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Game-Based Learning for Entrepreneurship in Vocational Education to Face 4.0 Industry Revolution

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Abstract: Vocational High Schools in Indonesia have the highest unemployment rate among educational levels. Therefore, this education level implements PKK course within their curriculum. However, the current PKK learning process has not yet produced students with ability to create their own job opportunities. This article aims to provide innovative policy directions for vocational high school graduates who have traditionally been trained and designed to become skilled laborers for industries. The writing method employed is a literature review with content analysis as an analysis technique. The findings indicate that the integration of technology is essential in the entrepreneurship learning process to achieve student competencies in the era of the Fourth Industrial Revolution. These competencies also include social skills, which are part of the cross-functional skills necessary for the Fourth Industrial Revolution and can be implemented through social entrepreneurship. Game-based learning is also effective in providing various new experiences during the learning process. These experiences include: 1) learning by doing, 2) reflective learning, 3) situated learning, and 4) learning from crises. This approach serves as an alternative solution to prepare vocational students for the challenges of the Fourth Industrial Revolution.

Keywords: Entrepreneurship Education; Fourth Industrial Revolution; Game-Based Learning; Vocational Students.

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Introduction

Vocational High Schools (SMK) in Indonesia have the highest unemployment rate among educational levels, with 7.05 million SMK graduates unemployed as of August 2019, representing 10% of the total unemployment rate in the country (Statistics, 2019). This is a concerning reality, considering that SMKs are expected to significantly reduce unemployment through creativity and innovation. The high unemployment rate is primarily due to a mismatch between the skills possessed by SMK graduates and the needs of the industry (Jatmoko, 2013). This problem is further exacerbated by the lack of job opportunities that cannot keep pace with the number of SMK graduates each year (Basri, Faiza, Nasir, & Nasrun, 2019).

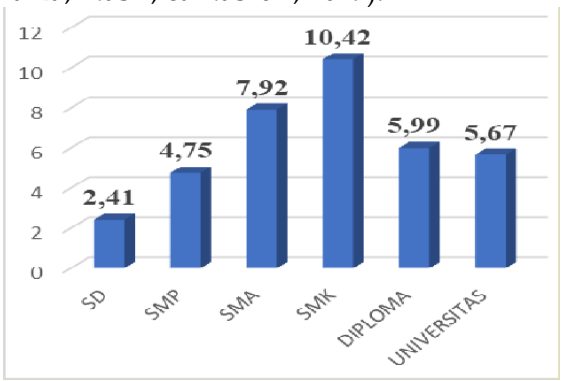

Figure 1. Unemployment Rate of Vocational High School (SMK) Graduates
Source: Statistics Indonesia, 2022

Several efforts have been made by the Directorate of Vocational School Development under the Ministry of Education and Culture (Kemendikbud) to address this issue. One such effort is the development of an entrepreneurship program combined with the BMW Program (Study, Work, and Entrepreneurship). This program focuses on production-based and business learning for SMK students. The government has also revised the Entrepreneurship curriculum in SMKs, which was previously perceived as overly theoretical, to include creative and innovative product development. This led to the issuance of Decree No. 130/D/KEP/KR/2017 by the Directorate General of Primary and Secondary Education on the 2017 SMK Curriculum Structure, modifying the Entrepreneurship subject to "Creative Products and Entrepreneurship" (PKK). This course aims to enhance students' creativity and innovation in entrepreneurship.

The PKK course can serve as a pioneer in cultivating young entrepreneurs, contributing to economic growth. Micro, Small, and Medium Enterprises (MSMEs) currently contribute 60.34% to Indonesia's GDP (Syarizka, 2019), and this is expected to increase to 6.5%, approximately IDR 2,394.5 trillion, by 2020. Thus, effective entrepreneurship education is crucial for educational institutions. Research has shown a strong link between solving global problems and entrepreneurship (Ramoglou, Stelios, & Zyglidopoulos, 2014; Ramoglou & Tsang, 2016; Schaltegger, Lüdeke-Freund, & Hansen, 2016; Wirtz, Pistoia, Ullrich, & Ottel, 2015).

