Performance Assessment Comprehensively Based on Project Learning Related to Critical Thinking: A Bibliometric Analysis

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Abstract: This study aims to find out a comprehensive performance assessment using project-based learning and improving critical thinking. The method of writing articles through literature studies published in 2010-2022 uses descriptive qualitative bibliometric analysis with the Perish 8 and VOSviewer applications, from 1000 articles sourced from journals, books, conferences, proceedings, and other literature sources that have been screened in the Google Scholar (GS) and Scopus databases with the Perish 8 application, researchers only take articles sourced from journals, namely 343 articles and only 1 09 articles are Scopus with 45 articles that are on quartile one (Q1), 34 articles on quartile two (Q2), 23 Articles at quartile level three (Q3) and 7 articles are at level quartile four (Q4) to be used as a reference for literature studies in conducting further article reviews. The results of the bibliometric analysis qualitatively found that there was a relationship between comprehensive performance assessment based on project-based learning and critical thinking.

Keywords: Critical thinking; Performance assessment; Project Based Learning.

Introduction

In the learning curriculum, especially in the science learning curriculum, there are so many innovative and cutting-edge ideas. One of these innovative forms is the assessment orientation applied, namely performance-based assessment (Performance Assessment) which is an assessment that is carried out in an integrated manner with teaching and learning activities. Assessment of student learning outcomes includes knowledge (cognitive), attitudes (affective), and skills (psychomotor) embodied in Audouin's thinking and acting habits (Audouin et al., 2012). Therefore, according to Anastasi (2013) in assessing these three domains, it is not enough just to use test assessment techniques. Project Based Learning (PjBL) is an innovative learning model or approach, which emphasizes contextual learning through complex activities. In project-based learning, students become more actively encouraged, and teachers facilitate and evaluate both their meaningfulness and their application in everyday life. In project-based learning, students play an active role in completing project tasks and are responsible for solving problems with various activities in the project work process to be able to improve the abilities of students (Sobral, 2021).

This learning helps students in growing knowledge about the concepts learned, the application of project-based learning has many benefits for students in addition to being able to increase children's creativity as well as being able to solve a problem (Sims, 2012). Project-based learning also blends science, technology, history, and society, to direct students in the investigation of problems in society and foster a passion for more effective learning.

However, in its implementation, the project-based learning model still has challenges that must be faced by teachers or students. The challenge faced by this learning model is learning that prioritizes the process and students who are the center of learning while so far learning is centered on the teacher, not on the students, students are required to understand and master the learning material only. Through the implementation of project-based learning, students will learn

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independently and build attachments with other students to gain an understanding of the topic being studied at that time. Thus, this project-based learning model cannot be used when the skills for self-study have not been mastered by students (Lyhne et al., 2020).

Teachers must use various variations, strategies, models, as well as approaches in implementing the learning process, project-based learning is one of the learnings that is being promoted in the independent learning curriculum. Innovative learning and more emphasis on student-centered learning with the final result in the form of projects, project-based learning is considered to be able to improve critical thinking skills that are important for students to have which is one of the higher-order thinking skills (Bensley et al., 2021), critical thinking, there are several scopes including analysis, synthesis, and evaluation (Sudirman et al., 2022). This skill is useful for facing the conditions that exist in society, especially the development of science and technology which is growing rapidly. Therefore, it is necessary to conduct a study to find out that a comprehensive performance assessment based on project learning can improve critical thinking skills.

Method

Writing this article through a literature review using bibliometric methods with a qualitative approach, this literature search was carried out on the Google Scholer (GS) database using the Perish 8 or Publish Application with the keyword "Performance Assessment, Project Base Learnings, and Critical Thinking". The search results are converted into an excel file, then the data is tabulated in the form of added graphics and further interpretation using VOSViewer qualitatively. The screening results selected for further analysis are those whose sources are from articles indexed by Scopus in quartile 1 to quartile 4.

Result and Discussion

The results of literature screening using the Perish application on the Google Scholer (GS) database found 1000 publication documents sourced from books, journals, conferences and proceedings, and other documents in the range of 2010 to 2022 as shown in Figure 1.

