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The Effect of Problem-Based Learning on Improving the Ability to Find Alternative Solutions Through Group and Independent Work

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Abstract

The implementation of the 'Freedom to Learn Curriculum' in higher education can serve as a catalyst for the nation's future advancement, yet how to realize this potential remains a critical question. This study implements an integrated Problem-Based Learning (PBL) model to enhance students' ability to solve economic and business problems across time. The research integrates several stages: identifying root problems, theoretical and applied reviews, analyzing government policies in practice, assessing impacts, and developing future problem-solving programs. This research aims to examine the effect of the problem-solving learning model on improving students' ability to address economic problems, focusing on strengthening self-identity and enhancing both group and individual work abilities. The research design employed a pre-experimental approach, starting with problem identification, theoretical foundation development, field exploration, analysis of supporting policies, and identification of potential impacts for the future. The subjects were 118 students enrolled in the Introduction to Economic Theory course at the Faculty of Economics and Business, Universitas Negeri Malang. Data on improvements in problem-solving ability, operational skills, individual work changes, and teamwork-based problem-solving capabilities were processed using SPSS-23 through ANCOVA with regression analysis. Meanwhile, improvements in problem management and opportunity recognition in economic activities were analyzed using SWOT through group work mechanisms. The process emphasized optimizing accessibility to problem-based activities and varying fieldwork and practical exercises for managing progressive life challenges. The results showed that based on the ANCOVA statistical analysis, the Problem-Based Learning (PBL) model had a significant effect on students' ability to develop alternative solutions, particularly through

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teamwork. In the Tests of Between-Subjects Effects model involving two independent variables—CVMT (PBL-based treatment) and TI (individual task category)—the overall model was significant, with a Sig. value of 0.008. This indicates that the combination of PBL treatment and variations in individual assignments jointly influenced students' group task outcomes. The individual task variable (TI) significantly affected group performance with a significance value of 0.049 and a Partial Eta Squared value of 0.137, indicating a moderate contribution. This means that the type or quality of individual tasks completed by students has a tangible impact on group work success. Descriptive Statistics results showed that the highest average group task scores came from students with individual task categories at scores of 85 (mean = 86.21) and 88 (mean = 86.00), indicating that students with strong individual performance tended to demonstrate better group outcomes. Conversely, groups with lower individual scores (TI = 75) also had lower group performance (mean = 74.65). This supports the assumption that success in group work originates from solid individual contributions. From the Parameter Estimates results, a significant difference was specifically found between the TI = 75 group and the reference group (TI = 90) with p = 0.032, showing that students with lower individual performance exhibited a statistically significant difference in group outcomes.

Keyword: Problem-Based Learning , Alternative solution ability , Group work , Individual task, Merdeka Curriculum

INTRODUCTION

Amid the rapid transformation of the global industrial landscape, undergraduate business education faces a major challenge in preparing graduates who can adapt to the changing dynamics of the labor market. Numerous studies have examined factors influencing the employability of business education students, including gender, field of study, and self-perception [1]. The urgency of this issue is supported by Tam et al. [2], who emphasize that appropriate business and entrepreneurship learning processes can enhance work readiness and psychological perception. In this context, there is a pressing need for a comprehensive review of existing business teaching methods to determine the most effective approaches for improving students' managerial competencies as desired learning outcomes.

Various studies have compared two or more learning models to determine which is more effective in specific classroom environments [3], [4]. Approaches such as Problem-Based Learning (PBL), Problem-Solving (PS), and Project-Based Learning (PJBL) have been explored and elaborated upon in relation to their significant correlations with learning outcomes. Some

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scholars have innovated by evaluating pedagogical approaches in business education through comparative analyses combining these methods. However, most of these studies only compared two approaches without considering carryover effects and fatigue effects [5], both of which are crucial in shaping students' meaningful learning experiences. Although previous research provides an initial theoretical basis [6], significant differences may still exist in the effectiveness of various learning models in achieving integrated business management learning outcomes—spanning cognitive, psychomotor, and affective domains.

