Research Article https://doi.org/10.12973/ijem.8.3.567

International Journal of Educational Methodology
Volume 8, Issue 3, 567 - 584.
ISSN: 2469-9632
https://www.ijem.com/

A Literature Review of the Project-based Teaching Method in the Education of Vietnam

Ca-Nguyen Duc
The Vietnam National Institute of Educational Sciences, VIETNAM

Phuong-Ngo Thi
Tay Bac University, VIETNAM

Thang-Ngoc Hoang
The University of Fire Prevention and Fighting, VIETNAM

Thuy-Nguyen Thi Thanh
The Vietnam National Institute of Educational Sciences, VIETNAM

Thang-Nguyen The*
The Vietnam National Institute of Educational Sciences, VIETNAM

Received: March 17, 2022 ▪ Revised: June 7, 2022 ▪ Accepted: August 1, 2022

Abstract: The teaching method is one of the main aspects to make a huge contribution to the success of any education system, and project-based teaching (PBL) is an important aspect to contribute to the success of education also. This research was conducted through a review of project-based teaching that has been used in the education system of Vietnam, including a sample, and setting that included imperial and theoretical literature selected from the fields of education. Findings show that this method has been applied to various sectors of education, from kindergarten education to higher education, in many disciplines and subjects, in schools and educational settings, and has become more widely popular than ever. This method, however, has its drawbacks because it takes time to master and teachers need more skills to manage the learning atmosphere. This method has been commonly accepted as one that can help teachers and learners understand more and get more benefits in the learning and teaching process.

Keywords: *Education, project-based teaching, teaching method, Vietnam.*

To cite this article: Duc, C.-N., Thi, P.-N., Hoang, T. N., Thanh, T.-N. T., & The, T.-N. (2022). A literature review of the project-based teaching method in the education of Vietnam. *International Journal of Educational Methodology*, *8*(3), 567-584. https://doi.org/10.12973/ijem.8.3.567

Introduction

Project-based learning is a type of teaching organization in which learners are highly self-reliant in the learning process to perform a complex learning task (defining goals, planning, implementing projects, testing, adjusting, evaluating process and performance), combining theory and practice, resulting in reportable and presentable deliverables. This approach has the following characteristics: practical orientation, social practical importance, interest-oriented learning, teamwork, product orientation, strong integration capacity, and the ability to create a comparable learning environment with a variety of instructional activities The process typically consists of four stages: identifying the problem and the project's objective; producing a comprehensive implementation plan; carrying out the project as planned; product announcement; and project assessment.

The project-based teaching technique is more popular than ever and is being used in a wide range of educational and training settings in the world. That is relevant to the teaching method and its use in terms of pedagogy, such as how effective it is to use teaching methods and project-based teaching (Sykorova, 2015), improved the previous teaching mode, and formed a competition-based project practice teaching mode (Chen et al., 2014), to measure an alternative teaching pedagogy in project-based learning (Pan et al., 2021), (Tsybulsky & Muchnik-Rozanov, 2019). In terms of learner advantages, such as creative thinking (Wu & Wu, 2020), which is important to blended learning (Khodeir, 2018). In terms of learner benefits, creative thinking (Wu & Wu, 2020), which is relevant to blended learning (Khodeir, 2018), is beneficial to nursing students' social skills (Şenyuva et al., 2014), and nursing students' experiences of learning the nursing process, (Nes et al., 2021) and teaching youth intercultural competence (Gajda & Pazik, 2014). This method is also useful for developing learners' technological abilities, such as mobile application development in

*Corresponding author:
Thang-Nguyen The, The Vietnam National Institute of Educational Sciences, Vietnam. ✉ thangvcl@gmail.com

computer/information technology (Alex david et al., 2020), the development of students' 21st century skills in science, technology, engineering, and mathematics (STEM) research university (Lavi et al., 2021), software engineering students' software development hands-on ability, innovation ability, and employment (Hong-mei & Rui-sheng, 2012). Furthermore, linguistic areas such as developing an applicable method for foreign language instruction (Cuma, 2013) and the efficiency of the implementation of the project-based method in teaching English for Specific Purposes can be effective if this method of teaching is used (Bolsunovskaya et al., 2015).

In the context of Vietnam's education, the Resolution on "Fundamental and comprehensive educational reform toward standardization, modernization, socialization, democratization, and international integration," was issued by the 11th National Party Congress (Vu, 2021). In fact, the popular education program is increasingly shifting from a content-centered to a student-centered approach. The substance of programs and disciplines in higher education, particularly pedagogical methods, must be restructured. Project-based learning is a teaching style that stimulates the development of learners' capacity by combining theory and social practice. In Vietnamese university education, project-based learning is the newest craze. The outcomes of project-based teaching will benefit society, demonstrating that the educational process improves the efficiency of training human resources for society.

Though it is a kindergarten with the simple activity of how to discover the things around or scientific subjects need to be practical in the ways of learning and teaching in primary education and general education, or project-based teaching is a fact in higher education. The increasing knowledge, skills, and competencies that can make learners more employable in the job market these days have increased the need for schools and teachers to recognize and cope with the challenges that effective teaching methods provided. The following review of the literature confirms that project-based teaching has problems that go beyond sparse methods in teaching a subject or an education sector in Vietnam, with particular discussions and viable solutions and conclusions that require initiatives to be developed for short–term and long-term educational directions.

This method has been researched by the authors, as project-based teaching (Pham & Pham, 2008) has both sides of advantages and disadvantages, with the negative aspects, such as the student cannot understand all the relevant knowledge of the lessons, it takes time to grasp the knowledge, and this method requires certain facilities and conditions. More importantly, if overusing this way of teaching leads to psychological issues in the learners. On the positive side, if this method is masterly applied to the learning process, the students will gain many benefits, especially the ability to easily adapt to new requirements both in the learning environment and daily life. In more detail, the author (Tran, 2009) examines the concept of project-based teaching, that how it was originally developed and how it has been used in the educational sectors of some provinces in Vietnam. The key findings of the article show how this concept of teaching should be conceptualized, some characteristics of this way of teaching, with new roles of teachers and students in the learning and teaching process.

And some of the advantages of this method were mentioned as well. Additionally the concept of a "project" has been transferred from business and social science to education (Phan, 2011). It is utilized as a teaching or training approach as well as an educational endeavor. Because the philosophy of project-based learning was founded on a foundation of general project management and educational research, not all projects executed on campus are PBL projects. As a result, the issue is: what are the qualities of a teaching project? This document will clarify and assist us in comprehending the qualities of PBL that effectively guide teachers' implementation. And PBL is suitable to the modern tendencies of teaching that was written in the government documents (Dinh, 2020). Moreover, a conceptual framework for project-based learning in general, inorganic chemistry is proposed, with three stages corresponding to three competency packages (Huynh et al, 2019): (1) project planning and development; (2) project implementation; and (3) project evaluation; PBT presents systematically the most basic problems of project teaching method and its application in teaching industrial electricity subjects and modules oriented to the development of performance action competency for students (Le & Nguyen, 2017); or it can be settled up in four steps, project-based teaching/learning from the standpoint of self-learning through the teaching organization process: (1) promotion of learning motivation; (2) project-based learning planning; (3) project implementation; and (4) project evaluation (Le & Huynh, 2020).

Methodology

Identify the Research Questions

The above tendencies show characteristics that are varied, continuous and active, interdisciplinary, etc. These are some of the reasons project-based teaching has been widely regarded as the most effective way to make educational activities more effective, but there is no a picture of how this method in Vietnam education sector has been researched and recommendations should be made, and that are the reasons why this study is guided by following questions

1. How many researches in to project-based teaching method have been researched in the education?
2. How many publications have been published in educational sectors?
3. What are main characteristics of the publications in project-based teaching?

Define the Inclusion and Exclusion Criteria

This study was developed by the research team on the basis of a term search to identify academic articles on project-based teaching methods and project-based learning. The goal is to locate all scholarly publications on project-based teaching and learning that have been published in Vietnam. These publications make no distinction between study disciplines or publishing eras, and they are not published by individuals, research groups, non-governmental organizations, or government agencies. The next step is to divide the found papers into two groups based on their titles and abstracts, one for the educational area and the rest is others. Identify the documents with the most relevant material to review and analyze after finding the abstracts from the most relevant articles using the specified keywords to locate the papers with the substance of the queries.

