European Journal of Humanities and Educational Advancements (EJHEA)
Available Online at: https://www.scholarzest.com
Vol. 4 No.10, October 2023
ISSN: 2660-5589

IMPLEMENTATION OF TEAM BASED PROJECT LEARNING METHOD AT D'TECH ENGINEERING SALATIGA

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Article history:

Received: August 14th 2023
Accepted: September 14th 2023
Published: October 16th 2023

Abstract:

In order to achieve success and competitiveness in the global society, learners must possess skills as effective communicators, creators, critical thinkers, and collaborators. Critical thinking, technological literacy, and problem-solving skills are considered essential competencies for learners in the 21st century. Team Project-Based Learning (PjBL) is regardedas an innovative collaborative learning method that has a direct impact on learners. D'tech Engineering serves as a place where many young individuals collaborate to create technological innovations in the field of manufacturing. This study aims to 1) understand the implementation of the Team Project-Based Learning model at D'tech Engineering in Salatiga and 2) examine the outcomes of implementing the Team Project-Based Learning model at D'tech Engineering in Salatiga. This research employs a qualitative approach, with the subjects being the employees working there and the informants being the CEO of D'tech Engineering in Salatiga. Data is collected through observation, interviews, and documentation. Data validity is ensured through source and method triangulation, and data analysis is carried out through data reduction, data presentation, and drawing conclusions. The findings of this research are as follows: 1) The learning steps align with the syntax developed by The George Lucas Educational Foundation, which includes essential questions, designing products, scheduling project completion, monitoring project activity and development, testing results, and evaluation. 2) The outcomes of implementing this learning approach indicate that employees are able to collaborate and solve problems in project development, enhance creativity, and become more independent while actively participating in the workforce.

Keywords: Learning method, team based learning, 21st century learning

INTRODUCTION

According to the NationalEducation Association, to achieve success and compete in the global society, students must be proficient and possess skills ascommunicators, creators, critical thinkers,and collaborators. In the 21st century, critical thinking skills, technological literacy, and problem-solving skills are considered essential. Therefore, in the learning activities, educators prepare everything through planning; learning activities are something that must be carriedout for the success of learning (Irviana,2020). According to A. Munawaroh, as cited in the research conducted by Lin Herlina, Mega Triasya Remana, Mila Andriani Nurcahya in 2022, the implementation of project-based learningoffers many benefits for students. In addition to enhancing the critical thinking process, this model also fosters students' creativity and equips them to effectively address problems. Through the acquisition of new and useful technological skills, students become adept communicators and proficient problems solvers, all of which provide them with significant benefits in the learning process (Bell, 2010).

D'tech Engineering in Salatiga is a place where many young individuals collaborate to create innovative technologyin the manufacturing field. They employ Team Project Based Learning in their domain. Project-Based Learning (PjBL) is a teaching strategy that uses projects oractivities as tools for achieving competencyin attitudes, knowledge, and skills (Hosnan& Sikumbang, 2014). The steps in the project-based learning model developed byThe George Lucas Educational Foundation(Nurohman 2008) are as follows: (1)selecting the project to be completed, with the guidance of teachers to help students analyze the project. (2) designing the solution activities, with students guided byteachers to develop a project completion plan. (3) creating the project completionschedule after the plan is established. (4) project completion, guided by teachers. (5) compiling the results of the project completion for presentation. (6) evaluatingthe completed project. Through this teamwork, the project-based learningmodel can enhance students' creative thinking abilities. This aligns with researchconducted by Orozco, as cited in (Sari et al.,2018), which states that project-basedlearning is effective in improving creative and innovative thinking for success in the 21st

century.

The world of education ischallenged to prepare the next generation tokeep pace with the changing times and evenbecome contributors to the next phase of development. Students need to be equippedwith critical thinking, communication, collaboration, and creativity, which are themost crucial skill aspects (Wibowo, 2014).The use of the PjBL method has proven effective in enhancing students' critical thinking and creativity. This method provides students with the opportunity to actively learn, collaborate, and apply their knowledge in real projects, making them better prepared to face real-world challenges (Kanah et al., 2023). Halpern has developed a taxonomy of critical thinking skills that includes logical verbal thinking, argument analysis, the ability to test hypotheses, dealing with possibilities and uncertainties, and decision-making andproblem-solving skills. It is the role of creativity that has attracted the author's attention to analyze and describe the "Implementation of the Team Project BasedLearning Model at D'tech Engineering Salatiga."