In alignment with the direction of the *Merdeka Curriculum* toward *Indonesia Emas 2045*, several systemic and sustainable challenges must be addressed to ensure the nation's continued progress. Field observations during community service programs (*P2M*) [7] reveal that a fundamental problem faced by pioneering students and MSME alumni managers is their limited capacity to access domestic and export markets due to regulatory barriers, distribution constraints, and human resource limitations—factors that weaken the competitiveness of superior products. One possible solution is to implement a Problem-Based Learning (PBL) model to strengthen students' and alumni's capacity for problem identification and resolution, supported by mentoring and facilitation that open opportunities for advancement. Such progress is expected to be transferred to new students through future *Practical Field Work (PPL)* programs, equipping them for prosperous professional lives.

The future academic profession requires lecturers to possess the fundamental ability to manage problems effectively. This capability can be cultivated by integrating the values and principles of entrepreneurial problem-solving into university courses and student research. However, implementing this ideal remains challenging. Therefore, this research was conducted to provide empirical experiences, practical mentoring, and problem-development support for students and MSME alumni, enabling them to apply entrepreneurial values and principles through theoretical mastery and practical reinforcement.

This study specifically aims to examine the effect of Problem-Based Learning implementation on enhancing higher-order intellectual abilities—particularly the capacity to solve problems related to the truth of knowledge (theoretical testing), to identify alternative solutions to real-world economic problems (economic measurement), and to apply ethical principles in individual and group behavior (business ethics). Operationally, the study tests the effectiveness of the *Merdeka Curriculum* through classroom applications such as: (1) Assignments designed to strengthen students' readiness to develop problem-based learning tools, (2) Mentorship sessions guiding students in identifying economic problems individually and collaboratively using digital-market platforms; and (3) Evaluations of economic production

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principles to enhance individual capability and teamwork with the *Merdeka Curriculum* framework.

From both theoretical and empirical perspectives, students' achievement motivation is strongly influenced by the quality of instruction provided by lecturers [8]. Being a professional lecturer is not a simple task. Mastery of content and delivery alone is insufficient to qualify as professional teaching. True professionals must possess specialized skills, a love for their work, and adherence to the lecturer's code of ethics (Moena). As civilization evolves, lecturers are required to continuously upgrade their expertise—especially in mastering and developing advanced subject matter. Ongoing professional development is essential to ensure that lecturers meet the demands of modern curricula.

Problem-Based Learning offers an alternative to traditional learning methods. Rather than focusing solely on achieving grades according to institutional standards, PBL emphasizes experiential learning linked to real-world contexts, effectively preparing students to confront and address authentic challenges [9]. Unlike traditional learning approaches, PBL centers learning activities on students, encouraging them to take an active role in the learning process [10]. PBL is designed to foster 21st-century skills—most notably critical thinking [11]. Furthermore, studies demonstrate that PBL can significantly enhance professional competencies, particularly in entrepreneurship and business-related fields [12]. The key learning outcomes of this model constitute essential foundations for entrepreneurial learning and the development of managerial and problem-solving capacities.

Problem-Solving Learning, by contrast, has a single core objective: to resolve problems through various learning activities. Any instructional step that leads toward problem resolution may be adopted [13]. This distinguishes the model from PBL, which focuses on problem-cantered activities with multiple learning goals. Problem-Solving Learning is characterized by highly detailed and focused objectives, one of which is decision-making, an operational indicator used to measure the model's effectiveness [14]. Such objectives correspond to higher-order thinking skills when applied to cognitive development, and to strategic and managerial decision-making skills when applied to practical business contexts [15].

Previous research findings [16] indicate that the fundamental challenges faced by student entrepreneurs and MSME alumni remain consistent—limited access to domestic and export markets due to regulatory constraints, weak distribution networks, and low human resource capacity. This research proposes an integrated online learning model combined with mentoring and facilitation to enhance students' and alumni's ability to manage entrepreneurial problems. These improvements are expected to be shared with future cohorts through field

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practice programs, creating a sustainable cycle of applied learning and socio-economic empowerment.

