



## Technopreneurial STEM Teaching: Integrating Business, Curriculum, and Education

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**Receive: 10/01/2023**

**Accepted: 10/02/2023**

**Published: 01/03/2023**

### Abstrak

This study aims to explain how technopreneurship learning tools in school education and STEM integration implemented Technology in the business world. The method used in this study is the System Literature Review method by adding Field Studies at Al-Mubarak High School. Technopreneurship learning tools in this study are needed in learning both in the classroom and the field. The stages of developing technopreneurship learning tools are obtained through integrated systematic STEM, which is carried out through stimulating students' interest in doing business and entrepreneurship, building trust in Self, developing creativity and innovation, and daring to take risks. In this curriculum, the involvement of educators with experience in entrepreneurship dramatically determines how the process encourages students' interest to be involved in entrepreneurship and the business world, especially in the learning process in the world of Education.

**Kata Kunci:** STEM, Technopreneur, Business, Curriculum, Education

### Introduction

Most universities in Indonesia have included entrepreneurship courses in the college curriculum as one of the main courses every student must take. Entrepreneurship education provides a theoretical foundation and shapes an entrepreneur's attitude, behavior, and mindset. It is an investment in human capital to prepare students to start a new business by integrating business experience, curriculum, and knowledge essential to develop and expanding a business. The COVID-19 virus pandemic has caused the number of unemployed to increase. The size of workers will be affected. Since the Covid-19 pandemic, not a few companies have closed their operations. Some are temporary, and some

are indefinite. Inevitably, workers, there will be unemployed for a while. Closing several companies to large retailers, such as shopping centers, is predicted to increase temporary unemployment. Not even a few, the company has to lay off its employees. Therefore, universities need to motivate students to have an entrepreneurial spirit so that students who will graduate do not depend on their intentions for the company.

In the current era of digitalization, changes in various aspects are very significant, including the world of education. So that the concept of learning needs to be changed, which leads to STEM (*Science, Technology, Engineering, Math*) and the *Internet of Things* (IoT) in the absorption of students' abilities in learning. This era of

disruption also formed a concept of digital entrepreneurship, better known as a technopreneur, so STEM and IoT learning can improve technopreneurs learning by integrating various other approaches such as business experiences and examples, educational curriculum, and knowledge improvement.

The business approach, curriculum, and education/knowledge are expected to be a trigger for stakeholders in education, not only for universities but all levels of education in Indonesia, by strengthening the learning of digital-based entrepreneurship courses combined with STEM (STEM technopreneur STEM). This concept can make students more independent and create jobs when they finish college and master digital marketing in entrepreneurship as an output of the industrial era 4.0.

Several studies on technopreneurs have been conducted by Yordanova et al. (2020), who found empirical evidence on the role of university support for entrepreneurial intentions among students who tend to show technopreneurs' choices. Determinants of entrepreneurial intention are identified in the literature as entrepreneurial role models. Then the findings show that those interested in starting a technology-based business have strong beliefs, good academic and technical abilities, and high motivation to learn new things in the world of Technology. Other studies have also confirmed the same (Al Hashimi et al., 2021; Ali, 2022; H. Hidayat et al., 2018; S. Hidayat et al., 2021; Paramasivan & Selladurai, 2017; Priyadharshini & Selladurai, 2016) who produce research give practical implications about technopreneurship

Al-Mubarak High School, as an integral part of the Educational Institution, implements the program to create an entrepreneurial spirit for its students. It is expected to get to know the business world earlier so that

after graduation, it is more adaptive and solutive according to experience. Competence coupled with an entrepreneurial spirit will produce quality alums who are ready to work and have the potential to become entrepreneurs who will open jobs and contribute to increasing the number of entrepreneurial ratios. So we need to learn skills that can be integrated with other sciences, for example, through STEM learning. STEM is an approach shown in the learning process that incorporates 4 (four) domains, namely science, Technology, engineering, and mathematics. STEM is a basic design of learning activities directly applied to real-life solving problems as done by scientists and engineers through an Interdisciplinary approach. Integrating stem learning in schools is one of the efforts to increase the interest and skills of 21st-century work and engage in stem fields, especially those related to technopreneurship. One of the learnings that can integrate 21st Century Skills is STEM - Science, Technology, Engineering, and Mathematics.