METHOD

The research approach used in this study is a qualitative research approach.Bongdan and Taylor, as cited in Moleong (2013), define qualitative research methodology as research that produces descriptive data, whether in the form ofspoken or written words, from people or behaviors observed. This research is a casestudy. A case study is a research strategy inwhich the researcher carefully investigates a program, event, activity, process, or agroup of individuals (Adhi Kusumastuti,2019). The research subjects in this study are the CEO and employees working atD'tech Engineering in Salatiga.

Primary data in this research is obtained from direct interviews with pre- selected informants. The researcher recordsall information obtained from the interviewees that is directly related to the research object. Meanwhile, secondary datais obtained through a literature review,including journals, theses, and books. Secondary data in this research can also beobtained from official websites of related industries and through notes, photos, and observation results related to the research focus. Data collection techniques include observation, interviews, and documentationto gather information about activities at the research site. Data validity is ensured through source and technique triangulation.The most commonly used data analysis technique in qualitative research is the dataanalysis technique proposed by Miles and Huberman, which includes data collection, data reduction, data presentation, and drawing conclusions.

RESULTS AND DISCUSSION

Start With Essential Questions

The initial step in itsimplementation involves fundamentalquestions. At D'tech Engineering in Salatiga, this is similar to handling client requests for the manufacturing of products.It entails the process of designing, producing, and delivering projects in line with the client's needs and specifications. Analyzing client requests involves an understanding of the required product quantity, technical specifications, anddesired specific features. Consistent with the opinion of Larissa Pahamov (2014),strong key questions in project-based learning are crucial because they can motivate students, guide their projects, andencourage strong critical thinking. Tutors strive to make these topics relevant for easier practical application (Kanah et al., 2023).

Fundamental questions in the context of Team Project-Based Learning atD'tech Engineering in Salatiga serve as theintellectual foundation essential in guiding the exploration, analysis, and implementation of engineering concepts inreal-world scenarios. In line with Wibowo'sstatement (2014) that the education world isrequired to prepare the next generation to keep up with the times, even become contributors to future developments, students must be equipped with critical thinking, communication, collaboration, and creativity, which are the most crucial skill aspects to be mastered. According to Yamada (2021), PjBL is effective in developing students' skills. One solution toovercome collaboration challenges in teamteaching is implementing value-based teamlearning. Fundamental questions in project-based learning at D'tech Engineering gobeyond directing projects but stimulate active and in-depth learning through theconceptualization, analysis, and applicationof technology in real-world situations.

Design Products

Designing involves a creative and technical process to produce innovative,functional, and aesthetically pleasing solutions in the field of technology. This stage is a complex and structured process that involves various steps to be carried outcarefully and systematically. Project designcan encourage students to become active and creative, tackle challenges, and gain practical experience (Kuppuswamy & Mhakure, 2020). The goal is to produce a project that not only meets the client's needsand expectations but also complies with thesafety, comfort, and aesthetic standards required. Creating a physical project prototype allows the testing of comfort, seating positions, and other features in a real-world context. According to Dulock inYamada (2021), the conceptual model is most beneficial when used to describe phenomena or events that are lessunderstood or related to emerging new phenomena. Product design requires additional knowledge and skills beyond theusual ones to prepare students to become competent sustainable product designers inthe future (Watkins et al., 2021).

The material selection must also beappropriate for the purpose and the environment, aiming to align with product usability, comfort, and safety. Designing a product must embrace these social and workplace environmental aspects to prepare students to be comprehensive and responsible product designers (Melles et al.,2011). Coordinating with the productionteam in project design enables an efficient production process that meets the requirements.

Project-based learningapproaches enhance student engagement and understanding, ultimately improving learning outcomes (Das et al., 2020). This stage has significant benefits, such as abetter understanding of sustainable design and the environment, as well as improving their design capabilities for the future (Lu et al., 2018).