As recommended by the Directorate General of Learning and Student Affairs (Belmawa) [17], universities should develop strategies and policies to establish entrepreneurial campuses, which improve students' employability and productivity. This requires collaborative efforts in developing entrepreneurship-oriented learning models. However, problems persist due to the imbalance between theoretical mastery—covering essential concepts, principles, laws, and theories—and practical familiarity with real-world contexts. Many students struggle to act quickly and effectively in solving real problems, particularly in developing entrepreneurial action competencies, self-character, and national independence values.

In this regard, developed the PATRIOT Learning Model, which provides structured guidance on how to organize learning content and scenarios to achieve optimal competence standards. Suharsono et al. [18] further synthesized that universities must build conceptual frameworks and learning processes based on a theoretical or life-cycle model suited to institutional needs. In other words, higher education should integrate moral values, disciplinary knowledge, real-life contextual understanding, and intelligent action to shape independent, problem-solving graduates (*wira-masalah mandiri*).

Integrated learning activities [19] can combine independent learning, interactive multimedia engagement, real-world fieldwork, and online experiences, together with iterative assignments and continuous performance assessments. The program was implemented across five entrepreneurship and MSME classes using an online format supported by Google Meet, virtual laboratories, and field projects. The underlying principle is that fostering innovation, creativity, risk-taking, and resilience constitutes the foundation of managerial problem-solving behavior. Data were collected through online interaction and performance assessment, and analyzed according to task characteristics and content.

The results suggest the need for alternative institutional policies to integrate entrepreneurial culture development into higher education's *Tridharma* (teaching, research, and community service), ensuring a continuous transformation from theory to application in business, services, manufacturing, and multi-product contexts.The implications of this problem indicate the need to reconstruct educational and professional research systems toward an entrepreneurial-culture-oriented paradigm [20]. The program's final competency goal is for graduates to develop the ability to act independently and contribute meaningfully to their communities.

The central research question is therefore: What strategies can make these learning

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models effective in real-world practice? Specifically, does direct empirical field experience significantly improve students' foundational entrepreneurial problem-solving abilities? Building on Suharsono's previous findings, this study operationalizes these questions through targeted learning outcomes and applications bridging theory to practice, with a focus on professional competence in independent entrepreneurial problem-solving.

As stated in the higher education curriculum content standards, entrepreneurship culture programs fall under institutional investment initiatives [21]. Hence, programs related to entrepreneurship development must be oriented toward empirical field realities. This study forms part of a multidisciplinary initiative to pioneer alternative skill-development programs in entrepreneurship education. The goal is to provide students with theoretical and practical experiences in applying entrepreneurial principles and values in professional contexts. The expected products of this study can be replicated by other higher education institutions across Indonesia to strengthen cooperation with micro, small, and medium enterprises (MSMEs) and foster entrepreneurial culture and innovation ecosystems.

A unique feature of this initiative is its learning-by-doing approach—strengthening entrepreneurial character and spirit by equipping students with hands-on experience in recognizing, organizing, and performing entrepreneurial activities [22], [23]. In this context, culture encompasses both conceptual ideas and their implementation in daily educational and creative practices. These two dimensions can be studied separately or integrated through sequential and continuous learning activities. The integration of face-to-face and online (hybrid) learning activities in a unified, continuous process is one of the distinctive innovations of this research.

The presence of professional lecturers in every educational institution remains crucial since education serves as the foundation for developing human capital. The rapid evolution of education demands that institutions continuously adapt to scientific and technological progress. A professional lecturer, as an essential component of the educational system, must demonstrate expertise, pedagogical skills, social competence, and professional mastery, supported by adequate project-based learning (PBL) and case-based learning (CBL) materials [24].

Finally, one of the core challenges faced by lecturers involved in startup ventures is how to increase sales volume and product value through online marketing networks, enabling local producers to reach buyers both domestically and internationally. The limited ability of such enterprises to penetrate markets often stems from regulatory barriers, distribution bottlenecks, and human resource constraints. A promising solution is the adoption of marketplace-based marketing strategies to reach global consumers. Therefore, systematic efforts are required to

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build an entrepreneurial culture early—through both education and research—among targeted learner groups.

