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Enhancement Quality of HOTS Assessment of Pre-Service Teachers Through Project-Based Learning

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ABSTRACT

To fulfill the professionalism of pre-service teachers in the aspect of pedagogic competence, each pre-service teacher will be equipped with knowledge related to the preparation of test instruments including cognitive test instruments based on high-order thinking skills (HOTS) which can be mastered only if students gain real experience regarding the preparation of these instruments through project-based learning. The purpose of this study is to describe the learning process and what projects are produced and describe the level of success. The method used is classroom action research proposed by Kemmis which goes through the stages of planning, action, observation, and reflection. The results of this study are, first; project-based learning that students go through can achieve the expected abilities, namely, students can develop valid and reliable test instruments as well as other supporting documents that support the success of the HOTS-based test instruments that are compiled. Second; Project-based learning has experienced success as indicated by the results of the learning questionnaire and the recapitulation of increased learning outcomes before and after the implementation of project-based learning on the HOTS questions.

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1. INTRODUCTION

One indicator of a professional teacher can carry out learning evaluations by indicators of learning achievement (Haswindy et al., 2018; Kim et a., 2019). It is no exception for prospective teachers who will enter the world of education. Of course, they must be trained since their college education to make suitable evaluation instruments. For this reason, a precise strategy is also needed for lecturers in preparing prospective teachers to become professionals through active, creative, critical, and fun learning.

Evaluation of learning that can increase the competence of cognitive aspects in the maximum domain must be directly proportional to efforts to improve the quality of the test instruments used by educators, including prospective teachers who will be directly involved in processing and developing student learning outcomes (Paidi et al., 2020; Saraswati et al., 2020). This is the basis for the importance for lecturers to carry out learning that provides a deep understanding so that students acquire inherent knowledge until they enter the real world of education. One way for prospective teachers to apply the knowledge gained is to apply a meaningful learning model, where students not only learn a concept that ends in understanding but can also apply it to the real world they face in their surroundings by applying the Project Based learning model.

Professional teachers are the primary condition that determines the quality of learning and students' learning outcomes (Gaikhorst et al., 2014; Powell & Bodur, 2016; Winingsih & Sulistiono, 2020). Prospective teachers must be challenged to reflect on their experiences and learn from these experiences (Willegems et al., 2018), and are no exception in preparing learning evaluation instruments (Alkamel & Chouthaiwale, 2018; Britton et al., 2017). One of the relevant learning models for prospective teachers to construct learning experiences is project-based learning, which is situation-based and based on constructive findings. Students gain a deeper understanding when they actively construct understanding by working together and expressing ideas in real-world contexts (Bada & Olusegun, 2015; Keith et al., 2016).

Project-based learning relates to efficiently managing time, tasks, and instruments and can incorporate thinking into designing something (Ferry, 2021). Based on the results of the research (Vogler et al., 2018), more than teaching the hard skills needed for practice (projects) is needed to realize the professionalism of prospective teachers. Instead, students must be involved with other people so that their soft skills are channeled. The success of project-based learning can be supported by assessment instruments that are varied and relevant to projects made by students, where there are cognitive activities in the form of asking questions, guessing causes and effects, and improving designs (Handayani, 2018; Jonassen & Carr, 2020; Riadi & Atini, 2018).

The professional experience of prospective teachers studied in this study is their ability to design learning outcomes test instruments that refer to high order thinking skills (HOTS) which is the ability to think critically, logically, reflectively, metacognitively, and creatively thinking where teachers are asked to carry out the process measurable learning from the aspects of knowledge, problem-solving, and critical thinking (Aviory & Susetyowati 2021; Epinasti et al., 2021; Zaki et al., 2019).

This study aims to examine the extent to which students' ability to compose HOTS questions through project-based learning, the questions in this study are, what are the stages of implementing PjBL to achieve learning objectives related to making HOTS questions for students and what is the success of lectures using project-based learning on HOTS question preparation material.

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2. METHODOLOGY

The subjects of this study were 32 students in the 6th semester of the Catholic Religious and Education Study Program at a public university in Pontianak who would carry out practical field experience in the 7th semester. This research uses a class action research design; class action research is a process of reviewing through cycles in various learning activities (Laksono & Siswono, 2018), with four stages of implementation, namely planning, action, observation, and reflection (Kemmis, 2021).

