

DEVELOPMENT OF ENTREPRENEURSHIP SKILLS AMONG MEDICAL STUDENTS: OPENING BUSINESS OPPORTUNITIES IN THE HEALTH SECTOR

Esa Indah Ayudia, Denok Tri Hardiningsih, Raihanah Suzan, Miftahurrahma, Budi Justitia, Hafizah

Faculty of Medicine and Health Sciences, Universitas Jambi, Jambi, Indonesia

Corresponding author email: esa_indah.at@unja.ac.id

ABSTRACT

In the era of globalization and rapid technological advancement, the healthcare sector in Indonesia faces various challenges, including the need for innovation and more effective services. Medical students possess significant potential to contribute to creating relevant solutions for public health issues. However, many of them lack adequate entrepreneurial skills. Conventional teaching methods often fall short in providing students with the practical skills necessary. Therefore, the implementation of Project-based Learning (PjBL) in entrepreneurship courses becomes essential. Through PjBL, students not only learn theory but also engage directly in projects related to current health issues. This allows them to develop practical skills such as market research and business planning. The program involved 119 first-semester medical students, beginning with a Pre-Test to assess their initial knowledge about Community Service, followed by presentation sessions and a Post-Test to evaluate their understanding. Results showed that 60% of students were interested in entrepreneurship within the healthcare sector; 52.5% recognized its importance; however, 70% still lacked an understanding of business concepts in healthcare. A significant increase was observed after the Post-Test was conducted. The application of PjBL needs to be conducted continuously to further enhance students' knowledge about entrepreneurship.

Keywords: Entrepreneurship, Project-based Learning (PjBL), Medicine

ABSTRAK

Dalam era globalisasi dan kemajuan teknologi yang pesat, sektor kesehatan di Indonesia menghadapi berbagai tantangan, termasuk kebutuhan akan inovasi dan layanan yang lebih efektif. Mahasiswa kedokteran memiliki potensi yang signifikan untuk berkontribusi dalam menciptakan solusi relevan untuk isu-isu kesehatan masyarakat. Namun, banyak dari mereka yang tidak dilengkapi dengan keterampilan kewirausahaan yang memadai. Metode pengajaran konvensional seringkali tidak cukup untuk menyediakan keterampilan praktis yang dibutuhkan. Oleh karena itu, penerapan Project-based Learning (PjBL) dalam mata kuliah kewirausahaan menjadi penting. Melalui PjBL, mahasiswa tidak hanya belajar teori tetapi juga terlibat langsung dalam proyek yang berkaitan dengan isu kesehatan terkini. Hal ini memungkinkan mereka mengembangkan keterampilan praktis seperti riset pasar dan perencanaan bisnis. Program ini melibatkan 119 mahasiswa kedokteran semester satu, dimulai dengan Pre-Test untuk menilai pengetahuan awal mereka tentang Pengabdian Masyarakat, diikuti dengan sesi presentasi dan Post-Test untuk mengevaluasi pemahaman mereka. Hasil menunjukkan bahwa 60% mahasiswa tertarik pada kewirausahaan di sektor kesehatan; 52,5% mengenali pentingnya, namun 70% masih kurang memahami konsep bisnis dalam kesehatan. Setelah Post-Test, terjadi peningkatan signifikan, menunjukkan bahwa penerapan PjBL perlu dilakukan secara berkelanjutan untuk meningkatkan pengetahuan tentang kewirausahaan di kalangan mahasiswa ini.

Kata kunci: Kewirausahaan, Pembelajaran Berbasis Proyek (PjBL), Kedokteran

INTRODUCTION

Project-Based Learning (PjBL) has undergone significant evolution over the past decade, transitioning from a traditional project-based framework to an advanced pedagogical method enhanced by digital technologies. The contemporary PjBL 4.0 model is characterized by three foundational elements: (1) the integration of digital collaboration platforms such as Miro and Notion to support team coordination, (2) the application of design thinking methodologies in problem-solving processes, and (3) a strong focus on achieving measurable social impact.¹ Recent implementations at the Faculty of Medicine, Universitas Jambi, have demonstrated that this approach can enhance students' problem-solving capabilities by up to 35% within the context of health entrepreneurship, while simultaneously fostering critical digital competencies aligned with Industry 4.0 standards.²⁻³

In the realm of health business development, PjBL has shown its effectiveness through five innovation models recognized by the World Health Organization (WHO).⁴ Evidence from recent studies involving 150 medical students revealed that the Health Tech Startup Project model increased entrepreneurial interest by 42%, whereas the Community Health Intervention model generated 28 community-based health solutions within a single academic semester.^{5,6} Despite these promising outcomes, several implementation challenges



persist. These include a digital competency gap among teaching staff, reported in approximately 45% of cases; limited technological infrastructure in 33% of participating institutions; and the need for curriculum adaptation, noted in 57% of study programs.⁷⁻⁹ Addressing these challenges requires multifaceted strategies, such as AI-assisted scaffolding for faculty development and strategic collaborations with local health-focused startups.¹⁰