METHOD

This study employed a pre-experimental design to produce technological products for solving learning problems in higher education of the future. Five stages were carried out in the first phase, starting from an initial analysis of the need for problem management, followed by designing the research with its core and supporting components. The next stage was (3) developing a matrix of problems and supporting product tools, complete with target specifications, and (4) testing the initial instruments with student representatives and experts to determine their validity and reliability levels. The final stage was (5) the implementation phase, aimed at collecting field data segments and facilitating learning processes to enhance problem-solving skills.

The field object referred to in this study is the site where the research subjects' problems occur. The research subjects consisted of 118 students from Universitas Negeri Malang who were enrolled in the Introduction to Economics (PIE) course, including project assignments with embedded problems. These are students came from various study program registered SIPEJAR or the MBKM program. The study collected five segments of data, these are (1) individual student research results, (2) mastery of five subdomains of entrepreneurial economics competence, (3) participants' responses to the provided mentoring services in problem-based learning, (4) managerial competence tools, and (5) operational competence in the field interconnected with UM.

The primary instruments used to collect data were the learning tools and the research module itself, while the supporting instruments consisted of three sets of response questionnaires and student assessments of the listed problems. Two additional supporting instruments included: feedback questionnaire from the supervising lecturers, and student feedback on the supplementary entrepreneurial services they received, either through research-funded or independently financed support facilities.

Data obtained were analyzed using component analysis, one-way covariance analysis (ANCOVA), and SWOT analysis as required. These analyses aimed to explore the implementation of entrepreneurial-research practices in higher education and field mentoring, as well as product evaluation in terms of added value from integrated research concepts and digital marketing applications. To measure students' performance levels in the Integrated Entrepreneurship Program for students and alumni, the ANOVA technique was used, based on progress scores at

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the end of the first year. Overall, two main products were expected: (1) improved problem of managerial ability, and (2) digital economic software capable of accessing local, national, and global markets for students' and alumni's flagship products.

The implementation testing of problem-management variations was conducted from the end of the first year through the third year, while the digital economic software prototype was produced at the end of the first year for implementation in years two and three. The methodological framework can be outlined in the following table (not shown here).

The participant composition consisted of undergraduate students accompanied by two supervising lecturers and a practitioner at the field activity site or virtual market, jointly created by lecturers and students based on their problem-based project (business plan). Subjects were selected collaboratively by students and their advisors, according to the students' interests and the feasibility of the problem as a practicum site for both individual and group assignments. In general, the research schedule can be explained as follows:The research activities on Enhancing Advanced Materials in the Field of Economic Education to Improve the Professional Competence of Lecturer-Alumni-Students of FEB, Marketing Program, Universitas Negeri Malang" were carried out in five sessions.

RESULTS AND DISCUSSION

Based on statistical analysis using the ANCOVA method, this study found that the Problem-Based Learning (PBL) model had a significant effect on improving students' ability to develop alternative solutions, particularly through group work. In the Tests of Between-Subjects Effects model involving two independent variables CVMT (PBL-based treatment) and TI (type of individual task). The model as a whole was significant (Sig. = 0.008). This indicates that the combination of PBL treatment and variations of individual tasks jointly affected students' group task performance.

The individual task variable (TI) had a significant influence on group work results (Sig. = 0.049; Partial Eta Squared = 0.137), indicating a moderate contribution. This means the quality of individual assignments significantly impacts success in group collaboration. Meanwhile, the PBL-based intervention (CVMT) showed a Sig. value of 0.089, which, although not statistically significant at the 5% level, exhibited a positive trend nearing significance (Partial Eta Squared = 0.028).

Descriptive statistics revealed that the highest mean group-task scores came from students with individual task scores of 85 (mean = 86.21) and 88 (mean = 86.00), indicating that higher-performing individuals tend to contribute to better group outcomes. Conversely, groups

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with lower individual performance (TI = 75) had lower averages (mean = 74.65), reinforcing the assumption that group success is rooted in strong individual performance.

Levene's Test confirmed homogeneity of variance (Sig. = 0.258). However, the F-test for heteroskedasticity yielded a significant result (p = 0.027), suggesting potential residual variance differences requiring caution for further decision-making. The Parameter Estimates indicated a significant difference between the TI = 75 group and the reference group (TI = 90) (p = 0.032), confirming that students with lower individual performance differed significantly in group outcomes.