Based on Figure 1 from 2010 to 2019 there is a tendency to increase the number of publications every year related to the topics analyzed, this means that researchers from various countries are consistent in researching learning assessments related to performance associated with critical thinking skills. Meanwhile, from 2020 to 2021 there was a decrease in the number of publications related to this research topic due to the

impact of Coronavirus Disease 19 (COVID-19) which had an impact on the world of education to conduct research and publication of scientific papers. After the decrease in transmission of the impact of Covid-19, the number of studies and publications began to increase again, this can be seen by the increase in the number of publications in 2022. The search results of 1000 articles (Figure 2) came from a book of 514 articles, a Journal of 343 articles, 66 articles sourced from article proceedings and 8 conferences, and sourced from other documents of 69 articles.
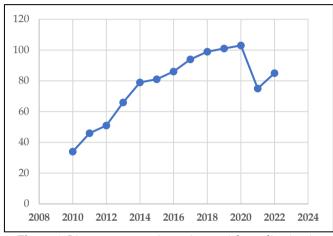

Figure 1. Literature screening using perish application in 2010-2022
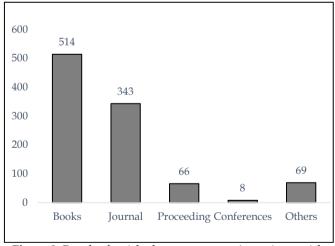

Figure 2. Result of article document screening using perish application

Based on Figure 2 it can be interpreted that most of the article writing related to the topic of writing this article is sourced from journals, namely 343 articles. Of the 343 articles are based on Figure 3. There are 109 articles indexed by Scopus, 183 articles that are not indexed by Scopus, and 51 articles that are duplicates.
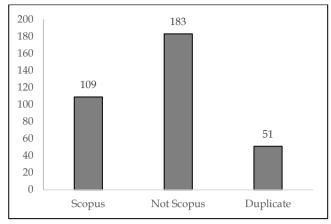
Figure 3. Results of checking the article index through the scimago application

Of the 343 articles that came from journals, only109 articles indexed by Scopus were used for systematic literature review in writing this article, based on Figure 4 it was found that of the 109 articles indexed by Scopus, 45 articles were in Q1, 34 of Q2 articles, 23 of Q3 articles and 7 articles that were at Q4 level. This means that most of the articles used in the further analysis in this study were at most at quartile one (Q1).
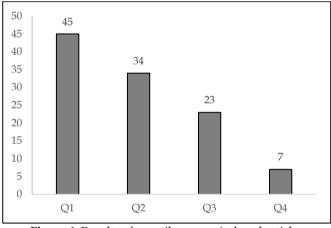

Figure 4. Results of quartile scopus indexed articles

Based on the VOSviewer analysis of keywords from this research topic, obtained in Figure 5. Based on the figure, it can be interpreted that the publication is related to the study of the research topic.

Comprehensive Performance Assessment

Analysis results with the VOSviewer application in Figure 6 show that performance assessment correlates with critical thinking and the presence of feedback during the learning process in groups, this allows group learning times there is an assessment process that involves students and applies their knowledge or understanding and skills in practical activities or scientific research as well as the formation of feedback in

the process where students give questions and make responses in groups or discussion groups to allow assessments to be carried out throughout the learning process, allows students to be actively involved in every process so that understanding of concepts and critical thinking is formed. This is reinforced by Sridharan et al. (2019) who stated that collaborative learning with performance assessment can be used to develop knowledge outcomes, communication, and collaboration skills as well as motivation.
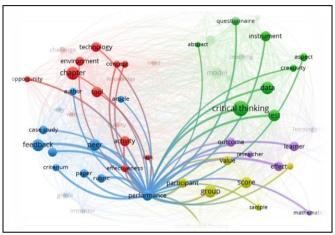

Figure 5. Performance assessment analysis with the VOSviewer application

Furthermore, Martín-Raugh et al. (2022) state that the intended skill, in this case, is performance or performance or performance (performance), either performance in the form of physical actions in the form of body movements or limbs in doing something. Thus, it deals with the psychomotor realm in Bloom's taxonomy. Performance is also related to the brain performing mental processes or thought processes to produce something. In this case, according to Shavelson et al. (2019) relates to the cognitive realm or domain. Performance can be a combination of physical performance and brain performance. The term psycho also denotes mental processes.