However, the current PKK learning process has not yet produced students with strong entrepreneurial attitudes, traits, and behaviors, nor the ability to create their own job opportunities (Maya & Suparman, 2019). This contributes to the high unemployment rate among SMK graduates. Teachers and students have not paid sufficient attention to PKK learning in schools, as evidenced by dull teaching methods that fail to engage students (Genefri, Kusumaningrum, Dewy, & Anori, 2017). Teachers also struggle to present the material contextually (Yulastri, Hidayat, Islami, & Edya, 2017).

With the advent of the Fourth Industrial Revolution, where technology plays a crucial role in daily life, educators are expected to integrate technology into their teaching methods (Mkwanazi & Mbohwa, 2018). Supporting this, data shows that Indonesia ranks first in mobile phone usage, with 95% of internet users accessing the internet via mobile phones (Forbes, 2019). A 2019 survey by Forbes found that 76% of internet users in Indonesia make purchases via mobile phones, the highest mobile e-commerce rate globally.

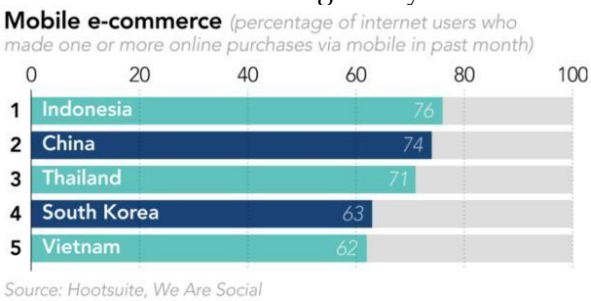

Figure 2. Mobile E-Commerce in Indonesia
Source: Forbes, 2019

Given these trends, incorporating games into learning presents a significant opportunity. Educational games can motivate students by making learning more engaging and contextually relevant (Hamari et al., 2016; Huizenga, ten Dam, Voogt, & Admiraal, 2017). Students gain practical experience through game-based learning, enhancing their interest in Creative Products and Entrepreneurship (PKK) at SMKs (Zampetakis, Kafetsios, Lerakis, & Moustakis, 2017). Successful PKK learning will produce competent young entrepreneurs and ultimately reduce the unemployment rate among SMK graduates in Indonesia.

Method

This article employs a research method in the form of a literature review. A literature review is a method aimed at identifying, evaluating, and understanding findings from previous research (Hsieh & Shannon, 2005). The process of conducting a literature review consists of six stages: (1) Defining the research topic, which focuses

on game-based learning for entrepreneurship education, the Fourth Industrial Revolution, and the characteristics of vocational high school (SMK) students; (2) Identifying literature sources from various search engines such as Sciencedirect, Springerlink, Google Scholar, DOAJ, and Garuda using keywords like the Fourth Industrial Revolution, entrepreneurship education, and SMK students; (3) Selecting literature by restricting studies to those published since at least 2016 and available in Indonesian, English, and other languages; (4) Reading and evaluating the gathered literature sources; (5) Drawing conclusions from the reviewed research; and (6) Discussing the research findings obtained. These steps are visually represented in the following diagram.

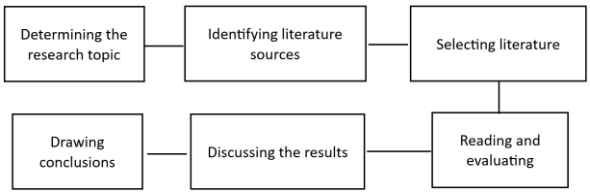

Figure 3. Stages of the Literature Review Process

Results

The findings of this study highlight the evolving nature of vocational education in response to the demands of the Fourth Industrial Revolution (Industry 4.0). The integration of technology into everyday life has necessitated a shift in educational practices, especially within vocational high schools (SMKs) that traditionally prepare students for immediate entry into the workforce. This discussion will address the implications of these findings, the effectiveness of game-based learning (GBL) in entrepreneurship education, and the importance of fostering social skills through social entrepreneurship.

