

Business Model Canvas Training for Entrepreneurial Mindset among MIPA Students

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Abstrak

Kesenjangan antara kompetensi sains teknis yang kuat dan literasi bisnis yang terbatas masih menjadi tantangan utama bagi siswa sekolah menengah atas, khususnya pada program Matematika dan Ilmu Pengetahuan Alam (MIPA). Meskipun siswa MIPA umumnya memiliki kemampuan analitis yang tinggi, mereka sering kali belum dibekali kerangka berpikir yang terstruktur untuk menerjemahkan ide-ide ilmiah menjadi model bisnis yang layak. Kegiatan Pengabdian kepada Masyarakat (PkM) ini bertujuan untuk memperkuat pola pikir kewirausahaan dan kompetensi perencanaan bisnis siswa melalui pelatihan Business Model Canvas (BMC). Kegiatan dilaksanakan di SMA Harapan Nusantara dengan melibatkan 40 siswa MIPA melalui metode *workshop* partisipatif yang mengombinasikan pemaparan konseptual, diskusi studi kasus, dan praktik kelompok secara langsung. Efektivitas kegiatan dievaluasi menggunakan desain *one-group pre-test* dan *post-test*, dengan analisis data dilakukan melalui statistik deskriptif dan perhitungan *Normalized Gain* (N-Gain). Hasil evaluasi menunjukkan peningkatan pemahaman yang signifikan, ditunjukkan oleh kenaikan nilai rata-rata dari 60,00 pada *pre-test* menjadi 88,00 pada *post-test*. Skor N-Gain sebesar 0,70 berada pada kategori efektivitas tinggi, yang mengindikasikan bahwa intervensi berbasis BMC sangat efektif dalam meningkatkan kompetensi perencanaan bisnis siswa. Selain peningkatan kognitif, kegiatan ini juga mendorong perubahan perspektif siswa dari orientasi produk semata menuju pemikiran yang lebih berorientasi pasar dan penciptaan nilai. Temuan ini menegaskan bahwa integrasi pelatihan BMC dalam kegiatan kokurikuler berpotensi menjadi strategi yang efektif untuk menumbuhkan kewirausahaan pada siswa jalur sains di tingkat pendidikan menengah.

Abstract

The gap between strong technical science competencies and limited business literacy remains a key challenge for senior high school students, particularly those in Mathematics and Natural Sciences (MIPA) programs. Although MIPA students generally demonstrate strong analytical abilities, they often lack a structured framework to translate scientific ideas into viable business models. This community engagement program aimed to strengthen students' entrepreneurial mindset and business planning competence through Business Model Canvas (BMC) training. The program was conducted at SMA Harapan Nusantara and involved 40 MIPA students using a participatory workshop method that combined conceptual delivery, case-based discussions, and direct group practice. Effectiveness was evaluated using a *one-group pre-test* and *post-test* design, with data analyzed through descriptive statistics and *Normalized Gain* (N-Gain). The results indicated a significant improvement in understanding, with the mean score increasing from 60.00 in the *pre-test* to 88.00 in the *post-test*. The N-Gain score of 0.70 falls within the high-effectiveness category, indicating that the BMC-based intervention was highly effective in improving students' business planning competence. Beyond cognitive gains, the program also encouraged a shift in students' perspectives from a product-oriented focus to more market- and value-oriented thinking. These findings suggest that integrating BMC training into co-curricular activities has strong potential as an effective strategy for fostering entrepreneurship among science-track students at the secondary education level.



