding ≥ 0.40 . The conclusion in this research is that the development of a project-based comprehensive assessment tool model through mathematics learning activities helps teachers provide direct assessments, identify learning objectives, see student progress over time, and describe students' mastery of the material, especially in mathematics learning

Keywords: Assessment Tool, Project, Mathematics, Wetland

Introduction

Assessment is one component of educational achievement (Guo et al., 2023). Assessment is an activity carried out to measure and assess the level of achievement of the curriculum so it is very important to carry out in an educational institution. In the assessment process, there are four main elements, namely the object being assessed, criteria as a benchmark, data on the object being assessed, and decision considerations (Inteni, et al., 2018). The expected assessment includes cognitive, affective and psychomotor aspects using the method certain assessments based on the aspects to be measured. The assessment method is a very important part of measuring, in fact it is the basis and center of the assessment process (Wether, 2016).

There are various techniques that can be used to collect data and information about students' learning progress, both related to learning outcomes and the learning process (Arifuddin, 2023). Likewise, in assessing psychomotor learning outcomes, one way is to use project assessment. Project assessment is a task that must be completed within a certain time period. This task takes the form of an investigation from collecting, organizing, evaluating, to presenting data. The project will also provide information about students' understanding and knowledge of certain lessons, students' ability to apply knowledge, and students' ability to communicate information (Efianti, et al., 2021). Project assessment is highly recommended because it helps develop students' higher thinking skills (critical thinking, problem solving, creative thinking). Project assessment to measure students' skill competencies is an alternative assessment to encourage students to have problem-solving abilities (Sofwan, et al, 2022).

The majority of elementary schools in Banjar Regency still use the 2013 curriculum. Furthermore, after confirming data from the Education Office on the Banjar Regency Education Office website, it was discovered that 95% of schools still use the 2013 curriculum. The assessment process used in elementary schools is still not able to accommodate the cognitive domain, affective, and psychomotor. The facts found in the field are that schools still prioritize cognitive aspects. Less than 30% of schools have implemented skills aspects through skills assessment rubrics. Other surprising facts were also discovered when researchers conducted in-depth interviews and observed learning activities in elementary schools. The assessment process carried out still focuses on C1 to C3 so that the orientation is still based on Low Order Thinking Skills and does not refer to High Order Thinking Skills at all (Ilham S et al., 2023).

Apart from that, teachers have not optimally used the mainstay models in the 2013 (K13) curriculum, including Project Based Learning Model, Problem Based Learning Model, Discovery Learning Model. This is certainly a concern considering that by 2024 the government requires all schools to have implemented an independent curriculum by implementing innovative learning models.

The facts found in the field were confirmed by interviews with teachers who said that up to now they do not have project learning assessment tools (Li et al., 2023). The principal also said that until now teachers have had problems in preparing project assessment rubrics for both K-13 and the independent curriculum, considering the many new components in the achievement indicators for the project to strengthen the profile of Pancasila students. The results of the 2019 Program for International Student Assessment (PISA) research show that the assessment results for Indonesian students were only in sixth position from the bottom in the fields of mathematics and literacy, Indonesia was in 74th position out of 79 countries.

Based on the background description above, it is important to develop project assessment-based mathematics learning tools to develop various relevant competencies in the era of society 5.0 in elementary schools, especially in the wetland environment which is the main object of study in South Kalimantan.

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Research Method

This research uses a type of research and development (Research and Development) intended to produce a product. Development research aims to produce products based on findings from a series of trials, through individuals, small groups, medium groups, field trials, revised to obtain results or products that are adequate or suitable for use. The type of R&D research used in this research is the Borg and Gall design model (Setyosari, 2020).

The research stages can be detailed as follows: (1) pre-field stage or preparation stage, (2) field survey, which is the stage for finding and collecting data, analyzing data, (3) post-field stage where the research team prepares a report.

This research will be carried out in three regencies/cities in South Kalimantan including: Tanah Bumbu Regency, Banjarbaru City and Banjar Regency (as product trial data), the research period will be from April to December 2023.

The target population for this research is elementary school students in Banjarbaru City, Kab. Tanah Bumbu and Kab. Banjar, for the 2023/2024 academic year, the population reached is around 165 people from 3 schools in three districts/cities. The sampling technique in this research is purposive random sampling. The initial field test (limited test) was carried out in Kab. Land of Spices. The main field test was carried out at one school with 57 students in Banjarbaru City and the operational field test was in Kab. Banjar in two schools with a total of 108 students.