Implications of Industry 4.0 on Vocational Education

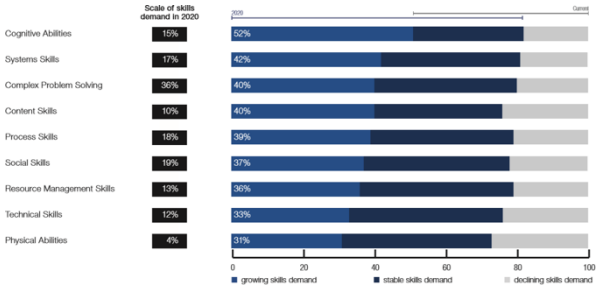

Figure 4. Shift in Skill Demand in the Fourth Industrial Revolution
Source: Klaus Schwab & Samans, 2016

The advent of Industry 4.0 has significantly impacted vocational education, necessitating a shift in both the educational process and the skills developed by students. The rapid integration of technology into daily human activities demands that educators incorporate technological tools in their teaching methods to enhance effectiveness and efficiency (Schwab, 2016). This shift is crucial for preparing vocational high school (SMK) students for the workforce by equipping them with essential competencies such as complex problem-solving and social skills, which are increasingly required in modern industries. According to the World Economic Forum (2016), complex problem-solving is projected to be the most needed skill in 2020, constituting 36% of total skill requirements across various sectors, while social skills are estimated to account for 19% (Schwab & Samans, 2016). These findings underscore the need for vocational education to adapt and align its curriculum with these emerging demands.

Effectiveness of Game-Based Learning in Entrepreneurship Education

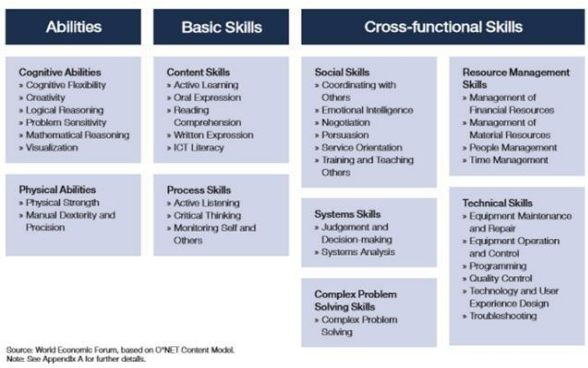

Figure 5. Skills for Industry 4.0 via Game-Based Learning

Source: World Economic Forum, 2016

Game-based learning (GBL) has emerged as an effective educational strategy in enhancing entrepreneurship education among SMK students. GBL provides various new learning experiences, such as "learning by doing," "reflective learning," "situated learning," and "learning from crises," which foster critical thinking, creativity, and problem-solving skills (Hamari et al., 2016; Huizenga et al., 2017). These educational experiences are not only engaging but also contextually relevant, making them suitable for the digital age. GBL allows students to simulate entrepreneurial activities, providing real-world experiences in a controlled, risk-free environment. This pedagogical approach aligns with the personalized learning needs of students in the Fourth Industrial Revolution, where learning is tailored to individual preferences and contexts (Karmokar, 2016). These findings highlight the potential of GBL to bridge the gap between theoretical knowledge and practical application in entrepreneurship education.

Development of Social Skills through Social Entrepreneurship

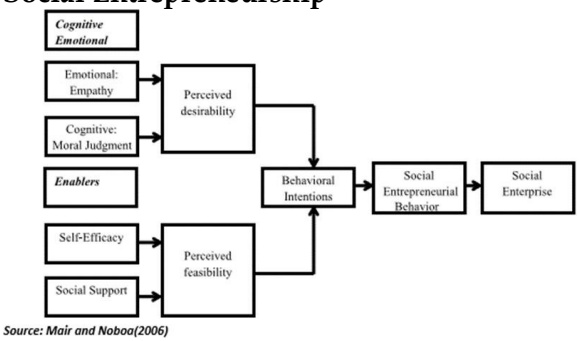

Figure 6. Social Entrepreneurship Model
Source: Pathak et al., (2018)

The integration of social entrepreneurship into the SMK curriculum is pivotal in developing social skills, which are identified as cross-functional skills vital for the Fourth Industrial Revolution (Schwab & Samans, 2016). Social entrepreneurship emphasizes not only business success but also social impact, fostering a sense of responsibility and ethical consideration among students (Boulven et al., 2018). This approach aligns with the educational goal of producing graduates who are not only capable of entering the job market but also of creating their own job opportunities while addressing societal needs. The focus on social entrepreneurship in vocational education can contribute to reducing the unemployment rate among SMK graduates by equipping them with the skills and mindset necessary for both employment and entrepreneurship (Pathak, Poudel, & Acharya, 2018). This finding supports the inclusion of social entrepreneurship as a core component of entrepreneurship education to foster a more holistic and socially responsible approach to business among future entrepreneurs.