Search, select Studies and extract Data

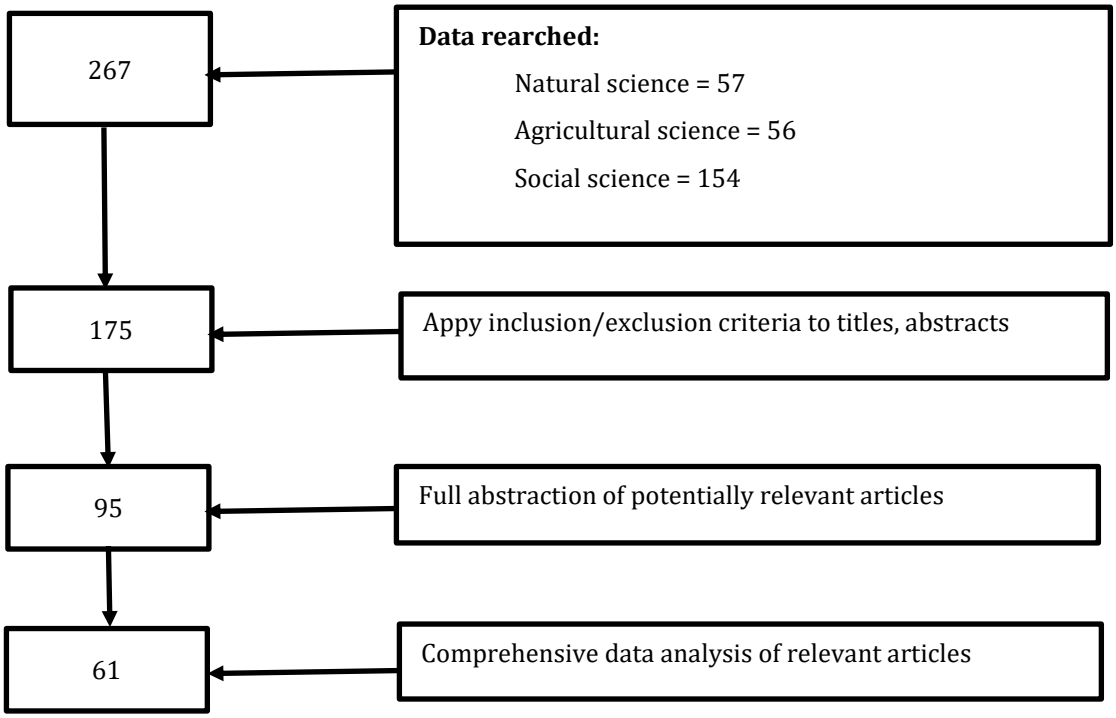

Figure 1. Database Search Algorithm and Review Criteria Used for Systematic Literature Review of Project-Based Teaching Method

The information for the article was collected by using the keyword "project-based teaching" in the database of science and technology in Vietnam. The documents containing the collected information are academic articles written by domestic researchers and published on the data website of the Ministry of Science and Technology of Vietnam (http://db0.vista.gov.vn/menu.aspx). The data search revealed 267 documents related to the concept of project-based teaching method, with natural science accounting for 57 documents, agricultural science accounting for 56 documents, and social sciences accounting for 154 documents. After classifying documents using criteria related to titles and abstracts, 175 documents were obtained. Next are 95 summaries of the most relevant documents, and finally 61 documents with content associated with the research questions selected for detailed analysis.

Assess Quality and Data Analysis

The papers are evaluated in order of increasing quality: (1) the complete layout of a scientific paper; (2) the structure of the paper ensures the following requirements: title, method, results, comments, conclusions, and references; (3) a clear explanation of the application of this teaching method alone or in combination with other teaching methods; and (4) provides conclusions and recommendations for this method, both theoretically and practically. Moreover, all data related to project-based teaching methods is classified in two directions. One is to remove articles that are not related to the field of education. The second is education-related articles classified by educational fields: preschool, elementary school, high school, and university. The data is then aggregated into aspects: author/year, topic/discipline, study design, data collection, and main findings. Each article is researched in detail and pointed out according to outstanding issues, including: effectiveness, knowledge and skills enhancement, teaching quality improvement, professional skills, advantages, and disadvantages. All of the documents are the results of research projects at all levels, from the school to the national, and are supported by public research grants. Moreover, these research results are reviewed and published in academic journals approved by the State Council for Professorship (available at the website http://hdgsnn.gov.vn/)

Findings

Table 1 shows that the approach is most commonly used in a variety of educational contexts, and it has been implemented and examined in all educational sectors. These are reflected by the number of years of study, the topic or discipline, the methods of research design, the research objectives, data collecting measures, and, most importantly, the major results.

Table 1. Characteristics of Articles and Key Findings

Author/Year	Topic/ Discipline	Study design	Aim	Data collection	Main findings
1. (Nguyen, 2015)	kindergarten	experimental research	scientific discoveries about the environment for preschoolers	Cross-sectional survey	increase their participation and confirm the effectiveness of this teaching method
2. (Nguyen & Hoang, 2013)	environmental education In Primary	Descriptive study	to achieve the objects of knowledge, attitude and the protection of the environment	Cross-sectional survey	satisfies all of the aforementioned criteria.
3. (Bui, 2021)	technology subjects /Primary	Conceptual analysis	Apply the method to organize the subject	Review	Can be use to accomplish the new general education curriculum's goals
4. (Nguyen & Nguyen, 2010)	the natural and social subject of the grade 3/ Primary	Mixed method	Apply the method to teaching natural and social subjects	Conceptual analysis and experiment	the students have better achievements
5. (Le, 2015)	Speaking skill of 8th grade speaking notes, The Language Arts program /Secondary	Mixed method	Apply the method to teaching the presentation skills	Conceptual analysis and experiment	assisting in the development of comprehensive capability, particularly in terms of learners' presentation abilities.
6. (Trinh, 2017)	developed a teaching theme /Secondary	Mixed methods	incorporates folk literature and implement a teaching theme	Conceptual analysis and experiment	demonstrates the validity of taking an integrated approach
7. (Nguyen & Vu, 2017)	ecology instruction /Secondary	Theories analysis	How to apply the method to teach ecology	Review	boosting scientific research skills for high school students
8. (Nguyen et al, 2020b)	assignments written by A2-level students /Secondary	Autobiographical narrative	develop a mindset of complex problem solving	based on the author's personal experiences	are regularly given opportunities to improve practical abilities in everyday life.
9. (Nguyen & Nguyen, 2018)	teaching mathematics /Secondary	Mixed method	Apply the method to teach math	Theoretical analysis and Experiment	make it easier for instructors to use
10. (Nguyen & Nguyen, 2012)	biodiversity of mangroves /Secondary	Mixed method	Apply the method to teach biodiversity of mangroves	Field trips	enhances various study skills including observation skills,, technical data processing, and presentation skills
11. (Nguyen & Lai, 2014).	Secondary	Conceptual analysis	Apply the method to teach biology	Review	to develop abilities to overcome the program's restrictions and widen their understanding of life collaborate to solve academic and practical problems
12. (Dinh, 2015)	Literature	Qualitative	reflects many current pedagogical viewpoints and contributes to the development of learner capacities	Case study	collected many positive results during the process of teaching
13. (Pham & Nguyen, 2013)	teaching Chemistry to high school students	Experiment	analyze and evaluate the effectiveness of the process-based learning project	experimental pedagogy	assistance of the teachers to teach students capable of adapting to the human of the twenty-first century