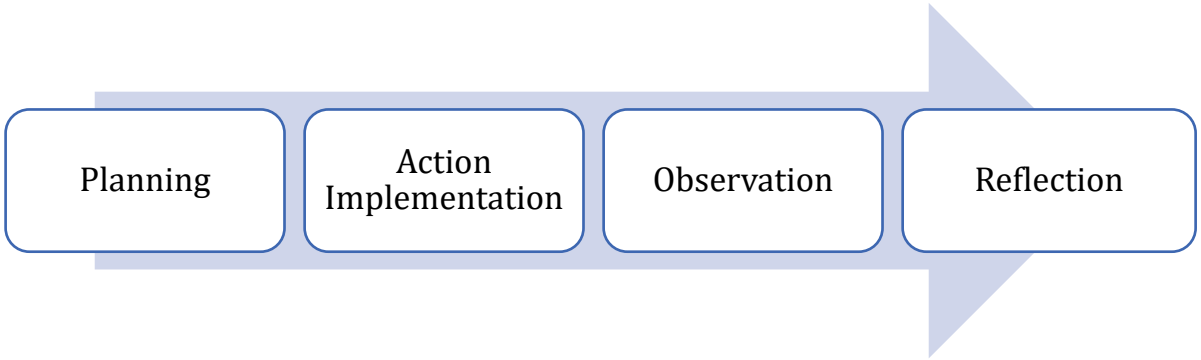

Figure 1. Classroom Action Research Stage

Data analysis techniques using quantitative and qualitative data analysis techniques. Quantitative data is a final project assessment instrument consisting of a portfolio and presentation assessment rubric (Dewi, 2021). At the same time, the qualitative data is in the form of project observation sheets in the form of learning evaluation questionnaires, and data in the form of a list of learning values in the school year before this project-based learning is applied to the study material for the preparation of HOTS questions that have been integrated with the Edlink Learning System Management (NGO) in tertiary institutions.

3. RESULT AND DISCUSSION

3.1. Application of Project-Based Learning

The first stage in implementing project-based learning is planning. Planning is made to measure the complexity of learning that supports achieving learning objectives (Gomez et al., 2020). The planning stage consists of the following steps: 1) determining the expected final ability according to the lesson plan, where project-based learning is carried out on the subject of authentic assessment and processing of learning outcomes. The expected final ability of project-based learning is that students can make cognitive assessment instruments in the form of multiple choice questions based on valid and reliable High Order Thinking Skills (HOTS) 2) Create a project assessment rubric consistingof portfolio assessment and presentation assessment, 3) Create a questionnaire as a reflection material on project-based learning that has been implemented.

The second stage is the implementation of project-based learning actions, where students start making projects in the form of multiple-choice test instruments totaling 20 questions in groups with the following procedure:

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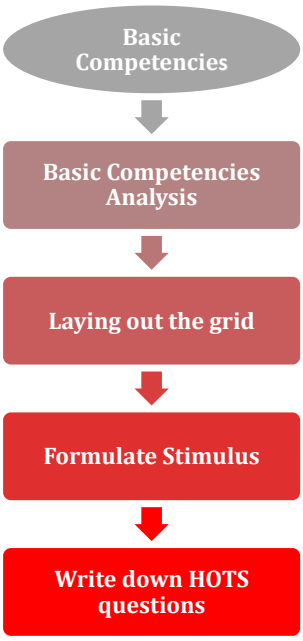

Figure 2. The flow of Preparing HOTS Questions

The project documents produced from this stage are 1) a grid form that contains essential competencies determined by students, material, question/stimulus indicators, cognitive level, question form, and question numbering (Vitiarti, 2022). 2) HOTS question cards containing HOTS-based multiple choice questions and answer keys, and 3) assessment guidelines.