Discussion

The findings of this study underscore the evolving nature of vocational education in response to the demands of the Fourth Industrial Revolution (Industry 4.0). The integration of technology into everyday life has required a shift in educational practices, particularly within vocational high schools (SMKs) that traditionally prepare students for direct entry into the workforce (Schwab, 2016; Ahmad, 2018). This discussion addresses the implications of these findings, the effectiveness of game-based learning (GBL) in entrepreneurship education, and the importance of fostering social skills through social entrepreneurship.

Implications of Industry 4.0 on Vocational Education

The Fourth Industrial Revolution has reshaped the skills landscape, with an increasing emphasis on technological proficiency and digital literacy (Schwab, 2016; Ahmad, 2018). The demand for skills such as complex problem-solving, creativity, and social skills—collectively referred to as "21st-century skills"—is growing across all sectors (Schwab & Samans, 2016; Guzmán-Simón et al., 2017). Traditional education models, which often focus on rote memorization and theoretical knowledge, are becoming increasingly inadequate (Lase, 2019). Instead, there is a need for a more integrated approach that

includes both digital and soft skills to better prepare students for a dynamic and technologically driven job market (Wulansari et al., 2019; Mina, 2019).

Research suggests that integrating technology into the classroom can enhance learning outcomes by fostering an environment that supports both the development of technical skills and the ability to adapt to new technological contexts (Ahmad, 2018; Mkwanazi & Mbohwa, 2018). However, this shift also requires significant changes in teaching practices, with educators needing to develop new competencies to effectively incorporate digital tools and methodologies (Muhonen et al., 2019; Balakrishnan & Gan, 2016). For SMKs, this means not only equipping students with the skills to be employable in traditional roles but also fostering entrepreneurial mindsets that encourage innovation and job creation (Basri et al., 2019; Jatmoko, 2013).

Effectiveness of Game-Based Learning in Developing Entrepreneurial Competencies

Game-based learning (GBL) has emerged as a particularly effective pedagogical tool in fostering entrepreneurial skills among SMK students (Hamari et al., 2016; Huizenga et al., 2017). Unlike traditional methods that may not engage students fully, GBL offers immersive, interactive experiences that replicate real-world scenarios, allowing students to learn by doing. This experiential learning approach is crucial for developing critical thinking, problem-solving, and decision-making skills (Fox et al., 2018; Karmokar, 2016).

Studies show that GBL can effectively address the shortcomings of traditional education by providing a more engaging and practical learning environment (Shore, 2015; El-awad et al., 2017). For example, through simulated business environments, students can practice entrepreneurship skills such as managing finances, negotiating deals, and leading teams—all within a safe, controlled environment that allows for experimentation and learning from failure (Kheng, 2017; Fellnhofer, 2018). Moreover, GBL aligns well with personalized learning approaches, where students can adapt their learning experiences to their own needs and preferences, thereby increasing motivation and engagement (Hamari et al., 2016; Guzmán-Simón et al., 2017).

However, the successful implementation of GBL in SMKs requires careful planning and support. Teachers must be adequately trained to integrate these tools into their teaching, ensuring that the digital elements complement rather than replace essential face-to-face interactions and traditional teaching methods (Mina, 2019; Yulastri et al., 2017). Furthermore, there is a need for ongoing research to evaluate the long-term effectiveness of GBL in enhancing entrepreneurial competencies and to identify best practices for its implementation in different educational contexts (Doern, 2016; Wirtz et al., 2015).

The Role of Social Entrepreneurship in Enhancing Social Skills

In addition to technical and entrepreneurial skills, the findings highlight the critical role of social skills in the modern workforce. Social entrepreneurship, which focuses on creating social value alongside economic success, is a valuable approach for fostering these skills within the SMK curriculum (Boulven et al., 2018; Pathak et al., 2018). Social entrepreneurship provides a framework through which students can learn to balance profit-making with social impact, thus fostering a sense of responsibility and ethical business practice (Schaltegger et al., 2016; Kurowska-Pysz, 2016).