Table 1. Continued

Author/Year	Topic/ Discipline	Study design	Aim	Data collection	Main findings
14. (Le, 2012)	high school physics	Quantitative method	It promotes positive, self-reliance and creativity and capacity to apply practical knowledge of electricity production	Experiment	capacity to apply practical knowledge of electricity production, problem-solving capacity, communication capacity of the students
15. (Phan & Nguyen, 2012)	teaching of chemistry	Mixed method	motivates students to learn, develop important soft skills for real life.	The quantitative and qualitative	teach the lesson "The Concept of Terpenes" in an advanced Chemistry textbook for Grade 11
16. (Nguyen & Pham, 2013)	teach chemistry in high school	Quantitative	Integrating knowledge with chemical pollution and environmental pollution control	Experiment Observation	gain cognitive ability and good learning skills and make sense and have a positive attitude In terms of environmental protection in the community
17. (La, 2012)	music and art	Mixed method	To encourage student's activeness and creativity	Experiment	To have flexibility, creativity, goal-orientation, and eligibility for learners
18. (Pham, 2012b)	teaching of inorganic chemistry	Mixed method	How to make students interested in learning and get better performance	quantitative and qualitative	increased interest in learning, improved academic performance, confidence, and initiative in learning life skills
19. (Nguyen, 2017)	teaching of Fine Arts and	Action research	integrated teaching of Fine Arts and extracurricular activities in Fine Arts	Experiment	lower secondary schools in the local educational program applied in province
20. (Tran et al, 2014)	Euclidean geometry/ at the secondary school level	Action research	help students enhance their thinking skills when it comes to addressing mathematical difficulties	Experiment	Its application in systematizing knowledge and discovering new results
21. (Ha, 2015)	teaching 10th grade Biology programs/ in upper secondary school	Conceptual analysis	improves students' self-study abilities	Review	as a positive teaching approach and learning activity
22. (Pham, 2012a)	local history/ in high secondary schools	Mixed method	an opportunity to do research, to combine the theories and practices, to encourage students to be involved into learning process	Conceptual analysis and experiment	it takes time and many supportive conditions
23. (Pham, 2021)	teaching management	Conceptual analysis	Evaluate the teaching method	Review	Teachers and students are motivated to collaborate, develops some management metrics for evaluating teaching under school principals' projects
24. (Pham, 2018)	civic education	Experiment	Looking for teaching strategies for civic education in 11th grade	Interview, review	improving learning and teaching in this school using project-based learning teaching methodologies for civic education
25. (Cao, 2010)	lower secondary school	experiment	on integrative Physic-Chemistry-Biology teaching	multi-subject project, inter-subject project, intra-subject project	a desire to learn and question about strengthening information skills (collection, analysis exchange) inter-subject knowledge that is more effective.

Table 1. Continued

Author/Year	Topic/ Discipline	Study design	Aim	Data collection	Main findings
26. (Le, 2014)	teaching electricity	Experiment	Apply to teaching electricity	Questionnaires Check list	the author feels compelled to provide some solutions to the situation
27. (Nguyen & Nguyen, 2014)	teaching methods	Theoretical	how to improve teaching methods in junior high schools?	review	This method is collaborative and practical, and it could help Vietnam achieve its education goal of improving overall educational quality
28. (Nguyen, 2009)	teaching method	Theoretical	how to use the project based teaching method in higher education	Review	learning objects, learner-center learning activities, balance between theory and practice, objective meaning
29. (Tran, 2019)	teaching advanced mathematics to economics students /Higher education	Experiment	To develop students' competencies to apply mathematics in reality	Questionnaires Lessons	improving the ability to combine learning theory and practice helps to develop students' ability to apply mathematics in real-world situations
30. (Nguyen, 2020a)	an integrated topic "Chemical fertilizer - farmer's buddy"	Experiment	contribute to increasing the quality of teaching, testing, and assessment	Lesson sheets	creates a new learning environment, piques students' attention, and advances the cause of comprehensive education reform
31. (Le & Nguyen, 2020)	modules in the Applied Informatics vocational training program	Experiment	assisting students in gaining knowledge and developing learning as well as occupational skills	Lesson sheets	is an excellent option for assisting students in gaining knowledge and developing learning as well as occupational skills
32. (Le et al, 2020)	English skills	Experiment	the application aided pupils in improving their English language skills	Lesson sheets	the benefit was more noticeable after a longer period of implementation
33. (Huynh et al, 2019)	inorganic chemistry	Theoretical	Improve educational quality	Conceptual	with three stages corresponding to three competency packages
34. (Phan et al, 2015)	teach the "Basis of Thermodynamics" chapter in 10th grade physics	Experiment	teaching practice in high school	Observation, discussion	it is necessary to urge for more research and implementation of the approach.
35. (Ta, 2013)	mathematics statistics teaching	Mixed method	to improve the quality of mathematics statistics teaching	Review Interview observation Statistics	they have learned in class, actively develop necessary skills such as problem solving, independent study, personal goal setting, and evaluation
36. (Thieu, 2021)	to teach early childhood psychology	Experiment	to increase student engagement and autonomy in the learning process.	Observation	using project-based teaching approaches to teach early childhood psychology is to increase student engagement and autonomy in the learning process
37. (Tran, 2014a)	the teaching of "geometrical optics" in the 11th grade of high school.	the design of experimental equipment	to develop intelligence and personality		a good setting for the students to develop their intelligence and personality through the interaction between the teacher and the learning environment

Table 1. Continued

Author/Year	Topic/ Discipline	Study design	Aim	Data collection	Main findings
38. (Nguyen et al, 2020a)	inorganic chemistry projects	Experiment	Promote to be self-aware and active within learning process	an observation checklist, a self-assessment sheet, and specifically developed examinations	encourages students to become more self-aware and engaged in the learning process. However, there is currently no appropriate tool for evaluating students' self-study abilities
39. (Tran, 2012)	teaching technique courses for pedagogical students	Theoretical	Apply to teaching technique	Review	project-based learning
40. (Tran, 2014b)	Teaching method	Theoretical	of teaching method courses for mathematic pedagogical students	Review	project-based learning
41. (Nguyen, 2020b)	teaching Advanced Maths for Engineering students	quantitative	The effectiveness of teaching method	Survey Questionnaires	lecturers must develop new teaching approaches in order to create successful learning activities for students
42. (Nguyen, 2021)	teaching of the module "Some applications of differential equations" in Advanced Math for Engineering students	Quantitative	created excitement for learners	a self-assessment sheet, and specifically developed examinations	through practical situations, helping learners develop self-awareness, self-reliance, sense of responsibility, practice soft skills
43. (Tran & Phan, 2012)	Teaching Methods Course for pedagogic students in general and a Mathematic Teaching Method for students in the Mathematic Faculty	Theoretical	To improve the training quality of pedagogic students	Review	a teaching style that focuses on the students and makes them the center of attention. some necessary strategies for teachers to select subjects and appropriate contents applicable
44. (Thai & Phan, 2012a)	Application of information and communication technology in project-based teaching classrooms	Theoretical	to support the process of studying, working, communicating, and cooperating	Review	the use of information and communication technology not only improves the quality of the teaching and learning process, but it also allows students to exercise their information, media, and technological skills
45. (Nguyen, 2016b)	Teaching method	Theoretical	the establishment and enhancement for pedagogical students of mathematics with essential professional competences	Review	contributions to the establish the essential professional skills by examining its characteristics as well as its strong points
46. (Tran, 2013)	Pedagogical training activities for university students	Theoretical	analyzing perceptual knowledge skills	Review	creating fundamental pedagogical abilities for students
47. (Lam, 2021)	teaching the social sciences and humanities subjects	Theoretical	to improve the quality of education and training in military schools	Review	teaching in the military schools

Table 1. Continued

Author/Year	Topic/ Discipline	Study design	Aim	Data collection	Main findings
48. (Pham & Pham, 2021)	Teaching method	Mixed method	To initially achieve certain results	Theoretical analysis Experiment	a good fit for Probability Theory and Mathematical Statistics
49. (Le & Nguyen, 2017)	teaching industrial electricity subjects and modules	Theoretical	the development of performance action competency for students	Review	teaching industrial electricity subjects and modules oriented to the development of performance action competency for students based on searching for materials to read, study,
50. (Le & Huynh, 2020)	the teaching organization process in four steps	Experiment	educates and enhances pupils' ability to learn on their own	Observation Discussion	assists teachers in orienting their roles of organization, assistance, evaluation, and encouragement of students' initiative and creativity in the classroom.
51. (Nguyen & Dinh, 2017)		Qualitative	Help the learners struggled to achieve the approach's learning outcomes	interview	some ideas for learners, teachers, and policymakers are offered from the perspectives of the participants, as well as pedagogical implications
52. (Do & Nguyen, 2019)	English theater project	Qualitative	to help students enhance their language abilities	Lessons Discussion	This course is believed to be broadly applicable
53. (Mai et al, 2017)	teaching of Chinese language courses	Quantitative	to improve the quality of teaching and learning of this course	Survey	there are still numerous challenges when first implementing this strategy in the teaching of Chinese language courses, particularly Chinese excursions
54. (Nguyen, 2013)	to build assessment tools	Conceptual analysis	the design of an assessable instrument for learners' results	assessment tools	Teachers who spend a lot of time and have certain expertise and skills are needed to build assessment tools
55. (Nguyen, 2016a)	Collaborative capacity	Theoretical	find answers and work together to address the problem or situation	assessment tools	gain understanding of lessons, attain learning outcomes, and improve collaborative ability through teamwork and collaboration
56. (Thai & Phan, 2012b)	Assessment of pedagogical practices	Mixed method	to examine the roles of information and communication technology in project-based teaching classrooms	Observation	some effective ways of using information and communication technology to support the process of studying, working, communicating, and cooperating.
57. (Pham & Pham, 2008)	advantages and disadvantages	Theoretical	To see the general knowledge of PBT	Review	masterly applied to the learning process, the students will get many benefits, especially they can easily adapt to new requirements both in the learning environment and daily life.
58. (Tran, 2009)	project-based teaching	Conceptual analysis	how it was original and how it has been used in educational sectors of some provinces	Review	how this concept to be conceptualized, some characteristics of this way of teaching with new roles of teachers and students in the learning and teaching process.