Recent advancements in Project-Based Learning (PjBL) methodologies include the introduction of micro-credentialing systems, enabling students to earn digital certifications for each specific competency they master.¹¹ Case studies conducted across 15 universities in Southeast Asia demonstrate that the hybrid PjBL model increases student engagement by 27% and enhances the quality of final project outcomes by 35%.¹² An impact analysis involving 500 medical graduates who completed PjBL-based programs revealed that 68% successfully launched health startups within three years of graduation. Among these, 54% achieved sustainable operations—representing a 22% higher sustainability rate compared to graduates of traditional instructional methods.¹³ These findings are further supported by a comprehensive meta-analysis of 120 interventional studies, which underscores the effectiveness of PjBL in fostering both practical skills and long-term entrepreneurial success.

Based on current evidence, optimal PjBL implementation requires: (1) integration with health SDGs,¹⁵ (2) development of competency-based assessment rubrics,¹⁶ (3) involvement of industry stakeholders¹⁷, and (4) utilization of learning analytics for real-time monitoring.¹⁸ Specific recommendations for medical education include designing project-based health entrepreneurship modules with components of 30% theory and 70% practice, as well as establishing incubators specifically for students' health business development.¹⁹

METHODS

The method for implementing this community service activity begins with coordination between the head of the community service team and the head of the Medical Study Program at Universitas Jambi. The design of entrepreneurship learning activities involves three stages: preparation, implementation, and final stages. During the preparation stage, specific goals are defined, a comprehensive curriculum is designed covering entrepreneurship theory, business practical courses, and case studies; a team of competent lecturers in entrepreneurship is formed; and necessary facilities such as classrooms, laboratories, and equipment are prepared.²⁰

In the implementation stage, theoretical lectures are conducted according to the developed curriculum, students are given opportunities to practice the knowledge gained through business simulations or real projects, guidance is provided for students in preparing business plans and running small ventures, intensive support is offered to students in need, and periodic evaluations of the learning process are conducted.²¹ The final stage involves compiling a final report containing the results of program implementation, evaluation, and recommendations, as well as publishing the research results or student works generated from the grant program. Here are the phases and methods of implementing the community service activity:

1. Situation analysis based on conditions experienced by service partners and identifying problems faced by partners. This process is carried out by the proposing team in collaboration with service partners to evaluate students' skills and interests in entrepreneurship.²²
2. Setting priorities for issues and alternative solutions relevant to the partners' situation, including curriculum development and creating a PPM plan that includes entrepreneurship materials.²³
3. Forming a team of competent lecturers in the field of entrepreneurship and preparing the necessary facilities such as classrooms, laboratories, and equipment.²⁴
4. Implementation of proposed service activities in the Medical Study Program at the Faculty of Medicine and Health Sciences, Universitas Jambi, including:
 - a) Starting with a pre-test.²⁵
 - b) Conducting theoretical lectures on developing entrepreneurship skills in medical students: Opening Business Opportunities in the Health Sector.²⁶
 - c) Conducting post-tests.²⁷
 - d) Providing opportunities for students to practice the knowledge gained through business simulations or real projects.²⁸
 - e) Guiding students in preparing business plans and running small businesses.²⁹
5. Support, monitoring, evaluation, and follow-up: Providing intensive support to students in need and conducting periodic evaluations of the learning process.³⁰

The results of the pre-test and post-test by participants were analyzed for differences using paired t-tests if the data is normally distributed or Wilcoxon tests if not; to determine the normality of pre-test and post-test results, the Shapiro-Wilk test was performed.³¹ This statistical analysis process was conducted using SPSS Version 26 with a significance level of $P < 0.05$.³²



RESULTS AND DISCUSSION

An overview of pre- and post-intervention findings is presented in Table 1, highlighting significant improvements in students' interest in health entrepreneurship, perceived importance of entrepreneurial skills, and understanding of healthcare business concepts following the implementation of a structured educational program.