Problem-Based Learning (PBL) offers an alternative pedagogical approach, emphasizing both instructional effects and nurturing effects. Its goal extends beyond grades to real-world experiential learning (Chueh & Kao, [24]. Unlike traditional learning, PBL centers on student activity and engagement (Shimizu et al., [25], enhancing 21st-century skills, particularly critical thinking (Anggraeni [206]. It also effectively builds professional competence in entrepreneurship and business.

Problem-Solving Learning (PSL), by contrast, focuses singularly on problem resolution through various learning activities (Huang et al., 2017; van Leeuwen & Janssen, 2019). The key differentiator from PBL is that PSL's goals are more specific and measurable, emphasizing decision-making as a central operational indicator (Graciano et al., [27].

Project-Based Learning (PjBL), another alternative, emphasizes the creation of tangible projects as evidence of learning achievement.. Students systematically engage in activities addressing real-world problems through observation and experimentation. This model is widely adopted in Indonesian higher education because it allows students to demonstrate practical, real-world outputs [28]. Prasetya and Amalia [29] found that PBL enhances students' learning independence, which positively impacts group collaboration. Similarly, [30] reported that strong individual performance is a key predictor of collaborative success in PBL.

These align with this study's findings emphasizing the role of individual work. Fully implemented PBL fosters students' creative problem-solving abilities. Although PBL's direct statistical effect here was not significant, its positive trend supports prior findings, especially when combined with high-quality individual work. In , this study demonstrates that the PBL approach contributes to students' ability to generate alternative solutions, particularly when coupled with high individual readiness. The findings provide critical insights for lecturers and curriculum designers to not only apply problem-based methods but also strengthen students' independent learning as a foundation for teamwork and collective responsibility in developing original ideas.

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CONCLUSION

The Problem-Based Learning (PBL) model has a significant influence on improving students' ability to formulate alternative solutions, particularly through group work. In the Tests of Between-Subjects Effects model involving two independent variables — CVMT (PBL-based treatment) and TI (individual task category) — it was found that the model as a whole was significant with a Sig. value of 0.008. This indicates that the combination of PBL treatment and variations in individual tasks together have an effect on students' group-task performance. The individual task variable (TI) shows a significant effect on group tasks, with a significance value of 0.049 and a Partial Eta Squared value of 0.137, indicating a moderate contribution.

The type and quality of individual tasks completed by students have a real impact on success in group work. On the other hand, the CVMT variable, which represents the PBL-based intervention, has a significance value of 0.09, which, although not statistically significant at the 0.05 level, still shows a positive trend approaching the significance threshold, with a Partial Eta Squared value of 0.028.

Results from Descriptive Statistics indicate that the highest average Group Task scores came from students with individual-task categories at score levels of 85 (mean = 86.21) and 88 (mean = 86.00), showing that students with strong individual performance tend to produce better group outcomes as well. Conversely, groups with lower individual scores (TI = 75) had lower average group performance (mean = 74.65). This reinforces the assumption that success in group work is rooted in the quality of individual contributions.

Results based on Levene's Test show that the data met the homogeneity of variance assumption (Sig. = 0.258), meaning that variance among groups did not differ significantly. However, the F-Test for Heteroskedasticity produced a significant value (p = 0.027), indicating the possible presence of heterogeneous residual variance that should be noted, particularly if the results are to be used for more advanced decision-making.

From the Parameter Estimates, it was specifically found that there was a significant difference between the TI = 75 group and the reference group (TI = 90) with p = 0.032, showing that students with lower individual task performance had a significant difference in group work outcomes.

As stated in the introduction, learning activities in higher education that focus on the application of innovative learning models using digital platforms can improve student learning outcomes and the quality of university graduates. Therefore, it is recommended that each course be designed with syntax divided into two phases of activity, namely:Theoretical phase

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(3P) focusing on mastering disciplinary content and developing 5K learning tools (Competence, Content, Activities, Conditions, and Completion) for unresolved problem-solving.

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