Figure 3. The Process of Preparing HOTS Question Projects

The third stage is observation; the observation stage consists of 2 activities, namely, 1) rational validation in the form of expert judgment involving material experts in Catholic Religious education. Most of the experts appointed by the students involved Catholic Religious Education and professional ethics teachers with more than three years of teaching experience. Questions that have been validated are then corrected according to input from material experts (Hardiansyah & Hidayatillah, 2022; Kartowagiran & Rohaeti, 2021; Vogler, et al., 2018)

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and are then ready to be tried out; 2) HOTS test questions that have been made for students from junior to senior high schools that have collaborated with universities. This trial aims to determine the reliability level of questions made by students. Class levels vary based on the group's agreement; 3) Revision of the questions; after validation and testing, the questions are corrected based on the findings obtained during the validity and reliability testing process. The project produced from this stage is a rational validation sheet, the results of the HOTS test reliability test consisting of discriminating power, level of difficulty, and distractor function, and final questions ready to be used as valid and reliable test instruments.

Reflection Phase, the things obtained from the planning process to the observations collected are then analyzed to ascertain whether project-based learning can realize students' abilities in preparing HOTS questions. In addition to the HOTS-based test instruments made by students, there are several documents produced by students from various stages of learning that are part of project-based learning, which can be seen in the image below:

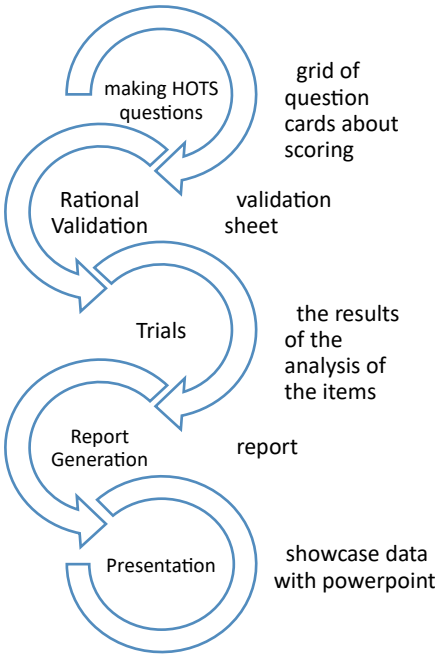

Figure 3. Project-Based Learning Process and the Resulting Document

Based on the abilities expected and included in the lesson plan, students are expected to be able to create test instruments in the form of valid and reliable HOTS-based multiple choice questions which can be seen in the following table.

Table 1. Rational Validity and Reliability af HOTS Questions Compiled by Students

Group	Rational Validity	Reliability
1	Worth to use with minor revisions	0,77
2	Worth to use with minor revisions	0,59
3	Worth to use with minor revisions	0,77
4	Worth to use with minor revisions	0,72
5	Worth to use with minor revisions	0,72

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Determination of rational validity can be seen from the score given by expert judgment on questions prepared by students by considering material aspects, question construction, language, and culture. Questions made by 4 out of 5 groups were declared suitable with a few revisions, while one other group was declared eligible for use with many modifications. Some input from material experts related to points that need to be revised are; 1) in terms of the use of words in the stimulus questions that are still ambiguous. Most of the stimulus questions presented by students were in the form of contextual stories, so that the length of the short story referred to by the expert judgment was not related to the cognitive level of students, but rather to the substance discussed in the report contained in the problem (Widana, 2017); 2) the sentences used must be clear and straightforward, so that the testee is not confused; 3) layout efficiency in questions and must pay attention to font size and margins so that paper is not wasteful; 4) the text on the stimulus used is not too long and according to the cognitive level of students, cognitive stages need to be considered so that the goals of the expected essential competencies can be achieved (Cahyaningtyas et al., 2020; Grant & Baden-Fuller, 2018; Widana, 2017); 5) there is a similarity in the meaning of words and sentences between one choice and another in one question so that it is possible to create confusion, at this point it makes a contradiction in students' understanding of objective test questions, where the alternative answers to multiple choice questions basically have to create a distractor or distractor which allows testees to choose if they do not master the material so that students prefer to keep the distractor that has been made (Putri et al., 2022).