Table 1. Continued

Author/Year	Topic/ Discipline	Study design	Aim	Data collection	Main findings
59. (Phan, 2011)	The change of teaching method	Theoretical	How the method has been transferred from business and social science to education	Review	clarify and assist us in comprehending the qualities of PBL that effectively guide teachers' implementation
60. (Dinh, 2020)	the modern tendencies	Theoretical	to make education activities more effective.	Conceptual analysis	is suitable to the modern tendencies of teaching that was written in the government documents
61. (Vu, 2021)	teaching style	Theoretical	stimulates the development of learners' capacity by combining theory and social practice.	Review Analysis	Demonstrate that the educational process improves the efficiency of training human resources for society

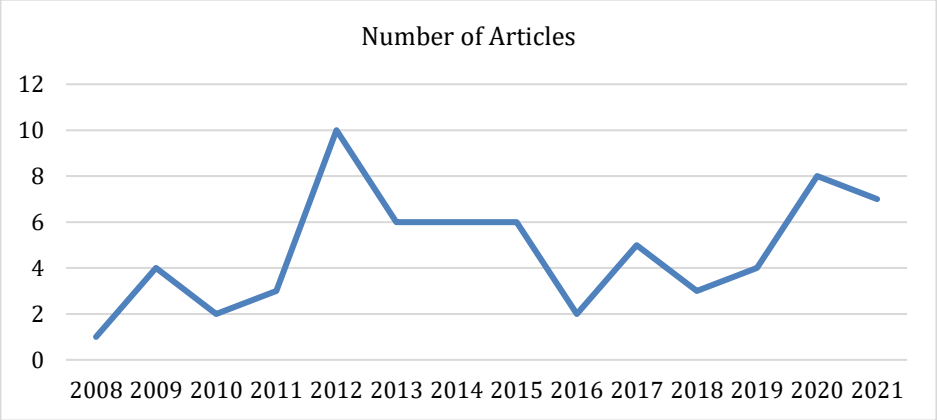

Figure 2. Number of Published Articles from 2008 to 2021

Figure 2 provides the information on the number of articles researched on project-based methods in Vietnam education published over the last decade. Generally, what stands out from the published articles is that the publication has fluctuated during the period. Looking at the details, as regards at the beginning, it started with 1 research in 2008, which means that this method was lately researched in Vietnam and rose among 2 and 4 articles before reaching the peak with the studies carried out in 2012. However, the number of publications went down to around 6 articles between the years of 2013 and 2015 and then plunged into the publications are 2 in 2016. The publication has had an upward trend in the last five years with the published articles around 7 and 8 publications in the years 2020 and 2021

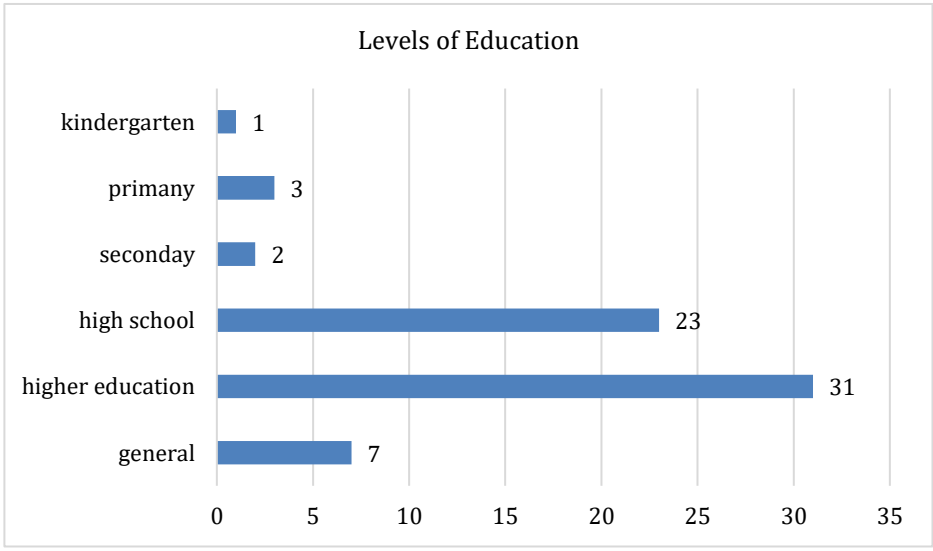

Figure 3. Publication Based on Levels of Education

Figure 3 illustrates data about how much research on project-based methods in education has been implemented at various levels of education. Overall, it is noticeable that the number of research articles in higher education is 31. This means that it had the highest number of publications compared with other sectors in education, while kindergarten saw only one article published. It can be seen in the figure that higher education is the second area that has been interesting to be studied by researchers, with 23 articles. Obviously, this teaching method has been researched and applied in higher education and high schools, while other sectors, including kindergarten, primary, and secondary, had 6 articles published and the general sector had 7.

Discussion

The project-based teaching technique is appropriate for current teaching trends and is strongly related to other types and methods of instruction. The contents of the articles have covered from kindergarten to higher education, represented varied aspects of education generally and teaching particularly, and there are some marked features consisting of effectiveness, knowledge and skills enhancement, teaching quality improvement, professional skills, advantages, and disadvantages that should be considered.

Effectiveness

The use of this strategy by offering essential activities has been shown to be the most effective way for 5–6-year-old preschoolers to learn about the environment via play (Nguyen, 2015). However, because this study was only done in a school, further practice in diverse educational settings at these educational levels is required. It has been proposed that project-based teaching approaches benefit learners in a variety of ways, ranging from how toddlers may readily explore the living world around them to how primary school students increase their understanding of environmental preservation. More than that, it gives psychological good features for pupils to grow, such as creativity, patience, evaluation capacity, and so on. However, teaching in this manner involves a significant amount of time, materials, and financial resources.

This aspect is also reasserted in primary education with technology and social subjects. That is one of the most effective ways to achieve the aims of the new general education curriculum (Bui, 2021). It can be useful to teach the natural and social subjects of grade 3 by using every single step (Nguyen & Nguyen, 2010); prove a viable method to teach primary students; and enable students to fulfill the objectives of knowledge, attitude, and environmental preservation (Nguyen & Hoang, 2013). In the context of executing the new general education program, this strategy might be used to help students improve their quality and competence in teaching primary school topics in general and the curriculum. Studies in technology, in particular, teachers' initial creativity, which is difficult to execute and easily causes disturbance in the classroom, the preparation of materials and instruments will take time, and other constraints, but the results reveal that kids are delighted. engage in data collection and processing The project's effective execution has helped to inspire and motivate instructors to continue executing future projects to increase teaching quality.

In general education, learners can get many benefits from the method, which is to assist in the development of comprehensive capability, particularly in terms of learners' presentation abilities (Le, 2015)**;** (Trinh, 2017) to demonstrate the validity of taking an integrated approach to the planning and implementation of the high school literature and linguistics curriculum; (Nguyen & Vu, 2017)**.** In terms of psychological benefits, students are motivated to learn more about the subjects they're studying when they participate in active and engaged learning. This type of learning not only actively assists students in acquiring knowledge, but also in the formation and development of essential skills and capacities, as well as the development of high moral values in students(Le, 2012); It promotes positive, self-reliance and creativity and capacity to apply practical knowledge of electricity production, problem-solving capacity, and communication capacity of the students. The method is not only motivates students to learn and improve their grades, but it also helps them develop important soft skills for real life (Phan & Nguyen, 2012); Students not only gain cognitive ability and good learning skills in the subject of Chemistry, but also make sense and have a positive attitude, thanks to the implementation of learning projects (Nguyen & Pham, 2013). Moreover, the teaching method provides students, such as increased interest in learning, improved academic performance, confidence, and initiative in learning life skills (Pham, 2012b); and students have a desire to learn and ask questions about strengthening information skills (collection, analysis, exchange) inter-subject knowledge that is more effective (Cao, 2010).