Research data was collected from elementary school teachers selected as research samples through questionnaires, interviews, documentaries and photos/videos of activities. Research uses qualitative and quantitative methods. Qualitative data is obtained from the results of descriptions, analyzing instruments to see product feasibility. Meanwhile, quantitative data, researchers analyzed the results of designing project-based assessment tools for comprehensive mathematics learning that is integrated into the elementary school curriculum

Result and Discussion

The assessment design contained in the learning implementation plan (RPP) was made by the current elementary school teacher when the researcher saw and interviewed directly with several good teachers in the district. Banjar, Kab. Tanah Bumbu and Banjarbaru City, around June 2023, before determining the research problem. The results of the researchers' findings so far, teachers designing learning tools still do not refer to the curriculum that has been implemented by the government, namely the independent curriculum and innovative learning in the 21st century.

The findings of the learning implementation plan are as follows. First, the findings in designing the RPP from Kab. Banjar, where the components developed include: School Identity, Subjects, place, time allocation, competency standards, basic competencies, learning

objectives, teaching materials, learning methods, steps of learning activities (initial activities, core activities that are directly designed for activities one week), and assessment. Assessments of attitudes, knowledge and skills have been made, but are not described in detail based on the learning objectives regarding what will be assessed against students. The question descriptions are not explained, and the format and assessment rubric are also not explained.

Second, the findings in designing the RPP from Kab. Tanah Bumbu, where the components developed include: School Identity, Subjects, place, time allocation, basic competencies, indicators, learning objectives do not describe high level thinking skills, teaching materials, learning methods. The steps for learning activities (initial, core and closing activities) do not describe the steps of the model being developed and do not use assessment and project-based learning, learning tools and resources and assessment are only cognitive aspects and there is no assessment rubric.

Based on the findings in Kab. There are several weaknesses in the design of learning tools made by elementary school teachers on fractional operations material, namely that the component of formulating learning objectives does not yet describe all aspects of ABCD (Audience, Behavior, Condition, Behavior), where all learning objectives describe exploration activities, do not describe aspects of attitude. knowledge and skills.

The learning strategy only includes learning methods, there are no learning approaches and models and the media used. Initial activities include pre-requisite knowledge, motivation, pre-learning. not preparing physically and psychologically (saying greetings, attendance, prayer, apperception, and conveying learning objectives. The core learning activities are outlined for one week of activities and there are no visible steps for a scientific approach according to the 2013 curriculum and innovative learning approaches.

So the learning method used is not varied because it is used at every meeting with the same method in one week. Because several meetings were held, the methods used were not varied according to the same material created in the learning activities. Assessments of attitudes, knowledge and skills have been made, but are not described in detail based on the learning objectives regarding what will be assessed against students. The question descriptions are not explained, and the format and assessment rubric are also not explained. Does not contain questions and statements that will be developed to measure the learning process, including attitudes, knowledge or skills.

Judging from the components of innovative learning activities, there are several things that need to be considered in terms of core competencies, indicators of competency achievement, learning objectives that contain elements of ABCD (Audience, Behavior, Condition, Behavior), according to the 2018 Ministry of Education and Culture regulations, including strengthening character education, honesty, nationalism, discipline, responsibility etc.

Including approaches, methods, media and learning resource materials, learning steps include preliminary activities which contain physical and psychological readiness, greetings, attendance, prayer, apperception and including learning objectives, core activities do not yet contain project-based learning and media has been prepared according to the material taught.

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Including 4C includes critical thinking, creativity, collaboration, communication, concluding learning material by providing assessments and asking about feelings or giving appreciation and giving advice before reading the home school prayer and determining remedial and enrichment. The assessment given must include attitudes, knowledge and skills (Hariyadi et al., 2023).

Barriers to the design of mathematics learning tools and the project-based assessment methods (Faizin et al., 2023) implemented are due to the lack of support and opportunities for educators both from the school and from the education department by providing opportunities to take part in training and learning workshops related to the implementation of the curriculum implemented by the government, and providing opportunities only on certain people, while the results are not disseminated evenly in schools. Apart from that, there is also a lack of supervision from both the principal and supervisor.