Typology	Technology Behind the Opportunity	Key Activities in the Process	Access to Resources and Funding
Technology Entrepreneurship	New products based on breakthroughs in research: science-based advances through specific knowledge in an academic field Example: Graphene	Technology proof of concept; first customer validation; activate a global but niche market (Clarysse et al., 2011)	Public research grants and other soft money sources Venture capital attracted by promising intellectual property (Audresch et al., 2012; Giones & Miralles, 2015)
Digital Technology Entrepreneurship	New products based on ICT technologies only; making smart devices using the possibilities of Internet of Things Example: Smartphone	Use of existing technologies; market validation, traction, and growth, scalability	Business angels; seed and venture capital; stock market Crowdfunding; reward and equity (Gedda et al., 2010)
Digital Entrepreneurship	New products and services based on the Internet. Services running only in the cloud; using big data or artificial intelligence. Example: Snapchat	Technology as an input factor; high growth ambitions (Wallin et al., 2016); stay ahead of competitors; be the dominant player in the category	Business angels; seed and venture capital; stock market Equity crowdfunding (Tomczak & Brem, 2013)

Picture. 1. Technopreneurship in Education Entrepreneurship means achieving student targets of generating profits, overcoming obstacles, predicting challenges and opportunities, and predicting community responses. For this reason, it is necessary to have a guide or module that is the basis of student activities, teaching materials, or modules designed to assist teachers or teaching staff in providing learning experiences involving mental and physical processes in interaction. Therefore, in Education, entrepreneurship teaching

materials must be considered content that contains aspects of digital technology entrepreneurship in the curriculum.

The curriculum can be defined as the core of the field of education, which is essentially a plan and arrangement of objectives, content, and learning materials, as well as ways that will later be used as guidelines in organizing learning activities by the needs to achieve the goals that have been set. The nature of curriculum development will be directed to attain general values, concepts, problems, and skills that will affect the overall educational activities. It is better to process curriculum development related to entrepreneurship, including numerical skills, communication, teamwork, problem-solving, and language skills, both local, national, and foreign languages. Responding to the importance of knowledge and mastery of entrepreneurship, the Head of SMA Al-Mubarak conveyed that the curriculum could help develop the entrepreneurship curriculum for students at the school. The school has a significant concern for developing the entrepreneurial spirit in its students and equipping them with adequate knowledge to run their businesses better and become successful entrepreneurs in the future and, most importantly, able to understand Technology.

Entrepreneurship Education in the Learning process and its integration into STEM has become an essential agenda of the school by including the development of entrepreneurial skills in the educational curriculum, especially Educational Institutions at school. However, entrepreneurship education is a field practice that requires a long process to assess success. Therefore, the article was developed to explain how to describe the concept of entrepreneurship education in schools, how students can implement the characteristics of the entrepreneurship

curriculum in integration in STEM, and what implications school leavers can realize in the business world.

## **Method**

The method used in this research is the System Literature Review method by adding Field Studies. This research includes Al-Mubarak High School and students participating in the author's Santripreneur activities. The Field Study aims to determine the response and level of application to integrating entrepreneurial learning in education through a STEM approach based on digital technology entrepreneurship. Compatibility between STEM-based learning tools developed The curriculum must be by the Competency Standards, Indicators, and entrepreneurship school materials students learn. And most importantly, the purpose of entrepreneurial learning tools through a STEM-based approach to digital technology entrepreneurship that is developed must meet Practicality by being assessed based on student interest questionnaire data and teacher responses to the learning tools developed

## **Results and Discussion**

Factors in students who have a strong desire to know about entrepreneurship can increase their high level of expertise and ability in entrepreneurship so that students feel no need to worry when starting a business. Technopreneur education affects the desire of students to be entrepreneurial. Where students will get motivation from the family environment so that they will have an entrepreneurial spirit that makes students enter the business world, with the growth of knowledge about entrepreneurship, it will raise the enthusiasm of the Indonesian people, especially the younger generation of

students, to create jobs by entrepreneurship, not only being job seekers (job seeking). The family environment is one of the determining factors for students' interest in becoming entrepreneurs.

Business capital is needed to carry out business activities in establishing a business or entrepreneurship. The easier it is to get business capital, will make someone interested in entrepreneurship because it will make it easier for someone to open a business. However, on the contrary, if you do not have money, it will make it more difficult for someone to channel entrepreneurial ideas or open a business.