Develop a Project Completion Schedule

Creating a project completionschedule is a crucial process to plan and organize time allocation, considering task dependencies, monitoring project progress, and ensuring effective team coordination and communication to achieve projectsuccess within the specified timeframe. In the initial stage of this process, D'tech Engineering Salatiga comprehensively analyzes the scope of the production project. According to Mulkan (2021), the use of precise, practical, efficient, and safe time management greatly aids in projectconstruction work completion. Scheduling in a project is used to determine the activities required to complete a project in aspecific order and timeframe, where each activity must be carried out to ensure the project finishes on time and within an economical cost (Gazalba Z.Warka I.G.P.Wirahman L., 2022). To complete a project as quickly as possible, various project planning and scheduling techniques,such as CCPM, are typically used in projectimplementation (Zohrehvandi, 2022).

According to Yamada (2021), a conceptual model is most beneficial when used to describe phenomena or events that are not well understood or relate to emerging phenomena. This stage relates to leading and coordinating resources, including human and material resources, using cutting-edge management techniques to achieve predetermined objectives, namely scope, quality, schedule, and cost, while meeting the desires of stakeholders (Fazis & Tugiah, 2022). Based on the book"A New Culture of Learning" by John SeelyBrown and Douglas Thomas, in the contextof PjBL, the products created by students should not only be the end result of their learning but also serve as tools for sharing and interacting with others.

Monitoring Project Activity andDevelopment

Monitoring the activity and progress of the project is a continuous process of tracking project activities and progress to ensure that the project is proceeding according to the established plan and targets. Through this monitoring, project management can identify issues or risks early and take corrective actions necessary to achieve project success at D'tech Engineering Salatiga. As per the opinion of Barhebwa-Mushamuka & Wagner (2022), appropriate monitoring andcontrol support enable better project management and anticipation of various changes in task schedules, effort distribution, and delivery schedules.

Victor A and Apriliani V.R.D, as mentioned in Juliana et al. (2018), havedeveloped a monitoring system that facilitates on-site project reporting conducted online. This allows the companyto continuously monitor project progress and assess project work developments compared to the project planning, enabling them to make decisions for improvements. High-level monitoring is conducted tomake measurements over time that indicatemovement towards or away from project goals. As per Bima Apria Savero (2019), monitoring systems in the construction field, such as progress monitoring, are usedto track ongoing projects, especially from acost expenditure production perspective. These systems simplify the creation of dailyproject progress reports and enable cost or budget control. This assists in evaluating whether the project is on target and in identifying early if there are delays or issuesin the project. D'tech Engineering Salatiga's mentor act as supervisors duringproject completion. They monitor how students work within groups, where each student has a role, and there are tools to record important activities (Fajra et al., 2020)

Test results

Testing the results is the process of inspecting and evaluating the quality and suitability of the outcomes with the previously set requirements and objectives.Designing a test protocol involves test methods, testing instructions, as well as thetools and equipment to be used during the testing process to ensure that all features function correctly and serve their intended purposes. Following this, a comprehensive final product testing is conducted to ensurethat the project is ready for mass productionand use, as well as tests to assess whether the product meets the predefined testingcriteria. Assessment of students' reflective thinking is more informative than summative assessment because it can revealdeeper understanding and the application ofknowledge in the future (YuekMing & Manaf, 2014). All team members, includingthe customer, share the responsibility toassess the direction of the development process and adhere to possible changes because they have a better understanding ofthe final product (Moe et al., 2010)

Evaluation

According to Squire, L. andHerman, G. Van Der Tak (1975), project evaluation is a study to estimate and analyze the benefits and costs of a project. Zhou in (Saputra et al., 2013) states that evaluation based on assessment variables inPjBL provides considerations from variousaspects of learning needs, such as the principles of assessment objectivity inindustry, with the aim of demonstrating fairresults and objective methods. Diana Curtis (sabar nurohman, 2015) emphasizes thatenthusiasm alone is not a sufficient reason to base a project-based learning approach, the results achieved from such enthusiasm provide a strong rationale for supporting thelearning method. Project evaluation atD'tech Engineering Salatiga aligns with theopinion of (Kuntjoro, 2002), which is an examination or analysis of whether the investment project can succeed when implemented. Meanwhile, Squire, L. and Herman, G. Der Tak (1975) mention that project evaluation is a study to estimate andanalyze the benefits and costs of a project. Evaluating the success of a project is acomplex task due to the varying perspectives on success, which depend on factors such as project characteristics,project management characteristics, and many other aspects (Varajão et al., 2022). The evaluation phase is conducted regularlyto assess employees' achievements,contributions, and developments

in theirwork.