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INTRODUCTION

In the context of digital transformation and increasing global competition, unemployment among the productive-age population remains a persistent socio-economic challenge. As a response, educational institutions are increasingly expected to produce graduates who are not merely job seekers but are also capable of creating employment opportunities. Rizan et al. (2024) emphasise that cultivating an entrepreneurial mindset among students is a strategic approach to addressing this issue, as limited entrepreneurial understanding often constrains young people from initiating independent ventures. Despite this urgency, entrepreneurship education at the secondary level continues to face a fundamental challenge, e.g., bridging the gap between memorisation-based theoretical instruction and authentic, practice-oriented business learning. Learning activities are frequently dominated by abstract concepts, providing students with limited opportunities to engage in concrete strategic thinking and business design. Evidence from entrepreneurship education indicates that structured interventions can strengthen entrepreneurial outcomes (e.g., intention and related competencies), including among technical/engineering learners (Fayolle *et al.*, 2015; Kurata *et al.*, 2023; Sánchez, 2013). This condition aligns with the findings of (Astina *et al.*, 2023), who argue that the effective implementation of new curricula often requires external facilitation to translate policy intentions into meaningful classroom practices. This gap is particularly evident among students in Mathematics and Natural Sciences (MIPA) programmes. While MIPA students typically possess strong analytical and problem-solving skills, the intensive emphasis on technical scientific content often restricts their exposure to business literacy and entrepreneurial frameworks. This is paradoxical, given their significant potential to develop technology-based innovations. It is consistent with evidence that technical learners (e.g., engineering students) have distinct entrepreneurship-education needs and benefit from design-oriented, problem-based pedagogies that connect innovation to value creation (Ilyas *et al.*, 2024). This challenge also underscores the importance of practice-oriented pedagogy that allows students to learn entrepreneurship through doing, such as experimentation, reflection, and iterative design, rather than solely through conceptual instruction (Neck *et al.*, 2014). In the absence of such structured guidance, many student innovations stagnate at the prototype stage and fail to evolve into sustainable business initiatives. Previous studies indicate that participatory and experiential learning approaches are effective in enhancing engagement and competence development, particularly in community-based economic empowerment programmes (Maulana, 2022). Extending this approach to educational settings, recent research demonstrates that BMC-based training significantly increases students' entrepreneurial interest by systematically structuring their business thinking (Chandra *et al.*, 2024). Similarly, (Putra *et al.*, 2024) report that BMC mentoring not only improves students' cognitive understanding of entrepreneurship concepts but also strengthens their practical competencies in formulating business strategies. However, most existing studies focus on vocational or general student populations, leaving limited empirical evidence on structured BMC interventions tailored specifically to science-track students at the secondary education level. Addressing this gap, the present community engagement programme was designed to equip MIPA students at SMA Harapan Nusantara with entrepreneurial soft skills through the application of the Business Model Canvas framework. The Business Model Canvas is widely recognised as a practical, visual framework for articulating how an organisation creates, delivers, and captures value through nine interrelated building blocks (Osterwalder *et al.*, 2010). In educational contexts, BMC also functions as a visual scaffold that helps learners connect market, customer, and operational logic in an integrated manner (Crotty *et al.*, 2017). Building on the findings of (Alam *et al.*, 2024b), which highlight the effectiveness of visual project-based tools in enhancing business concept comprehension, this programme emphasised the translation of science-based ideas into structured and measurable business models. The novelty of this work lies in its targeted integration of BMC training within a science-track secondary education context, combining participatory workshops, real-world case analysis, and hands-on group practice. Accordingly, this study aims to (1) examine the effectiveness of BMC training in improving MIPA students' business planning competence and (2) explore its potential to shift students' entrepreneurial mindset from product-oriented thinking toward market- and value-oriented reasoning.

METHOD

This community engagement activity was conducted at SMA Harapan Nusantara using a participatory workshop approach designed to strengthen students' entrepreneurial competence through the dissemination of research-based knowledge and practical expertise. The participants consisted of 40 students from the Mathematics and Natural Sciences (MIPA) programme, selected purposively based on their expressed interest in entrepreneurship. The participatory design was chosen to ensure active engagement, collaborative learning, and contextual relevance to students' academic backgrounds.

Preparation Phase

The preparation phase focused on establishing coordination with the school as a community partner to ensure contextual alignment and programme relevance. Activities in this phase included conducting a brief needs analysis to identify students' initial understanding of entrepreneurship and business planning, as well as developing assessment instruments for programme evaluation. The assessment instruments consisted of pre-test and post-test questions designed to measure students' cognitive understanding of the Business Model Canvas (BMC) framework.

Implementation Phase

The implementation phase constituted the core of the community engagement activity and was delivered through a structured workshop consisting of four interconnected activities. First, an introduction to the entrepreneurial mindset was conducted to shift students' perspectives from being job seekers to becoming potential job creators. This session emphasised technopreneurship, encouraging MIPA students to perceive their science-based projects not merely as academic tasks but as problem-solving innovations with economic value. Motivation was strengthened through the presentation of case studies featuring successful young technology entrepreneurs. Second, an exploration of the Business Model Canvas elements was delivered to introduce the nine key components of the BMC framework developed by Alexander Osterwalder. The explanation followed a deductive sequence, beginning with Customer Segments and Value Propositions as foundational elements and progressing toward operational and financial components, including Key Activities, Cost Structure, and Revenue Streams. Visual explanations and simple analogies were employed to ensure accessibility for students without prior business education. Third, a case study analysis was conducted to contextualise theoretical concepts. Students analysed the business model of a well-known company, Kopi Kenangan, under the guidance of facilitators. This activity aimed to develop students' analytical reasoning by examining causal relationships between BMC elements, such as how Key Activities influence Cost Structure and Value Propositions. Finally, hands-on group practice was implemented to enable experiential learning. Students were organised into small groups of five to six members and tasked with developing science- or technology-based product ideas. Each group translated its idea into a large-format BMC worksheet. During this activity, facilitators provided intensive coaching to validate the coherence and feasibility of the proposed business logic. The session concluded with short pitching presentations, allowing students to articulate their ideas and practice basic business communication skills.