The teacher's age factor also influences the teacher's ability to develop direct learning and assessment implementation plans that are in accordance with the demands and developments in the current curriculum. To increase self-development in terms of participating in activities related to their profession (workshops, seminars, KKG activities, training and workshops), most of them experience obstacles related to limited transportation facilities so that it takes a long time to get to the location of the workshop, seminar, KKG, training and workshops. If they decide to take part in self-development activities, they risk abandoning their teaching duties, which ultimately becomes a dilemma for them as educators.

Based on the findings in Kab. Tanah Bumbu from the design of learning tools made by elementary school teachers on number counting operations material has several weaknesses, namely the learning objective is only to move indicators in the learning implementation plan, the learning objectives should be formulated with elements of ABCD (Audience, Behavior, Condition, Diegre). The learning method has been explained but the learning model approach is not explained and the learning media is not attached to the learning plan created. The initial activity steps do not include the character values being developed, do not motivate and convey learning objectives but include apperception to remind the material that has been studied with the material that will be taught to determine number counting operations. So communication and collaboration between teachers and children is still not carried out well.

In the core learning activity the teacher only provides notes about the concept of number counting operations. This can be seen from being active in only one direction, namely the teacher in conveying learning activities to children. It should be in the core learning activities that have been planned, such as approaches, models, methods and learning media that must be included in the core learning activities that are in accordance with the curriculum, but also not in accordance with the project model learning steps.

In the closing activity, this RPP only provides practice questions for homework, the teacher and students should conclude the learning material provided, and provide practice questions in the form of quizzes or other assessments. If the learning uses a learning approach and model that has syntax and steps that provide rewards in any form, then at the closing time

this is carried out and continued by reflecting on the learning activities that have been carried out by asking what feelings they enjoyed and what they still don't understand. So that in learning activities, critical thinking and communication emerge. For the assessment, only techniques and instruments are used, but it is not explained what techniques will be used to measure and see aspects of attitudes, knowledge and skills. The existing assessment is only cognitive aspects, does not detail aspects of attitudes and skills.

Barriers to the design of mathematics learning tools and the way assessments are carried out are due to the lack of support and opportunities for educators both from the school and from the education department by providing opportunities to take part in training and learning workshops related to the implementation of the 2013 curriculum, and providing opportunities for people only certain areas, while the results have not been disseminated evenly to schools. Apart from that, there is also a lack of supervision from both the principal and supervisor. The teacher's age factor also influences the teacher's ability to develop direct learning and assessment implementation plans that are in accordance with the demands and developments in the current curriculum.

The learning tool model that was developed was made in accordance with findings in the field, where the researcher created a learning tool by adapting the steps of the project learning model, as well as a comprehensive assessment that was developed including (cognitive, affective and psychomotor) and included an assessment of student learning processes and work results made both individually and in groups. Before using this learning device, it was first tested according to the development research steps developed by Borg and Gall. The learning tools, assessments and approaches used went through three tests, first internally and secondly externally, namely limited trials and main field tests.

The first internal trial was carried out from 18 to 27 July 2023, given to five experts with Master's doctoral degrees with educational backgrounds in Mathematics, Educational Research and Evaluation and Practitioners in the field of Education (SN, RD, RY, RA, and SW) and five of their practitioners also have Bachelor's and Master's degrees in Primary School Teacher Education (E, J, D, H, and Y). The project-based comprehensiveness assessment developed in this research includes assessment of processes and results as well as structured tasks including knowledge, attitudes and skills contained in planning, working and implementing project products based on an assessment rubric, along with a scoring rubric.

The draft project-based comprehensive assessment model will then be tested internally using the opinions of a team of experts with Doctoral degrees, which are five people. To calculate several values given by experts or teams of experts to the project-based comprehensiveness assessment model design, see the table below:

Table 1. Expert Assessment of Project-Based Assessment Instrument Components

No	Component	Score calcul ate	Score criteria	Value	description
1	Conformity of instrument design with comprehensive project-based assessment	15	20	$15:20 \times 100 = 75$	Components approved

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2	Compatibility of KD and Indicators with comprehensive learning materials	20	20	$20:20 \times 100 = 100$	Components approved
3	Conformity of assessment techniques with rubric	18	20	$18:20 \times 100 = 90$	Components approved
4	Suitability of instrument design with high level thinking HOTS	18	20	$18:20 \times 100 = 90$	Components approved
5	Suitability of language used	18	20	$18:20 \times 100 = 90$	Components approved
Average				89	