In order for project-based teaching to be effective and to ensure that all students in the class enjoy the benefits of this teaching method, teachers need to pay attention to the students in the class to advise on the analysis. Adjust the project appropriately, pay special attention, create conditions and encourage children to participate in the project. In addition, the results from these studies are clear evidence of the effectiveness of designing and implementing learning content and topics in general education so that each lesson becomes a bridge from knowledge to learning. In practice, each student gets to live by how the theoretical content is shown in the living environment around him, and he actually becomes an active factor in the process of orienting his own future. Moreover, applying the project-based teaching method needs to be done and experienced regularly before it can be concluded its effectiveness in the current

conditions. Recognize the important role of teachers in preparing, organizing, and controlling student learning activities in different stages of the project-based learning process.

This teaching method's application in universities helps to develop students' ability to apply mathematics in real-world situations (Tran, 2019), encourages students to become more self-aware and engaged in the learning process (Nguyen et al, 2020a), to create successful learning activities for students (Nguyen, 2020b); allows students to not only acquire essential content but also to develop and practice crucial pedagogical skills and abilities (Tran, 2013); educates and enhances pupils' ability to learn on their own (Le & Huynh, 2020). This methodology may be used to university-level courses like mathematics, as well as learning settings targeted toward or linked with the application of mathematical knowledge and methodologies in economics. However, lecturers must spend a significant amount of time planning, amending, accepting, and assessing project outputs, despite the fact that the number of periods for the module may be insufficient in comparison to the quantity of information required. As a result, further research and adaptation to the realities of training are required so that the approach may be used more effectively in higher education.

Knowledge and Skills Enhance

It helps students in primary schools achieve better achievements, it is not because it makes their cognition smarter but it is because it helps learners' imagination more imaginal (Nguyen & Nguyen, 2010). This is one of the strategies that contribute to the deployment of an innovative teaching style and improves students' learning efficiency. However, some requirements must be satisfied for its application: teachers must be educated in this approach; class numbers must not be too large; and they must be supplied with a minimum number of teaching aids for students to present the output of the learning project.

In secondary education, this way of teaching is a dynamic teaching technique in which students investigate real-world issues and difficulties (Nguyen & Vu, 2017); besides, students can develop a mindset of complex problem solving and are regularly given opportunities to improve practical abilities in everyday life; students' self-study abilities by learning from teachers who apply the method in their lessons (Ha, 2015); and it gives students an opportunity to do research, to combine the theories and practices, and to encourage students to be involved in the learning process, but it takes time and many supportive conditions (Pham, 2012a). It provides the development of comprehensive capability (Le, 2015), or is a new type of student capable of adapting to the human of the twenty-first century, especially when learners synthesize information from different subjects of study and apply it creatively in real life (Pham & Nguyen, 2013). The most important is the method must be practical, suitable for students, adheres to the subject program, and can be implemented inside or outside the classroom, and the teacher must be the guide, consultant, fellow student, and with students;

Apart from speaking (Le, 2015) and writing skills (Nguyen et al, 2020b), it also includes (Nguyen & Nguyen, 2012) observation skills, ability to collect and process information, technical data processing, and presentation skills, in addition to producing excitement in studying and assisting learners in grasping biology ideas; or students gain knowledge and skills by responding to a complex learning task- combining theories and practice with high self-discipline throughout the entire process, from determining purposes, planning, performing, examining, adjustments, and assessment (Dinh, 2015); and helping students enhance their thinking skills when it comes to addressing mathematical difficulties (Tran et al, 2014). Skills and mastery of skills are a challenge for all high school students, which can be explained by traditional teaching methods, which are mainly communicative but limited by teachers, restricting student activity. Proficient skills due to project-based teaching methods positively demonstrate a new trend in teaching methods in schools, but synchronous preparation is required for higher effectiveness. The awareness of the whole educational system towards supporting the achievements of this method and its wide application is also important.

Higher education has its own characteristics in this method's application and skills enhancement (Le & Nguyen, 2020) is an excellent option for assisting students in gaining knowledge and developing learning as well as occupational skills (Huynh et al, 2019). Self-studying creates excitement for learners through practical situations, helping learners develop self-awareness, self-reliance, a sense of responsibility, practice soft skills, and develop learning abilities with features such as practical orientation, product orientation, and professional competency development orientation (Nguyen, 2021), that the application helped pupils improve their English language skills (Le et al, 2020). This is a modern method of teaching that focuses on the subject of learning activities in order to equip learners with information, enhance awareness, perfect skills, and create required abilities. Students who are taught using this strategy get better learning results than those who are taught using standard methods. Not every content, however, is appropriate for the application. Project conception, planning, and execution in high school biology instruction is a multi-stage process. Depending on the lesson's topic, pick the type of project and how to carry it out correctly and successfully, or combine it with other measures to fulfill the demands of the lesson.

Teaching Quality Improvement

Though many of the selected articles are related to teaching methods, there are a few concerns about the quality of the teaching. One of them is research into subjects of music and art showing that the method can be used to increase educational quality in general education (La, 2012), or even be applied to building an integrated theme by incorporating folk literature into the process of teaching in classes and homework assignments (Trinh, 2017). In terms of the method's efficacy as it was used for teaching and learning foreign languages in universities, it was created and implemented to assist students in improving their language abilities (Do & Nguyen, 2019).

Improvement in teaching quality is also mentioned in education quality generally. One of the aspects that determines the quality of education and training in medical colleges is self-learning (Le & Huynh, 2020). In four steps, project-based teaching/learning from the standpoint of self-learning through the teaching organization process: (1) promotion of learning motivation; (2) project-based learning planning; (3) project implementation; and (4) project evaluation. Project-based learning also assists teachers in orienting their roles in the organization, assistance, evaluation, and encouragement of students' initiative and creativity in the classroom. As a result, it educates and enhances pupils' ability to learn on their own.

Although there are many benefits and effectiveness to the method, there are specific issues that need to be taken into account for better teaching quality; that is, teachers need to let students prepare topics half a month or a week in advance. Besides, it is possible to divide groups of students to work on a topic, and at the same time provide specific instructions on the implementation process. For students' parents, it is necessary to pay attention and spend time with their children studying, regularly checking and encouraging them. Schools should regularly organize seminars and group meetings in the direction of lesson research so that teachers can exchange experiences and find ways to improve the quality of lessons. The development of curricula and textbooks should have clear orientations to help teachers organize project-based teaching activities.

This is a modern form of teaching, oriented to the subject of learning activities in order to equip knowledge, raise awareness, perfect skills, and develop necessary competencies for learners. The learning outcomes of students using this method are higher than those of teaching using traditional methods. However, not all content is suitable for the application. The design, organization, and implementation of projects in teaching biology in high schools is a multi-stage process. Depending on the content of the lesson, how to choose the type of project and how to conduct it appropriately and effectively or combine it with other measures to meet the needs of the lesson. Although there are many benefits and effectiveness to the method, there are specific issues that need to be taken into account for better teaching quality, that is, teachers need to let students prepare topics half a month or a week in advance. Besides, it is possible to divide groups of students to work on a topic and at the same time provide specific instructions on the implementation process. For students' parents, it is necessary to pay attention and spend time with their children studying, regularly checking and encouraging them.

Professional Skills

Learners' presentation abilities (Le, 2015)**;** (Dinh, 2015) orienting students to explore, sense, and analyze the short story positively, creatively, and especially by developing students' general skills as well as individual professional skills (Pham, 2021). Teachers and students are motivated to collaborate when they receive accurate feedback. General education shows some remarkable features reflects many current pedagogical viewpoints and contributes to the development of learner capacities such as self-discipline, creation, problem-solving, ICT use, responsibility, and teamwork (Dinh, 2015). Also, the article is to analyze and evaluate the effectiveness of the process-based learning project through the results obtained from experimental pedagogy (Le, 2012). *In the sector of higher education*, to contribute to increasing the quality of teaching, testing, and assessment in accordance with the new general education curriculum (Nguyen, 2020a); has created the necessary favorable conditions for students to apply what they have learned in class, actively develop necessary skills such as problem-solving, independent study, personal goal setting, and evaluation, and thus contribute to improving the quality of mathematics statistics teaching (Ta, 2013); to increase student engagement and autonomy in the learning process (Thieu, 2021); not only improves the quality of the teaching and learning process, but it also allows students to exercise their information, media, and technological skills (Thai & Phan, 2012a); assists teachers in orienting their roles of the organization, assistance, evaluation, and encouragement of students' initiative and creativity in the classroom (Le & Huynh, 2020).