Evaluation Phase

The evaluation phase aimed to assess the effectiveness of the community engagement programme in improving students' entrepreneurial understanding. Cognitive competence was measured using researcher-developed pre-test and post-test instruments consisting of ten multiple-choice questions representing all elements of the Business Model Canvas (BMC). The instrument was constructed based on the conceptual indicators of the BMC and designed to correspond with the instructional content delivered during the programme. Prior to administration, the instrument was reviewed to ensure content relevance and alignment with the intended learning outcomes. Data were analysed using descriptive quantitative methods to compare students' performance before and after the intervention. Programme effectiveness was further measured using the Normalized Gain (N-Gain) formula, following the framework proposed by Sundayana (2020). The resulting N-Gain scores were interpreted to classify the effectiveness of the training into high, moderate, or low categories.

RESULTS AND DISCUSSION

Implementation Phase

The implementation of the Business Model Canvas (BMC) training demonstrated a high level of student engagement and active participation throughout the programme. During the initial sessions, which is the explanation of the BMC, as can be seen on the Figure 1, students responded positively to discussions on entrepreneurship and technopreneurship, particularly when scientific projects were framed as potential solutions to real-world problems with economic value. Many students actively shared their ideas and reflected on how their academic knowledge could be applied beyond classroom assignments, indicating an early shift in perspective toward entrepreneurial thinking.



Figure 1. The explanation of the BMC.

As the programme progressed, students showed increasing comprehension of the BMC framework. Rather than treating the canvas as a set of isolated components, participants began to articulate logical relationships between elements, such as aligning value propositions with specific customer segments. This conceptual integration was especially evident during interactive questioning and peer discussions, where students demonstrated growing confidence in explaining business logic using their own terminology. The case study discussion served as a critical moment for consolidating understanding. Students were able to identify key strategic elements within a familiar business context and relate them to their own emerging ideas, can be seen on the Figure 2. Observations during this session revealed that students moved beyond surface-level recognition of business components and began analysing causal relationships, such as how operational decisions influence cost structures and customer experience. This analytical behaviour reflects the effective internalisation of the BMC framework among science-track learners.



Figure 2. The BMC comprehension test.

During the group-based practical activities, can be seen on the Figure 3, all student groups completed a full BMC draft for their proposed science- or technology-based products. The completed canvases demonstrated measurable improvements in structure and clarity compared to the students' initial, informal ideas. Facilitator observations indicated that students increasingly prioritised customer problems and value creation rather than focusing solely on product features, suggesting a meaningful shift toward market-oriented reasoning.



Figure 3. Group Activities: completing the BMC.

The pitching session, can be seen on the Figure 4, further reinforced these observations. Several groups explicitly articulated customer needs, value propositions, and basic revenue logic in their presentations. Compared to early discussions, students' communication became more structured and persuasive, reflecting both improved conceptual understanding and enhanced interpersonal skills. These observed outcomes confirm that the implementation phase not only transferred business knowledge but also facilitated behavioural and cognitive changes aligned with entrepreneurial mindset development.



Figure 4. The pitching session.

Improvement in Learning Outcomes

Throughout the programme, students demonstrated high levels of engagement, particularly during the case study and group discussion sessions. To objectively assess the learning impact of the intervention, a comparative analysis of pre-test and post-test scores was conducted. Table I summarises the statistical results for the 40 participants and demonstrates a positive shift following the intervention

Table I. Comparison of Pre- and Post-Workshop Scores.

Parameter	Pre-Test Score	Post-Test Score
Mean	60.00	88.00
Minimum	20.00	40.00
Maximum	100.00	100.00
Mean Increase	-	+28.00 points

The data indicate a substantial improvement in students' cognitive understanding of business planning concepts. The average score increased by 28 points, from 60.00 in the pre-test to 88.00 in the post-test. Notably, the minimum score doubled from 20 to 40, suggesting that students with the lowest initial level of understanding also experienced significant learning gains. This improvement reflects not only an overall increase in achievement but also a more equitable distribution of learning outcomes across participants.