The design of the project-based comprehensive assessment model will then be tested internally using the opinions of practitioners who have been randomly selected. The instrument will then be given to 5 people to use in providing an assessment of the design of the project-based comprehensive assessment instrument. To calculate some of the values given by experts or teams of experts to the draft project-based comprehensive assessment model, see the table below:

Table 2. Practicion Assessment of Comprehensive Assessment Instrument Components Project Based

No	Component	Score calculate	Score criteria	Value	description
1	Conformity of RPP design with project-based comprehensiveness assessment	17	20	$17:20 \times 100 = 85$	Components approved
2	Kesesuaian Compatibility of KD and Indicators with comprehensive learning materials	17	20	$17:20 \times 100 = 85$	Components approved
3	Conformity of assessment techniques with rubrics	16	20	$16:20 \times 100 = 80$	Components approved
4	Suitability of instrument design with high level thinking HOTS	15	20	$15:20 \times 100 = 75$	Components approved
5	Suitability of language used	17	20	$17:20 \times 100 = 85$	Components approved
Average				82	

Based on the data listed in the table above, it can be seen that there is a difference between expert and practitioner assessments. In conclusion, the system design has been tested by experts and practitioners with the average value not being much different. This means that quantitatively the design of the project-based comprehensiveness assessment model received a good score, and can be continued to be tested externally.

Assessment in the project-based comprehensive assessment instrument format, the average final score given by experts on the project-based comprehensive assessment instrument

is said to be valid if the results show a number ≥ 0.40 . The first assessment item regarding the suitability of the RPP design with the concept of project-based comprehensive assessment received an average value of 0.87, the second item regarding the suitability of basic competencies and indicators with comprehensive learning material received an average value of 0.80, the third item regarding the suitability of assessment techniques and the rubric obtained an average value of 0.87, the fourth item regarding the suitability of the instrument design with HOTS higher level thinking received an average value of 0.80, and the fifth item regarding the suitability of the language used received an average value of 0.93. Thus, the project-based comprehensiveness assessment instrument that has been formulated and tested by researchers can be said to have high validity.

Expert assesment

Input for the first internal test from five experts who teach as PGSD lecturers consists of: SN's assessment of the project-based comprehensiveness assessment instrument which discusses the material of adding fractions to different denominators, namely the cognitive instrument should be formulated in a HOTS manner referring to Anderson and Krathwol's revised Bloom's Taxonomy from C4 to C6. As for the cognitive aspect assessment rubric, the value weights need to be adjusted to the level of difficulty of the cognitive instruments/questions being developed. For project-based competence, the identity section of the assessment sheet should be clarified by including the name of the assessee and the name of the assessor. There is no LKPD instrument or evaluation questions.

RD's assessment of the project-based comprehensiveness assessment instrument which discusses material about flat shapes, area and perimeter of rectangles, namely the formulation of cognitive instruments as well as affective and psychomotor assessment rubric indicators from a linguistic perspective, should use effective sentences so that students can easily understand them. Questions that are still closed tasks should be changed to all open ended task questions so that they become HOTS questions.

RY's assessment of the project-based comprehensiveness assessment instrument which discusses material about flat shapes, area and perimeter of rectangles, namely that the question instrument should be developed in a HOTS manner using operational verbs in the cognitive domain from C4 to C6. Students' ability to analyze problems is related to writing down what they find and ask about in story problems. For the affective assessment rubric, the word complete in the integrity indicators of the first and second points can be emphasized with the word earnest. Meanwhile, for the cognitive assessment rubric, the value weight for each question should be adjusted to the cognitive level being developed.

RA's assessment of the project-based comprehensiveness assessment instrument which discusses the material of adding fractions to different denominators, namely the cognitive instrument items developed should refer to the level of high-order thinking abilities (HOTS) with effective sentences that are easy for students to understand. The skills assessment that is formulated should be focused on what type of assessment instrument you want to develop that is in accordance with the concept of adding fractions to different denominators, whether it is a practice, project or product assessment instrument. Meanwhile, regarding the rubric that

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measures the project-based comprehensiveness assessment instrument which discusses adding fractions to different denominators, the criteria used in the attitude assessment rubric would be better if it used the sentences (1) need guidance; (2) starting to develop; (3) already entrenched; and (4) habits. From a linguistic perspective, the use of effective sentences needs to be reviewed.