Project-based teaching is one of the teaching methods that promote the initiative of pedagogical students by asking them to carry out learning projects to absorb the knowledge of the lesson. Therefore, students are actively involved in the teaching process and are allowed to choose some learning content suitable for their own abilities. Students need to actively research and master the training program in order to be able to perform the next learning tasks, thereby forming and developing their necessary professional competencies. The requirements of this method are quite diverse, and it takes effort to make the participants form professional skills, especially pedagogical students, because not only must they master modern skills. However, future teachers must also understand new values in the pedagogical process, such as creativity, discipline, and motivation. In addition, the system of pedagogical schools is also facing challenges when transforming all training activities as well as structuring and preparing the system of facilities and related

assurance conditions so that the teaching methods can be adapted to the needs of the students in order to achieve the best project ever completed

Advantages

Teachers and students collaborate to solve not only academic but also practical problems associated with a general-nature learning purpose (Nguyen & Lai, 2014); allowing students to not only achieve the program's knowledge content requirements, but also to develop abilities that will enable them to overcome the program's restrictions and widen their understanding of life (Nguyen & Nguyen, 2014); This method is collaborative and practical, and it could help Vietnam achieve its educational goal of improving overall educational quality by focusing on increasing capacity, improving skills, applying knowledge in daily practice, developing creativity and self-learning, and encouraging lifelong learning(Tran, 2014a); It also becomes a good setting for the students to develop their intelligence and personality through the interaction between the teacher and the learning environment. With reference to higher education, improving the ability to combine learning theory and practice (Tran, 2019); is one of the most effective methods of active teaching that has been used in classrooms (Thai & Phan, 2012a); emphasizes teamwork and practice, the establishment and enhancement of essential professional skills for pedagogical students of mathematics with essential professional skills by examining its characteristics as well as its strong points (Nguyen, 2016b); to contribute to improving the quality of education and training in military schools (Lam, 2021); Students can gain competencies as well as a variety of abilities (Pham & Pham, 2021).

These research findings suggest that the technique has numerous benefits that extend beyond educational settings, but these benefits require more research, applications, and verification offered by employees and laborers with labor market experience. This can be explained by the increasing number of students who struggle to find job after graduation, and it is commonly defined in a fairly generic way by employers as a lack of unlearned skills. As a consequence, the gap between the quality of skills and academic achievements at school and the skill level and responsiveness of children and students in the social environment must be investigated.

In summary, this method has the following primary benefits: linking theory with practice, thinking and action, school, and society; stimulating learners' motivation and interest in learning; promoting self-reliance and responsibility; developing creativity; capacity training to solve complex problems; practicing endurance and patience; capacity training to work collaboratively; developing assessment capacity. These benefits are also important core values that education may convey to learners through the educational process.

Disadvantages

How to apply PBL depends on the design of an assessable instrument for learners' results but it requires teachers who spend a lot of time and have certain expertise and skills needed to build assessment tools (Nguyen, 2013). This is significant in that it provides the foundations for designing tools as well as some sample evaluative tools for assessing learners' outcomes in PBL learning. More importantly, teachers must be able to deal with challenges and real-life situations that have personal significance, as well as solve problems and collaborate to address the problem or situation (Nguyen, 2016a). And then students will gain an understanding of lessons, attain learning outcomes, and improve their collaborative ability through teamwork and collaboration among individuals in the group after completing project-based teaching or problem-solving. Additionally this method should be properly combined with other facilities of information and communication technology, which not only improve the quality of the teaching and learning process, but also allow students to exercise their information, media, and technological skills (Thai & Phan, 2012b). This would have been useful to describe how it helps the process of studying, working, communicating, and cooperating. These data suggest that one possible explanation is that the more preparations that have been made, the more successful learners and teachers may be. It is obvious that preparations for unseen variables, such as instructors' perfected abilities or how to definitively assess a real-life situation, should be created.

More specifically, in higher education, many requirements such as learning objects, learner-centered learning activities, a balance of theory and practice, objective meaning (Nguyen, 2009), and, most importantly, it should be systematically organized by specific steps (Tran, 2012). It also includes certain approaches and criteria for selecting subjects, materials, and organizational procedures. Additionally, learners struggled to achieve the approach's learning outcomes of key content knowledge and real-life skills due to a variety of issues, including poor study skills, a lack of prior knowledge, and a lack of references, and unauthentic assessment (Nguyen & Dinh, 2017). The teaching of Chinese excursion, was investigated and proved to improve the quality of teaching and learning in this course, but the findings may have been more applicable if the research method was more developed. It is deemed to be the most important discovery, but its application to preschools is restricted (Mai et al, 2017). This is due to the fact that the strategy has not been widely employed in this type of institution. These schools may struggle the most with adopting this system of various requirements.

To sum up, this method has limitations when used, but the main ones are: it is not suitable for transmitting abstract, systematic theoretical knowledge or training the system of basic skills; it takes a long time and is not a replacement for presentation and practice, but rather a necessary supplement to traditional methods; and it requires appropriate

physical and financial resources. Understanding these fundamental limits will therefore assist teachers in maximizing the efficacy of applying the technique to improve teaching quality.

Conclusion

There is an overlap in understanding and methodological approaches leading to research referring to project-based teaching, but there are studies that describe project-based learning, despite the difference between the two concepts, if key players are considered in terms of participating in activities. Furthermore, some articles demonstrate only a hazy understanding of the aforementioned concepts.

In general, although the project-based teaching method has been applied to all levels of education, the research has mainly been carried out in the fields of higher education and general education. A few studies on primary education have been carried out, and preschool had only one study. However, each field has many prospects for applying the method in education or training. These prospects not only depend on the level of study, with many conditions and requirements, but more importantly, they are highly dependent on the design and implementation capabilities of the teacher and the relevant conditions in each school, each class, and each lesson.

The research has shown remarkable points: firstly, early childhood and elementary studies demonstrate the effectiveness of the method through exploring the relative subjects of science, technology, and the environment; secondly, is a general education that focuses on the following topics: speaking skills, developing teaching topics, teaching biology and biodiversity, teaching chemistry, electricity, music, and fine arts, math, history, teaching management, civics education, and English speaking skills. With regard to higher education: advanced mathematics, an integrated topic "Chemical fertilizer farmers buddy", modules in the Applied Informatics vocational training program, inorganic chemistry, mathematics statistics, early childhood psychology, the subjects of social sciences and humanities, industrial electricity subjects, Chinese language courses, and business, and social science.

Although there are many challenges to applying this method in the teaching process at all levels of the education system, especially the time and capacity required of teachers. Many researchers have reached the same conclusion that the effectiveness of this method is that learners benefit from the formation of knowledge, and skills as well as the ability to apply what they have learned into practice. In addition, in order to apply this method effectively, many other necessary conditions are needed, including class size, facilities, preparation time, teacher capacity, the consensus of school leaders, etc.

Recommendations

The education sector today continues to increase the effectiveness of teaching methods. Research into the problems caused by ineffective ones, from too much depending on conventional methods or advanced ways that need a lot of technical support and take time to manage in varied pedagogical environments. Reflecting the immaturity of Vietnam education, the literature reviewed in this report defines the general problems and offers some conclusions. However, further research should focus on the difficulties caused by the application process and practices to develop effective training programs to deal with these challenges for teachers and student teachers in the future.

Limitations

This research compiles all studies on project-based teaching methods in Vietnam's present publication system. Due to the limitations of this scope, it is not possible to investigate project-based teaching methods in other languages and must instead rely on recently updated research. Because of the country's educational background, the research has not adequately proved the importance and advantages of the method when compared to other international studies.