The integration of social entrepreneurship into vocational education can address the growing demand for cross-functional skills, such as emotional intelligence, negotiation, and service orientation, which are crucial for Industry 4.0 (Schwab & Samans, 2016; Short et al., 2009). Engaging students in social entrepreneurship projects can help them develop these skills in a practical context, preparing them for a range of career paths,

including those that require strong interpersonal and leadership abilities (Teece, 2010; Subroto, 2015). However, effective integration requires comprehensive resources, including relevant teaching materials and practical support from industry practitioners who can provide real-world insights and mentorship (Kheng, 2017; Lase, 2019).

Recommendations for Future Educational Strategies

Based on the findings, several recommendations can enhance the effectiveness of vocational education in preparing students for the demands of Industry 4.0. First, there should be a strategic effort to incorporate digital literacy and technological skills across all subject areas to ensure all students are prepared for a digital economy (Mkwanazi & Mbohwa, 2018; Balakrishnan & Gan, 2016). The expansion of game-based learning can provide more engaging, practical experiences, but it should be complemented by traditional methods to ensure a well-rounded education (Fox et al., 2018; Fellnhofer, 2018). Moreover, fostering social entrepreneurship within the curriculum can help develop socially responsible graduates who are prepared to address societal challenges through innovative and ethical business practices (Boulven et al., 2018; Pathak et al., 2018). Engaging with industry practitioners and integrating practical experiences can enhance the relevance and application of social entrepreneurship education, thereby preparing students for both employment and entrepreneurial roles (Teece, 2010; Subroto, 2015).

Future research should focus on the long-term impacts of these educational strategies on student outcomes, particularly in reducing unemployment among SMK graduates (Doern, 2016; Wirtz et al., 2015). Additionally, more studies are needed to explore the most effective ways to implement these strategies in diverse educational contexts, ensuring they are adaptable and responsive to the needs of both students and the workforce (Pathak et al., 2018; Lase, 2019).

By adopting these strategies, vocational education can better align with the needs of the Fourth Industrial Revolution, ensuring that students are not only prepared for the current job market but also equipped to be innovators and leaders in their fields.

Conclusions

The significant contribution of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia highlights the need for effective and efficient entrepreneurship education, particularly within vocational schools (SMKs), which are well-positioned to implement such programs. By fostering creativity and innovation among SMK students, combined with an entrepreneurial mindset, these institutions can produce innovative products that enhance community income. This necessitates innovative approaches in entrepreneurship education, especially in light of the Fourth Industrial Revolution, where the integration of technology is crucial. Aligning with 21st-century competency demands—namely the 4Cs: Communication, Critical Thinking and Problem Solving, Collaboration, and Creativity and Imagination—entrepreneurship education must also support the development of social skills, a vital cross-functional skill in this era, effectively implemented through social entrepreneurship models.

The adoption of game-based learning (GBL) is particularly effective in entrepreneurship education at SMKs, as it offers direct simulations of business processes that provide contextual learning experiences. These experiences enhance students' understanding of entrepreneurship concepts through different learning modalities, including learning by doing, reflective learning, situated learning, and learning from crises. Selecting appropriate game scenarios, such as existing options like "Craftivity," can tailor the learning experience to both the students' needs and the teacher's conditions. GBL thus represents a viable solution for preparing SMK students for the ongoing challenges of Industry 4.0.

Suggestion and Recommendation

To maximize the effectiveness of entrepreneurship education through the Game-Based Learning approach in SMKs, further research is recommended to identify the most suitable types of games and technologies tailored to the needs and characteristics of SMK students. It is also crucial to integrate learning materials that align with current industry demands, enabling students to develop skills relevant to the challenges of Industry 4.0. Collaboration with industry practitioners and successful entrepreneurs could provide valuable insights for developing more practical and applicable learning materials. Additionally, expanding this research to assess the effectiveness of Game-Based Learning in other subjects could reveal the broader potential of this method within vocational education contexts, offering a more comprehensive approach to equipping students for future workforce needs.

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