Meanwhile, to determine the reliability of questions compiled by students using the Cronbach Alpha formula. Where the questions are said to be valid when the correlation coefficient is at intervals of $0.4 \leq rxy \leq 1$ (Aviary & Susetyowati, 2021). Based on the reliability test with the application of anates, five groups have reached the appropriate interval, which means the questions made are valid and acceptable.

3.2. Success of Lectures Using Project Based Learning (PjBL) on HOTS Question Compilation Study Materials

The success of lectures can be seen from; first, student responses regarding the project-based learning process that has been passed can be seen from the responses to the questionnaire below:

Table 2. Student Responses to the Project-Based Learning Model in HOTS Question Compilation Study Materials

	Indicator	Very Less (1)	Less (2)	Enough (3)	Good (4)	Very Good (5)
Learning Process						
1	Mastery of course material	0	0	2	19	11
2	Systematics explaining lectures	0	0	2	17	13
3	The ability to generate interest in learning for students	0	0	1	22	9
4	Ability to provide solutions to the constraints of the projects being worked on	0	0	0	22	10

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	Indicator	Very Less (1)	Less (2)	Enough (3)	Good (4)	Very Good (5)
5	Willingness to help students outside of class hours	0	0	2	19	11
6	Compatibility with the Syllabus and Semester Learning Plan (RPS)	0	0	1	18	13
7	Clarity of syllabus and lecture lesson plans	0	0	0	23	9
8	Clarity of competencies that will be obtained after attending lectures	0	0	1	22	9
9	Assessment procedure	0	0	1	21	10
10	The clarity of this series of courses with other courses	0	0	0	23	9
11	The project assignments given are in accordance with the course load	0	0	1	24	7
12	Learning Benefits for students	0	0	1	17	14
Total Answers		**0**	**0**	**12**	**247**	**125**
Total Score		**0**	**0**	**36**	**988**	**625**
Total value					**1649**	
Average					**4,29**	

Based on the results of the questionnaire, the project-based learning process that was implemented received a positive response from students; this was indicated by the acquisition of an average score of 4.29 which meant that the project-based learning process was satisfactory from the aspect of delivering material, project construction to assessment (Chen & Yang, 2019; Guo et al., 2020).

Table 3. Increase in Average Lecture Score Using Project-Based Learning

Aspect	Before PjBL	After PjBL
Assessment Results on HOTS Question Compilation Study Materials	69,21	84,97
Final Lecture Grades	74,07	81,43
Grade/Lecture Quality	3,33	3,85

Second, apart from being based on the results of questionnaires from students, the success of lectures on HOTS question preparation material was also seen in the increase in the average grade of courses in the last semester before using the Project-Based learning model with the year in which the Project-Based learning model was applied, where there was an increase in the value of learning evaluation in the study material for the preparation of HOTS questions before the implementation of PjBL ranged from 69.21 to 84.97, the increase in the final course scores before the implementation of PjBL was 74.07 to 81.43 and the improvement in course quality from 3.33 to 3.85. different learning outcomes because in the previous semester,

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students completed the task of making HOTS questions individually, narrow access to exchange ideas made students prefer to make questions without paying attention to the right strategy and problem solving, compared to students who made HOTS questions with the implementation of project-based learning, tasks are completed in groups so that problems that arise can be solved together, they identify, find, and use appropriate resources, learn actively, are integrated and connected (Amini et al., 2019; Hujjatusnaini et al., 2022; Susanto et al., 2022).

4. CONCLUSION

The application of project-based learning to the study materials for compiling questions based on high-order thinking skills (HOTS) through a process of planning, action, observation, and reflection, where each stage provides experience to students in constructing question grid documents, HOTS question cards, scoring guidelines, validation sheets, item analysis documents, trial reports, and showcase data that maximize students' critical thinking skills, problem-solving, creativity, and innovation in each document project work that is in line with the learning objectives, namely students can create valid and reliable HOTS-based questions.

Project-based learning on the study material for the preparation of HOTS questions has experienced success, as indicated by the results of the learning process questionnaire, which achieved an average score of 4.29 and was classified as good. Success can also be seen from the increase in learning outcomes, final grades, and quality of lectures from before and after applying project-based learning to the study material to prepare HOTS questions on authentic assessment material in educational evaluation courses.

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