SW assessment of project-based comprehensiveness assessment instruments that discuss the material of adding fractions to different denominators, namely the skills assessment instruments and rubrics that are formulated should be focused on what type of assessment instrument you want to develop that is in accordance with the concept of adding fractions to different denominators, whether the instruments and assessment rubrics are practical, project or product. The evaluation assessment score rubric has not been created sequentially.

Practitioner Assessment

The design of the learning tools given the assessment format refers to the performance test assessment (UKIN) in the RPP design, and the project-based comprehensiveness assessment instrument uses a format created by the researcher.

Assessments in the project-based comprehensiveness assessment instrument format get the average final score given by practitioners to the project-based comprehensiveness assessment instrument which is said to be valid if the results show a number ≥ 0.40 or exceed the predetermined standards. The first assessment item regarding the suitability of the instrument design with the concept of project-based comprehensive assessment received an average value of 0.93, the second item regarding the suitability of basic competencies and indicators with comprehensive learning material received an average value of 0.87, the third item regarding the suitability of assessment techniques and the rubric obtained an average value of 0.67, the fourth item regarding the suitability of the instrument design with HOTS higher level thinking received an average value of 0.67, and the fifth item regarding the suitability of the language used received an average value of 0.67. Thus, the project-based comprehensiveness assessment instrument that has been formulated and tested by researchers can be said to have high validity.

Input for the first internal test from five practitioners who teach as elementary school teachers consists of: E's assessment of project-based comprehensiveness assessment instruments that discuss the material of Adding Fractions to Different Denominators, namely the assessment of the skills formulated should be focused on what type of assessment instrument you want to develop that is in accordance with the concept of adding fractions to different denominators, whether practical, project or product assessment instruments. Meanwhile, for input regarding the rubric that measures the project-based comprehensiveness assessment instrument which discusses the addition of fractions with different denominators.

J's assessment of the project-based comprehensiveness assessment instrument which discusses material about flat shapes, area and perimeter of rectangles, namely the cognitive instrument items developed should refer to the level of high order thinking abilities (HOTS). For input regarding the attitude assessment rubric, the criteria measuring words use the words

"needs guidance" for the criteria for one aspect being implemented, "starting to develop" for the criteria for two aspects being implemented, "already entrenched" for the criteria for three aspects being implemented, and "habit" for the four aspects being implemented .

D's assessment of the project-based comprehensiveness assessment instrument which discusses the material of flat shapes with the area and perimeter of a rectangle, namely the skills assessment instrument items formulated should be focused on what type of assessment instrument you want to develop which is in accordance with the concept of flat shapes with the area and perimeter of a rectangle, whether the instrument assessment of practices, projects or products. For input regarding the cognitive assessment rubric, the value weight for each question should be adjusted to the level.

H's assessment of the project-based comprehensiveness assessment instrument which discusses the material of adding fractions to different denominators, namely the cognitive instrument items developed should refer to the level of high-order thinking abilities (HOTS). Meanwhile, for input regarding the attitude assessment rubric, the criteria measuring criteria use the words "needs guidance" for the criteria for one aspect being implemented, "starting to develop" for the criteria for two aspects being implemented, "already entrenched" for the criteria for three aspects being implemented, and "habit" for the four aspects being implemented. . For cognitive assessment rubrics, the value weight for each question should be adjusted to the cognitive level.

Y's assessment of the project-based comprehensiveness assessment instrument which discusses material about flat shapes, area and perimeter of rectangles, namely the cognitive instrument items developed should refer to the level of high-order thinking abilities (HOTS) and the Psychomotor (skills) skill assessment instrument items formulated should be focused on What type of assessment instrument do you want to develop that is in accordance with the concept of flat shapes with area and perimeter of a rectangle, whether it is a practice, project or product assessment instrument. For input regarding the cognitive assessment rubric, the value weight for each question should be adjusted to the cognitive level

Conclusion

From the research results, it can be concluded that developing a comprehensive project-based assessment tool model through learning activities can encourage and assist teachers in providing direct assessments, identifying learning objectives, seeing student progress over time, and illustrating student mastery of the material and fostering a sense of trust. self and responsibility to students. The suggestion given is that teachers, especially mathematics teachers, can create project-based assessment tools to assess aspects of students' skills

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