Assessment or assessment is an assessment of aspects of performance both physical and or mental performance demonstrated by students (Shavelson et al., 2019), both before learning (placement assessment) (Chen et al., 2022), during the learning process (formative assessment) (Rear, 2019), and after the learning ends (Xiao et al., 2019). Assessment or assessment of attitude aspects is also an assessment related to the affective aspects that students demonstrate, both before learning, during the learning process, and after learning ends (Deveze et al., 2022). Through theoretical and practical studies, it is hoped that an educator will be able to assess or access aspects of skills/performance and affective aspects of students,

both before learning, during the learning process, and after learning ends (Sudirman et al., 2022).
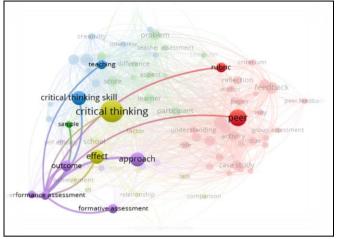

Figure 6. Correlation of performance assessment with VOSviewer application

In Figure 6 Showing the relationship between outcomes-based performance assessments (outcomes) is prepared to provide information about students' abilities or process skills and critical thinking which is assessed in each process (formative assessment) through peer assessment, one of which uses a rubric. This is further explained by Harahap et al. (2019) who stated that using a performance task assessment instrument (Yin et al., 2022) and equipped with a scoring rubric (Shui Ng et al., 2021), which contains a fixed scale and characteristics describing the performance for each point in the scale (E. M. Y. Yan, 2022). The grading scale starts from the highest score for a perfect answer to the lowest score for a completely imperfect answer. All assessment criteria to students before they work on performance tasks. The scoring rubric is often doubtful of its reliability and validity. Through the inter-rater reliability technique, a performance assessment instrument can be tested for reliability. The validity of performance assessment instruments can be tested through face validity techniques which means the instrument has appeared to measure what should be measured (Thienpermpool, 2021).

Based on the implementation of the external-based performance assessment according to Cheong et al. (2023), an important conclusion was reached that students are not always able to do performance tasks well (Orhan, 2022). Environmental situations affect students' ability to do assignments (Cogswell, 2022). Therefore, the achievement of learning outcomes must be interpreted contextually (Raaijmakers et al., 2019). Teachers' opinions on the merits of the performance test after they have undergone this assessment model for 6 months show that 74% of teachers find it beneficial and

very beneficial. A total of 67% of teachers stated that this assessment provides better assessment information compared to traditional assessment models. An important finding to note is that this assessment model consumes a lot of time, so teachers cannot do it often. Consequently, this scoring model cannot completely replace the traditional scoring model.

The implementation of a performance-based assessment model according to Roberts (2021) can use various forms of instruments, including portfolios and work samples. Carter et al. (2017) conducted an experiment using a form of performance assessment instrument in the form of examples of work in teacher education institutions. In this study, prospective teacher students who were practicing teaching were asked to make a description of the teaching unit for 2-3 weeks. This description is approximately 20 pages and contains an analysis of 1) Environmental factors used to plan its teaching and assessment; 2) Learning objectives and their compliance with local, state, and national standards; 3) Assessment plans, both pre-and post-test and formative assessment; 4) a Teaching Plan that mentions the learning strategy and its technology; 5) Instructional decision making based on student responses and developments in the field; 6) Analysis of student learning outcomes in relation to learning objectives distinguished by gender, socioeconomic conditions and success rates; and 7) Self-reflection and evaluation for future development for capacity improvement.

James et al. (2016) developed a comprehensive assessment program on technical education. The application of this assessment model aims to realize a continuous improvement process in the field of engineering education. Developing this model, there are five stages in developing a comprehensive assessment program, namely: (1) defining objectives, strategies, and outcomes, (2) identifying assessment methods, (3) developing and piloting the assessment process, (4) implementing/expanding the assessment process, and (5) applying the results.

This comprehensive assessment model was then applied at the New Jersey Institute of Technology (NJIT). Based on the experience at NJIT, three integrated strategies must be implemented in institutions that run a comprehensive assessment model in the field of engineering education. First, a systematic process should be provided for educators and administrative staff. So that there is synergy, then there needs to be a common view and expectation for all educators and staff. Second, a series of formal meetings between all components should be held to focus on understanding and motivation. This is to facilitate updates and discuss issues that arise. Third, the assessment process must be identified, planned, piloted, and implemented. In this

case, should consider the scoring model that has been running before. Fourth, all assessment methods must be integrated to focus on some predefined outputs.