In technopreneurs, universities need to apply the concept of *coaching clinics* that are run through sharing with the business community. The business community can make student characters do business planning that focuses on intangible assets concepts such as logos, brands, and brands that start from simple things that can become more serious. This shows how businesses are in demand through monitoring with Google Trends.

Google trends can help business management produce an out-of-the-box mindset by goals and impacts and need to be practiced for students to practice alms which is often trending in the business community so that the business planned and implemented becomes more blessed facing the digitalization era.

In the curriculum, the initial observations that have been made have obtained the condition of entrepreneurial subjects inserted in STEM-based learning with the problem of the absence of learning tools entrepreneurship based on STEM approaches; There are still many internal and external constraints and factors related to entrepreneurship-based subjects. The next stage is to design and produce an initial draft of the curriculum before it is developed. The tools designed are in the

form of Syllabus, RPS, and Test Instruments that are integrated with STEM systematics and are structured as a means for students to develop problem-solving skills through integration Technopreneurs and businesses are thus able to create prerequisites that enable efficient digital technology transformation through the implementation of various technological innovations. Learning activities apply to learning with a STEM approach. Learning activities apply the STEM learning model. The steps for developing STEM-based learning tools are a reference for teaching steps in RPS. Learning methods are selected based on the characteristics of learners and the suitability of the appropriate material. Learning activities refer to the disciplines of science, Technology, engineering, mathematics, and science entrepreneurship. STEM steps are a reference for learning steps in RPS. This stage point results in a STEM learning design. The stages of developing entrepreneurial learning tools obtained the determination of entrepreneurship integrated STEM systematics carried out through Santripreneur in the form of main medium activities for market products using smartphone applications. This is done as a learning step used to increase interest in entrepreneurship.

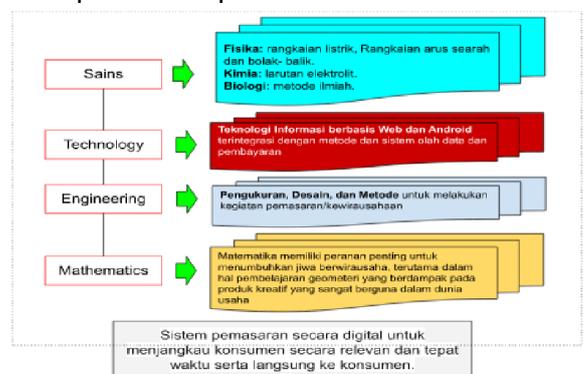


Figure 2. Integration of STEM in the Education curriculum

Curriculum development is carried out based on several stages according to the development framework obtained initial

information in the form of problem identification analyzed and then developed in the form of learning device design technopreneurship and STEM. Therefore, teachers who want to implement this curriculum have experience in the business and business world. Because many entrepreneurship education teachers feel that the education culture has not fully supported them in developing creative and innovative learning approaches, it is difficult for teachers to understand entrepreneurship education. In addition, teachers find it challenging to develop professional competence in themselves because they do not have experience in the business world.

Then in nature can create an entrepreneurial culture among students; strong encouragement is needed by providing knowledge, confidence, and courage to start and face risks, improve skills, and build an entrepreneurial spirit. It has started with entrepreneurship education which is Entrepreneurship Education: Concepts, Characteristics, and Implications aimed primarily at the generation of Technology, with entrepreneurship education currently offered through many school educational institutions, both through the Education curriculum, on-field practices that include the field of entrepreneurship as compulsory subjects in school.

### Conclusion

The integration of learning tools and stem-based curriculum, especially technopreneurship and entrepreneurship, to mature in the business world requires teacher skills who can create integrated learning tools, Implementation of field activities in schools by reducing theory and more practice so that the point of the teacher's ability to make tools and learning designs which include: develop RPS

learning tools Syllabus and teaching materials for subjects that are integrated with technopreneurship with a STEM instrument approach. The problem in the learning process in entrepreneurship education is the availability of educators with sufficient qualifications and entrepreneurial experience. For this reason, it is essential to encourage teachers and students to get more involved in entrepreneurship by building their business activities through creative and innovative ideas in the school environment and not being fixated on learning in the classroom.

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2

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