Authorship Contribution Statement

Thang- Nguyen The and Thang-Ngoc Hoang designed the study. Ca- Nguyen Duc, Thuy –Nguyen Thi Thanh, and Phuong- Ngo Thi contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript. All authors discussed the results and commented on the manuscript

References

Alex David, S., Shalini, S., Hassan, A. A., Bavanitha, S., & Goyal, C. (2020). Teaching mobile application development (MAD) – The project centered learning method. *Materials Today: Proceedings*, 1-5. https://doi.org/10.1016/j.matpr.2020.10.911

Bolsunovskaya, L. M., Phillips, C., Korotchenko, T. V, Matveenko, I. A., Strelnikova, A. B., & Ulyanova, O. S. (2015). Project-based Method in Teaching Foreign Language for Specific Purposes. *Procedia - Social and Behavioral Sciences*, *215*, 176–180. https://doi.org/10.1016/j.sbspro.2015.11.615

Bui, T. T (2021). Applying project teaching method in engineering subjects in primary school according to the new general education program. *Journal of Education and Society*, *4*, 86–90. [In Vietnamese]

Cao, T. T. (2010). Building an integrated physics-chemistry-biology topic and experimenting with project-based teaching methods in high schools - Vietnam Academy of Educational Sciences. *Journal of Educational Sciences*, *5*, 37–41. [In Vietnamese]

Chen, D., Li, Z., & Wang, T. (2014). Exploration and practice: A competition based project practice teaching mode. *Mechatronics*, *24*(2), 128–138. https://doi.org/h6t2

Cuma, F. İ. (2013). Project-based learning in teaching with the DAF Montessori method. *Procedia - Social and Behavioral Sciences*, *70*, 1901–1910. https://doi.org/10.1016/j.sbspro.2013.01.268

Dinh, T. T. L. (2015). Teaching "one Hanoian" by Nguyen Khai in high school by project-based teaching method. *Vietnam Journal of Education*, *357*, 33–35. [In Vietnamese]

Dinh, H. S. (2020). The relevance of project-based teaching to modern teaching trends. *Journal of Labor and Society*, *474*(4), 41–42. [In Vietnamese]

Do, T. S., & Nguyen, T. T. (2019). Teaching foreign languages through English drama project at School of Foreign Languages, Thai Nguyen University. *Journal of Science and Technology, Thai Nguyen University*, *198*(05), 17–22. [In Vietnamese]

Gajda, K., & Pazik, A. (2014). Outgoing seminar as project based teaching of intercultural competence – A description of the results of the project 'study trip to concentration camp memorial site and youth encounter S'. *Procedia - Social and Behavioral Sciences*, *143*, 163–167. https://doi.org/10.1016/j.sbspro.2014.07.380

Ha, T. T. (2015). Organizing teaching according to biology projects in 10 high schools, contributing to improving students' self-study ability. *Vietnam Journal of Education*, *358*(5), 47–51. [In Vietnamese]

Hong-mei, S., & Rui-sheng, J. (2012). Research on case teaching of software development comprehensive practice based on project driven. *Procedia Engineering*, *29*, 484–488. https://doi.org/10.1016/j.proeng.2011.12.747

Huynh, G. B., Ngo, T. K. L. Nguyen.T.T.L (2019). A conceptual design of project - based learning instruction in inorganic chemistry for pharmaceutical students. *Vietnam Journal of Educational Sciences*, *19*, 19–23. [In Vietnamese]

Khodeir, L. M. (2018). Blended learning methods as an approach to teaching project management to architecture students. *Alexandria Engineering Journal*, *57*(4), 3899–3905. https://doi.org/10.1016/j.aej.2018.10.004

La, T.T. (2012). Teaching by project, by contract, by angle and applying it in teaching music and art in high schools. *Vietnam Journal of Education*, *286*(2), 48–51. [In Vietnamese]

Lam, H.D. (2021). The requirement to apply the project-based teaching methods in teaching social sciences and humanities at the military schools. *Teacher of Vietnam Magazine*, *168*, 109–112. [In Vietnamese]

Lavi, R., Tal, M., & Dori, Y. J. (2021). Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning. *Studies in Educational Evaluation*, *70*, 101002. https://doi.org/10.1016/j.stueduc.2021.101002

Le, K. (2012). Organizing project-based teaching of some physics knowledge about electricity production in high schools. *Vietnam Journal of Education*, *290*, 52–54. [In Vietnamese]

Le, K. (2014). Experimental project-based teaching in some high schools in Vinh Phuc province. *Vietnam Journal of Education*, *327*(2), 54–57. [In Vietnamese]

Le, T.H. (2015). Developing presentation skills in the class "practice speaking and interpreting a device" in grade 8 by project-based teaching. *Vietnam Journal of Education*, *358*(5), 27–30. [In Vietnamese]

Le, T.T. & Huynh, G.B. (2020). Developing self-learning capacity for students of medical college through project-based learning with general inorganic chemistry. *Journal of Science, Vinh University*, *49*, 100–109. [In Vietnamese]

Le, D.M. & Nguyen, T.T. (2017). Application the project based teaching method into subjects, moduls of industrial electricity for student's competencies. *Journal of Vocational Sciences*, *45*, 15–19. [In Vietnamese]

Le & Nguyen. (2020). The organization of Project-based teaching of object-oriented programming modules" for students of Applied Informatics of Quang Tri Teacher Training College. *Vietnam Journal of Education*, *474*, 43–47. [In Vietnamese]

Le, T. T. H., Tran, T. P. T., & Vu, T. H. (2020). Applying mi-based projects to improve EFL students' English proficiency at Vinh University. *Journal of Educational Sciences*, *2014*, 39–43. [In Vietnamese]

Mai, T. N. A., Vi, T. H., & Pham, H. T. (2017). Application of project-based learning to the teaching of Chinese excursion at school of foreign languages Thai Nguyen University. *Journal of Science and Technology*, *174*(14), 117–122. [In Vietnamese]

Nes, A. A. G., Høybakk, J., Zlamal, J., & Solberg, M. T. (2021). Mixed teaching methods focused on flipped classroom and digital unfolding case to enhance undergraduate nursing students' knowledge in nursing process. *International Journal of Educational Research*, *109*, 101859. https://doi.org/10.1016/j.ijer.2021.101859

Nguyen, T. H. (2009). Using the project based teaching method in higher education. *Journal of Educational Sciences*, *214*(5), 38-45. [In Vietnamese]

Nguyen, V. T. (2013). Developing a toolkit to assess learning outcomes in the process of applying project-based teaching methods. *Vietnam Journal of Education*, *2*, 32–34. [In Vietnamese]

Nguyen, T. T. (2015). Applying project-based teaching method to organize scientific discovery activities about the surrounding environment for preschool children 5-6 years old to improve children's participation level. *Vietnam Journal of Science, Technology and Engineering*, *9*, 105–112. [In Vietnamese]

Nguyen, D. T. (2016). Develop learners' collaborative capacity through project-based teaching. *Journal of Educational Sciences*, *10*, 45–47. [In Vietnamese]

Nguyen, N. B. (2016). Project-based learning form's contributions to the establishment and enhancement for pedagogical students of mathematics with required professional competences. *Vietnam Journal of Education*, *381*(5), 53–56. [In Vietnamese]

Nguyen, V.T (2017). Applying project-based teaching method to design integrated teaching topics for extracurricular activities in art at lower secondary level. *Journal of Science, University of Khanh Hoa*, *1*(2), 59–68. [In Vietnamese]

Nguyen, M. Đ. (2020a). Combining project-based learning method and experiential activity on integrated topic of "Chemical fertilizer-friend of farmer." *Vietnam Journal of Education*, *473*, 28–35. [In Vietnamese]

Nguyen, V.T. (2020). The status of organizing project-based teaching activities in teaching Advanced Maths for Engineering students at universities in Hanoi city. *Vietnam Journal of Education*, *472*(2), 44–49. [In Vietnamese]

Nguyen, V. T. (2021). Organization of Project-based teaching of the module "Some applications of differential equations' in teaching Advanced Maths for students in Engineering. *Vietnam Journal of Education*, *496*(2), 14–19. [In Vietnamese]

Nguyen, H. Đ., & Dinh, N. H. M. (2017). A participatory case study into learivers' difficulties and pedagogical implications of doing project-based learning ESP course. *Journal of Science and Technology*, *174*(14), 135–140. [In Vietnamese]

Nguyen, M. G., & Hoang, T. T. (2013). Environmental education for 5th graders by project-based teaching. *Journal of Science, Ho Chi Minh City University of Education*, 162–175. [In Vietnamese]

Nguyen, T. H., & Lai, P. L. (2014). Organization of project-based teaching in teaching students to learn in high schools. *Vietnam Journal of Education*, *333*, 62–64. [In Vietnamese]