Larsen (2018) developed an integrated performance assessment model. Science materials are used to measure student progress, science materials are designed to assist teachers in assessing several skills at once (multi-task assessment). Science is used to determine the level at which students understand comprehensively (comprehend) and interpret authentic texts, interact with other students verbally and in writing and present verbally and in writing to an audience of listeners and readers. The purpose of applying this science material is first to produce a comprehensive assessment instrument for student performance, seeing its effect on teachers' perceptions of teaching practice and the results will be used as a catalyst in curriculum and teaching reform. The Science assessment model consists of three tasks, namely: interpretive task, interpersonal task, and presentational task. Student performance in science is evaluated with an assessment rubric (longitudinal scoring rubric) and is divided into three levels, namely: novice, intermediate and pre-advanced. Performance rankings are divided into three categories: exceeds expectations, meets expectations, and does not meet expectations. The teacher's reflection on the questionnaire showed that the implementation of science affects the teacher's perception of science learning. As many as 83% of respondents stated that the implementation of science had a positive impact on their teaching and 91% of respondents said that this project had a positive effect on the design of future assessments.

Research on the assessment of performance skills in agriculture, food, and natural resources has been conducted by Yan (2019) the findings obtained from this study, namely: (1) graduates, can solve problems, work independently, and work successfully in depressing situations are the most important competencies; (2) the ability to identify the political implications of a decision is the lowest competence possessed by graduates; (3) graduates feel most competent in terms of working independently, collaborating with peers and interacting with superiors.

Project Based Learning (PjBL)

Baker et al. (2014) defines project-based learning as a systematic learning method that involves learning in learning knowledge and skills through the preparation of complex questions, authentic questions, and work or product designs. Project work according to Azaza et al. (2020) is a form of open-ended contextual activity-based learning and is part of the learning process that places a strong emphasis on problem-solving through. In addition to being carried out collaboratively, Azaza et al.

(2020) added that the project was also carried out in an innovative, unique and focused on solving problems related to learning life or community needs. From the two opinions above, it can be concluded that project-based learning is a systematic learning process that collaborates between work/product design and problem-solving in everyday life.
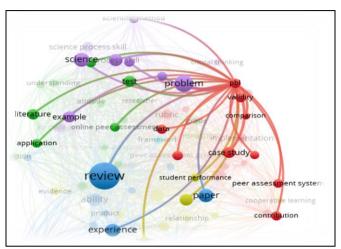

Figure 7. Linkages of project base learning (PBL)

In Figure 7, it can be interpreted that PBL is related to research issues raised in project activities, to assess performance using peer assessment, there is a review process together to gain experience in collaborative problem solving to deepen learning, where students use investigative questions and technologies that are relevant to their lives. Furthermore, Sobral (2021) stated that this project serves as material for testing and assessing students' competence in specific lessons, rather than using conventional exams. In the PBL model, students develop their investigations with group colleagues and individually, so that students will automatically develop their research skills as well. Therefore, according to Bensley et al. (2021) students are actively involved in the process of defining problems, problem-solving, decision-making, and other investigative activities. They are encouraged to come up with realistic ideas as well as solutions.

In project-based learning, students are encouraged to be more active in the teaching and learning process (Poce et al., 2019). The teacher acts as a facilitator, evaluating the product of work so that it becomes a real product that can encourage the level of student creativity in analyzing natural phenomena and students' daily activities. Project-based learning is also a learning model that provides opportunities for teachers to manage to learn in the classroom by involving project work (Kørnøv et al., 2022). Therefore, it can be concluded that the Project Based Learning (PjBL) model learning is a learning model that links technology with

problems in everyday life that students are familiar with. Project-based learning is a learning process involving students directly to produce a project (Zandvakili et al., 2019). This learning according to Evans et al. (2017) will be able to help improve the skills of students to solve, work on and produce a project. In addition, this learning will also be a challenge for students, namely in determining the topic or work to be made, and will provide extensive experience in making a decision. Through this learning, students will be active and directly involved in solving problems and providing opportunities and opportunities for students to express creativity. In the process of learning activities, innovation is needed so that learning activities become fun and students can implement their creativity in a work or project, and learning outcomes are improved. And in Project-based learning, there are project-making activities, namely students who will carry it out and educators as facilitators in the implementation process, namely supervisors (Sánchez González, 2021).