Collaboration and Problem-SolvingSkills

The results of the research on the implementation of team-based project learning at D'tech Engineering Salatiga align with the statement made by Hamid (2011), which emphasizes that collaboration is believed to accelerate the achievement of learning targets or objectives because group work isconsidered superior to individual work. Team project-based learning helps studentsdevelop collaboration skills, such as teamwork, proactive communication, and the ability to find innovative solutions. Thisproject is not competitive because each team has its unique challenges (Ballesteros-Sola & Magomedova, 2023). It has been widely researched and advocated ineducation (Laal & Laal, 2012). According to Loughry, Oakley, and Zheng (Aranzabalet al., 2022), the ability to communicate andwork effectively in a team is one of the mostdemanded skills by engineering companies.Individuals must be good communicators, team members, and lifelong learners. Theyinvolve groups working together to solve problems, complete tasks, or create products (Chandra, 2015). Consistent with the opinion of Rawani et al. (2023),teamwork skills can enhance students' creative characters because they promote collaboration, communication, and joint problem-solving in a real learning context.

Increase Creativity

Research on the team-based projectlearning model at D'tech Engineering Salatiga can foster a more disciplined learning attitude among students and makethem more active and creative in their learning. Characteristics of creative individuals, according to Sund (cited in Slameto, 2010), include openness to new experiences, a strong curiosity, flexible thinking, a desire to discover and explore, passionate dedication, and an active approach to tasks. Creativity involves the ability to generate new ideas, innovative solutions, or works that add value or novelty (Rolly B. Valdez, 2022). Quoting from Halpern (1998), critical thinking also involves evaluating the thinking process - the reasoning used to reach conclusions or the factors considered when making decisions. Critical thinking doesn't only involve the use of specific skills in appropriate situations, but it also encompasses an attitude or disposition to recognize when these skills are needed andbe willing to apply them. Critical thinking is essential to have both the skills and the readiness to use them appropriately when required (Sears & Parsons, 1991). Creativity serves as a triggering agent that generates alternative formulations and unconventional approaches in dealing withtechnical challenges and product design, inline with the views of Serrano & Bedia (cited in Rumanti et al., 2023), creativity isthe ability to produce new works and is considered the starting point and root of innovation.

Real-world Immersion (Independent)

Through this process, they build a deeper understanding and greater capabilities. They gain experiential learning, which is working together in real-life situations. Participants understand howto apply knowledge and skills in their everyday lives. Self-directed learning is an effort to learn based on one's own motivation to understand a problem, so as to solve the challenges faced (Afnan et al., 2020). Team-based project learning atD'tech Engineering Salatiga helps participants develop more relevant skillsand collaborate in facing challenges while working with people from diverse backgrounds. In today's increasingly globalized work world, the ability to interact with individuals from different cultural, educational, and experientialbackgrounds is crucial.

D'tech Engineering Salatiga also utilizes the concept of the Zone of ProximalDevelopment and Scaffolding, which is theability to solve problems independently andthe potential developmental level defined asproblem-solving skills under the guidance of adults/experts or in collaboration with more skilled peers. Scaffolding is the assistance given to an individual to learn and solve problems, in the form of guidance, encouragement, warnings, and providing examples so that individuals caneffectively learn independently. Accordingto Wena in (Saputra et al., 2013), the advantages of this project-based learning are that projects can be chosen or developedto achieve specific goals, enabling participants to have independence and skillsin completing their tasks.

CONCLUSION

Based on the research findings and discussion, the researcher concludes thatthe success of project-based learning is closely tied to thorough planning. Additionally, the individuals involved should possess the necessary skills and expertise to guide and support throughout the learning process. The steps in team-based project learning involve a collaborative approach to tackling challenging and relevant projects. Planningincludes setting ground rules, selecting activities that can support the answering ofessential questions by integrating various subjects as needed, and identifying tools and resources accessible to assist in project completion. Assessment is carried out to aid in measuring the achievement of standards and plays a role in evaluating the progress of the level of understanding attained. Creativity is derived from enhancing the quality of participants in developing their thinking and their ability to elaborate on an idea. The application of team project-basedlearning here can instill a more disciplined attitude toward learning in participants, making them more active and creative learners, and fostering a sense of responsible teamwork.

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