Nguyen, T. N., & Nguyen, T. T. T. (2010). Applying project-based teaching method to teaching 3rd grade natural and social subjects. *Vietnam Journal of Education*, *11*, 29–31. [In Vietnamese]

Nguyen, T. H., & Nguyen, T.H. (2012). Practice scientific research skills and promote students' independence and creativity through project-based teaching in teaching ecology (12 grade biology). *Vietnam Journal of Education*, *2*(300), 37–39. [In Vietnamese]

Nguyen, T. S., & Nguyen, T. P. T. (2014). Improving the efficiency of using project-based teaching in teaching organic chemistry in junior high schools in the northern mountainous provinces. *Journal of Science of HNUE*, *59*(8), 101–111. [In Vietnamese]

Nguyen, T.H., & Nguyen, T. M. H. (2018). Designing a case study for teaching Mathematics according to the project teaching method in high schools. *Journal of Educational Sciences*, *9*, 72–76. [In Vietnamese]

Nguyen, T. S., & Pham, H. B. (2013). Integrating environmental education through project-based teaching in high school non-metallic chemistry. *Vietnam Journal of Education*, *315*(1), 45–47. [In Vietnamese]

Nguyen, V. H., & Vu, T. T. T. (2017). Project-based teaching and the development of scientific research capacity for students in teaching ecology in high schools. *Journal of Science and Technology*, *167*(07), 79–83. [In Vietnamese]

Nguyen, X. T., Huynh, G. B., & Nguyen, T. T. L. (2020a). Designing tools for evaluation of students' self-learning capacity through project based learning in general chemistry- inorganic in medical college. *Journal of Science Educational Science*, *65*(1), 192–203. https://doi.org/10.18173/2354-1075.2020-0019

Nguyen, T. H. N., Nguyen, T. H., & Luong, T. L. (2020). Develop thinking and complex problem-solving skills through writing exercises. *Dictionaries and Encyclopedias*, *3*, 128–132. [In Vietnamese]

Pan, G., Shankararaman, V., Koh, K., & Gan, S. (2021). Students' evaluation of teaching in the project-based learning programme: An instrument and a development process. *International Journal of Management Education*, *19*(2),

100501. https://doi.org/10.1016/j.ijme.2021.100501

Pham, T. K. A (2012). Designing local history lessons in high school by project-based teaching method. *Today's Teaching & Learning Magazine*, *1*, 45–47. [In Vietnamese]

Pham, H. B. (2012). Experience in bringing project-based teaching into effective teaching of high school inorganic chemistry. *Vietnam Journal of Education*, *2*(282), 42–44. [In Vietnamese]

Pham, M.T. (2018). Applying the project-based teaching method to the subject of civic education grade 11 at the practical high school - Ho Chi Minh City University of Education. *Journal of Science, Ho Chi Minh City University of Education, Ho Chi Minh City University of Education*, *15*(1), 162–172. [In Vietnamese]

Pham, T. B. (2021). Management of teaching assessment by project in high school. *Journal of Educational Sciences*, *49*, 84–89. [In Vietnamese]

Pham, & Nguyen. (2013). Activities of teachers in project-based teaching of chemistry in high schools. *Journal of Science of HNUE*, *58*(1), 46–54. [In Vietnamese]

Pham, D. Q., & Pham, T. M. (2008). About active teaching methods and project-based learning. *Today's Teaching & Learning Magazine*, *3*, 35–38. [In Vietnamese]

Pham, T. N., & Pham, T. T. N. (2021). Project-based teaching for Probability Theory and Mathematical Statistics for students of the University of Labor and Social Affairs. *Today's Teaching & Learning Magazine*, *7*(1), 44. [In Vietnamese]

Phan, D. C. T. (2011). Features of project-based teaching methods. *Journal of Science and Technology*, *3*, 132–137. [In Vietnamese]

Phan, Đ. Q. C., & Nguyen, Q. M. P. (2012). Teaching by project "concepts of TECPEN" advanced 11th grade chemistry program. *Journal of Education, Ho Chi Minh City University of Education*, *34*, 86–91. [In Vietnamese]

Phan, T. H. L., Le, T. K. O., & Nguyen, V. A. (2015). The application of project - based learning in teaching engineering applications of physics. *Journal of Sc Ho Chi Minh City University of Education*, *8*(74), 70–80. [In Vietnamese]

Şenyuva, E., Kaya, H., & Bodur, G. (2014). Effect social skills of nursing students of the project based teaching methods. *Procedia - Social and Behavioral Sciences*, *152*, 393–398. https://doi.org/10.1016/j.sbspro.2014.09.218

Sykorova, J. (2015). Outputs of interactive exploration and project-based teaching at Mendel University in Brno, Czech Republic. *Procedia - Social and Behavioral Sciences*, *174*, 3224–3227. https://doi.org/10.1016/j.sbspro.2015.01.986

Ta, H. H. (2013). Proposing processes in project - based learning to teach mathematical Statistics for students at Bac Ninh Sports University. *Journal of Scientific Training and Sports Coaching*, *6*, 37–41. [In Vietnamese]

Thai, H. M., & Phan D. C. T. (2012a). Roles of information and communication technology in project-based teaching. *Journal of Science, Quy Nhon University*, *7*(1), 51–61. [In Vietnamese]

Thai, H. M., & Phan, D. C. T. (2012b). The role of information and communication technology in project-based teaching. *Journal of Educational Sciences*, *7*(82), 21–30. [In Vietnamese]

Thieu, T. H. H. (2021). The effectiveness of using project-based teaching approaches to teach an early childhood psychology subject. *Journal of Education and Society*, *2*(3), 58–62. [In Vietnamese]

Tran, V. C. (2009). About the project-based teaching method. *Vietnam Journal of Education*, *207*, 25–26. [In Vietnamese]

Tran, V. C. (2012). Project based teaching method for "Antiderivative and integral"of maths pedagogical students. *Vietnam Journal of Education*, *1*(281), 35–37. [In Vietnamese]

Tran, V. C. (2013). Evaluating and assessing perceptual knowledge skills and developing essential pedagogical abilities for students by using PBL approach as well. *Vietnam Journal of Education*, *306*(2), 31–33. [In Vietnamese]

Tran, V. C. (2014). Organization of project based learning - a suitable form in teaching the teaching method's course for pedagogical students within training credits. *Journal of Science and Technology*, *5*(2), 40–51. [In Vietnamese]

Tran, T. H. (2014). Design a "microscope," for the Physics curriculum in the 11th grade of high school by project-bases teaching. *Journal of Educational Equipment*, *105*, 29–31. [In Vietnamese]

Tran, T. N. (2019). Designing the learning project of "the implementation of mathematics on evaluating the effects of tax on the consumer, producers and the authorities'' policy in teaching advanced mathematics for economics students. *Journal of Educational Sciences*, *23*, 27–32. [In Vietnamese]

Tran, V. C., & Phan, A. H. (2012). Organizing project-based teaching of subjects, teaching methods, contributing to pedagogical training for students of mathematics pedagogy. *Journal of Science and Technology*, *98*(10), 115–120.

[In Vietnamese]

Tran, V. C., Nguyen, N. T., & Nguyen, P. B. (2014). Organization of project-based teaching in teaching mathematics for high school students. *Vietnam Journal of Education*, *325*(1), 44–47. [In Vietnamese]

Trinh, T. L. (2017). Design and deploy intergrated teaching themes of folk-literature in high school. *Journal of Science, Educational Science*, *62*(4), 24–32. https://doi.org/10.18173/2354-1075.2017-0054

Tsybulsky, D., & Muchnik-Rozanov, Y. (2019). The development of student-teachers' professional identity while team-teaching science classes using a project-based learning approach: A multi-level analysis. *Teaching and Teacher Education*, *79*, 48–59. https://doi.org/10.1016/j.tate.2018.12.006

Vu, T. N. T. (2021). Project-based learning: A new trend of higher education in Vietnam. *Today's Teaching & Learning Magazine*, *6*, 8–10. [In Vietnamese]

Wu, T. -T., & Wu, Y. -T. (2020). Applying project-based learning and SCAMPER teaching strategies in engineering education to explore the influence of creativity on cognition, personal motivation, and personality traits. *Thinking Skills and Creativity*, *35*, 1-10. https://doi.org/10.1016/j.tsc.2020.100631