The Relationship between Project Based Learning and Critical Thinking

In Figure 8 the relationship between Project-based learning and critical thinking in participants shows that there is a relationship between the uses of the Project-based learning model to the ability to think critically in students. This is in line with the results of research conducted by Shavelson et al. (2019) who said that Project-based learning can improve the thinking skills of students. This is according to Rear (2019) because in the syntax of learning in Project-based learning there are activities that can train students to be able to think so that students' thinking skills can improve.
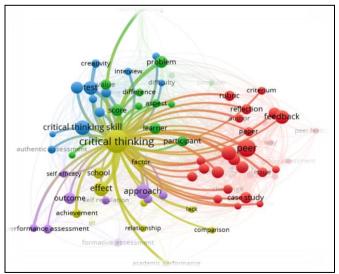
Figure 8. Critical thingking relationship with PBL by VOSviewer application

Furthermore, Ng et al. (2020) stated that in learning students can design and find their solution to a problem.

With this, making a project will increase the creativity of students so that the project can be completed properly (Lucy, 2016). In addition, through this learning, students will be able to be constructivist or discover new concepts and experiences and students can solve a problem based on their creativity (Orhan, 2022). So that through students as a learning center or student center in this strategy will improve their learning outcomes. A person managing and transforming information in memory to solve a problem and form a concept is also thinking (Carter et al., 2017).

In addition, according to Karki et al. (2020) the thought process is often carried out to form a concept, reason, and think critically, and creatively towards decision-making and in overcoming problems, the goal is to be able to obtain or find a rational decision and be able to set a policy in doing something also including one part of critical thinking. Critical thinking has the goal of being able to have the ability to choose and weigh a decision that will be used in solving a problem or in the activities to be carried out. So critical thinking skills are thinking activities that lead to a goal (Braun et al., 2020).
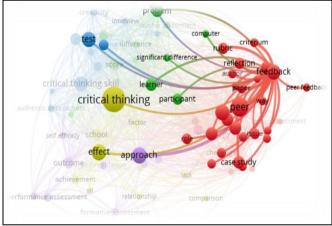
Figure 9. Feedback process in forming critical thinking

In Figure 9 there is a feedback process in learning based on projects related to critical thinking, according to Possin (2020) there are aspects that can be grouped into critical thinking skills including the following (1) can improve basic skills such as having the ability to consider the validity of information such as being trustworthy or not and being able to understand and weigh reports from observations; (2) can provide simple explanations such as analyzing, focusing, asking and answering questions, against an explanation; (3) have the ability to provide explanations such as being able to explain and give terms, being able to understand a concept from various points of view and being able to understand assumptions; (4) have the ability to set strategies and tactics such as being able to determine the

actions to be taken and being able to communicate with others in making a strategy, namely by collaborating or working together; (5) have the ability to give conclusions, which can be done by deducting and inducing or considering the results of deduction and induction and can make and determine judgments in considering something.

Project-based learning according to Kulkarni et al. (2018) applies skills and knowledge in developing solutions to the problems encountered so that it is considered to increase metacognition in children. This has to do with the ability to think critically is something metacognitive. Metacognitive has a sense of one's awareness of the ability to observe using and also assess learning progress independently. The ability to solve problems logically and reflectively carried out by students means that it can happen if the metacognitive in students increases, this can increase the ability to think critically in students because the ability to solve problems logically and also reflectively it is one of the abilities in critical thinking because in thinking is managing, transforming and manipulating the information obtained in the memories or memories possessed by each individual in a diverse and different distinctive way in thinking activities (Zandvakili et al., 2018).

Conclusion

Comprehensive performance assessment through Project-based learning related to critical thinking skills means that performance assessment with a Project-based learning model can improve students' thinking ability in designing and finding their solution to a problem, increasing creativity, constructing or discovering new concepts and experiences, and being able to solve a problem based on the creativity he has so that it will improve his learning outcomes.

Acknowledgments

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