Table 1. Results of the Pre-Test and Post-Test

Aspect	Statistical Test	P Value
Level of Interest in Entrepreneurship	Paired t-Test	< 0.001
Importance of Entrepreneurial Skills in Medicine	Paired t-Test	< 0.01
Understanding Business Concepts in Healthcare	t Paired t-Test	< 0.005

The community service activity was attended by 119 first-semester medical students at Universitas Jambi. A pre-test was conducted before theoretical lectures were provided according to the developed curriculum (Figure 1). The results of the pre-test indicated that interest in entrepreneurship in the health sector revealed that 70% of students were not very interested, 15% of students were interested, and 10% of students were very interested. From the second question regarding the importance of entrepreneurial skills in the field of medicine, nearly half of the students responded that it was not very important. Meanwhile, understanding of business concepts in health showed that almost half of the students did not have a good understanding of business concepts in the health sector. The interest of students in participating in entrepreneurship training in the health sector was indicated by 50%, meaning students were interested in participating in entrepreneurship training in the health sector. After the pre-test, theoretical lectures on the development of entrepreneurship skills among medical students by opening business opportunities in the health sector were conducted by dr. Esa Indah Ayudia, M.Biomed (Figure 2).



Figure 1. Participants conducted a Pre-test.



Figure 2. The theoretical lecture activities on developing entrepreneurship skills among medical students: Opening Business Opportunities in the Health Sector by dr. **Esa Indah Ayudia, M.Biomed.**

This activity presented entrepreneurial skills in the health sector that can be applied in the medical field. After the theoretical lecture on developing entrepreneurship skills among medical students, a post-test was conducted to assess students' understanding and interest in developing entrepreneurship skills in the medical field (Figure 3). The post-test results revealed that 25% of students were very interested, 60% were interested, and 15% were not very interested in entrepreneurship in the medical field. From the second question regarding the importance of entrepreneurial skills in the field of medicine, nearly half of the students answered that it was



important. Moreover, the understanding of business concepts in health indicated that almost half of the students began to grasp the business concepts in the health sector after receiving theoretical lectures on entrepreneurship skills.



Figure 3. Participants conducted a Post-test.

The interest among students in participating in entrepreneurship training in the health sector was approximately 60%, meaning students were interested in attending entrepreneurship training in the health sector. Entrepreneurial skills among medical students are crucial in facing challenges in the health sector. By leveraging their medical knowledge, students can create innovative solutions that not only meet market needs but also enhance the quality of health services. Medical students have in-depth knowledge of health issues, which can be utilized to develop new, more effective, and efficient services.³³ With entrepreneurial skills, students can not only work in the health sector as professionals but also create job opportunities and reduce unemployment rates in this sector.³⁴ This contributes to economic independence, both for themselves and their communities.³⁵

Several studies highlight the growing importance of entrepreneurial skills for medical students. Innovation and entrepreneurship programs integrated into medical education, particularly in countries like the United States, have been shown to help students develop the competencies needed to design novel solutions for healthcare challenges. These skills also enable future medical professionals to deliver services that are more efficient, effective and responsive to evolving market demands. Recent reviews of current trends in health entrepreneurship indicate that entrepreneurial competencies empower young doctors to identify new opportunities while simultaneously enhancing the quality of care provided.^{21,22,36,37} Explore the development of specialized entrepreneurship teaching programs for medical students, indicating that formal education in the business aspects of medical practice empowers them to become change leaders in the healthcare industry.^{23,38} In short, entrepreneurship education implemented in universities, especially the medical faculty, should be able to promote the entrepreneurial orientation of students. Entrepreneurship Education is assessed from several dimensions: the quality of lecturers, entrepreneurial climate, curriculum quality, and assessment.³⁹ Finally, evaluate the impact of entrepreneurship seminars within medical education and find that active participation increases students' interest in entrepreneurial careers and strengthens their understanding of healthcare market dynamics.^{24,39}

Statistical analysis results indicate significant differences in several aspects of entrepreneurial skills among medical students. First, regarding the interest level in entrepreneurship, the paired t-test yielded a P-value < 0.001, indicating that a specific educational program or intervention successfully increased student interest significantly.²¹ Furthermore, regarding the importance of entrepreneurial skills in medicine, the paired t-test results also indicated a P-value < 0.01, showing a significant change in students' perceptions of the value of these skills after participating in the educational program.²⁴ Therefore, it can be concluded that the understanding of the relevance of entrepreneurial skills is increasing among medical students. Finally, for understanding business concepts in the health sector, the paired t-test yielded a P-value < 0.005, indicating a significant improvement in understanding business concepts after the intervention.⁹ These findings affirm the importance of integrating entrepreneurship education into the medical curriculum to better prepare students for challenges in the health sector.

CONCLUSION

The development of entrepreneurial skills among medical students plays a vital role in preparing them to seize business opportunities within the health sector. Integrating innovative learning methods such as Project-Based Learning effectively enhances these skills. This approach equips students not only to become competent healthcare professionals but also to become successful entrepreneurs who can contribute positively to healthcare innovation and service delivery.



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