Effectiveness Analysis Using N-Gain

To further evaluate the effectiveness of the BMC training, learning gains were analysed using the Normalized Gain (N-Gain) formula:

$$\text{N-Gain} = \frac{\text{Post-test score} - \text{Pre-test score}}{\text{Maximum score} - \text{Pre-test score}} = \frac{88 - 60}{100 - 60} = \frac{28}{40} = 0.70$$

Based on the interpretation criteria proposed by Sundayana (2020), an N-Gain score of 0.70 falls within the high effectiveness category. This result indicates that the participatory BMC workshop was highly effective in enhancing students' understanding of entrepreneurial and business planning concepts within a relatively short intervention period. The observed learning gains are consistent with prior evidence on entrepreneurship education, showing that even relatively short interventions can produce measurable improvements in entrepreneurial competencies and intentions when supported by an appropriate learning design (Fayolle *et al.*, 2015; Sánchez, 2013).

Programme Impact

The attainment of a high effectiveness level suggests that short, intensive, and well-structured workshops can generate substantial cognitive gains when supported by participatory learning strategies and visual business tools. This is aligned with evidence that adapted BMC templates in project-based learning can enhance peer learning and metacognition, supporting learners in systematically refining value propositions and feasibility logic (Abelenda *et al.*, 2023). This finding strengthens prior evidence reported by (Putra *et al.*, 2024; Chandra *et al.*, 2024), who emphasise the role of BMC training in structuring entrepreneurial thinking among secondary school students. However, unlike many previous studies that primarily focus on vocational or mixed student populations, this programme specifically targeted MIPA students, demonstrating that BMC-based interventions are equally effective when adapted to analytically oriented learners. Consistent with (Hutasuhut *et al.*, 2020), the results confirm that BMC learning significantly improves students' conceptual understanding by simplifying complex business ideas into a structured framework. Nevertheless, the present study contributes additional value by showing that high cognitive gains can be achieved even within a community engagement context, without long-term formal coursework, provided that the training design is participatory and contextualised. Beyond quantitative improvements, qualitative observations during pitching sessions revealed a noticeable shift in students' perspectives. Students increasingly framed their ideas in terms of customer needs and value propositions rather than solely focusing on technical product features. This finding corroborates (Jamira *et al.*, 2021), who argue that BMC implementation effectively nurtures entrepreneurial mindset attributes such as innovation orientation and confidence in business initiation. Similarly, (Rizan *et al.*, 2024) highlight that a solid understanding of the BMC framework catalyzes student engagement in digital entrepreneurship, transforming learners from passive job seekers into proactive value creators. This qualitative shift is also consistent with entrepreneurial learning theory, which emphasises that learning is strengthened through social interaction and situated engagement, enabling learners to develop meaning-making beyond individual cognition (Rae, 2017). In addition to technical business competencies, the programme also fostered students' interpersonal and collaborative skills. Group-based activities and discussions required students to negotiate ideas, empathise with potential customers, and communicate value propositions clearly. As emphasised by (Yupita *et al.*, 2025), human skills-based learning is essential for developing socio-preneurial competence, and this dimension was effectively integrated into the workshop through collaborative problem-solving tasks. The problem-solving orientation embedded in the case study approach further contributed to programme success. As noted by Alam (2024a), clearly defining problems is a foundational step in generating relevant and sustainable solutions. MIPA students, who are accustomed to logical and analytical reasoning, responded positively to the systematic structure of the BMC. The positive response from the school administration, documented through post-activity feedback and visual documentation of student participation, reinforces the relevance of this approach and supports the school's commitment to integrating similar training into regular co-curricular activities (Subekti *et al.*, 2021).

CONCLUSION

This community engagement programme demonstrates that disseminating structured entrepreneurial knowledge through Business Model Canvas (BMC) training can effectively address the gap in business literacy among science-track students by strengthening their entrepreneurial mindset and enabling them to reinterpret scientific ideas as value-creating solutions rather than purely academic outputs, resulting in a more holistic understanding of entrepreneurship that integrates analytical reasoning, customer awareness, and basic business logic; for the target community, particularly students in the

Mathematics and Natural Sciences (MIPA) programme, this initiative expanded career perspectives beyond conventional employment pathways by positioning entrepreneurship as a realistic and accessible option that supports the broader educational goal of preparing learners to adapt to dynamic economic and technological environments, and from an institutional perspective, the positive response from both students and school administrators underscores the relevance of practical entrepreneurship education at the secondary level, although because the programme was implemented as a short-term intervention its sustainability may be limited without continued support, therefore it is recommended that BMC training be integrated into co-curricular activities on a sustained basis and complemented by follow-up initiatives such as a mini business incubator or mentoring programme to enable students to further develop their ideas into testable prototypes and strengthen the long-term impact of entrepreneurship education within the school community.

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