A Framework of Science Based Entrepreneurship Through Innovative Learning Model Toward Indonesia in Society 5.0

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Abstract. A technological development has extremely changes the value of society which is now moving to society 5.0. It is an era in which technology is being a part of human life. Internet is supposed not only to be an information media but also becomes a part of life including in education. Society 5.0 requires students to have the ability to solve complex problems, think critically, and be creative. This ability is needed to adopt the development of science and technology, not only as a "taker" but also as a "maker" through entrepreneurial principles. Therefore, the learning system should move to the concept of science-based entrepreneurship (SciPreneur). However, the current entrepreneurial learning system has not adopted the learning paradigm emphasizing on cognitive understanding because the learning process is still either theoretical-based or rote learning. Therefore, we need an appropriate learning model to accommodate a learning system to meet the society 5.0. In this paper, we introduce a framework on science-based entrepreneurship using the discovery ability-based creative entrepreneurial learning model (CEL-BaDiS UP). This model is expected to enhance a science-based entrepreneurship skill.

1. Introduction

The technology development that extremely growth causes changes in the value of society. The new value that is created by technological development is called Society 5.0. Society 5.0 is an era that represents the current state of society because it is existed in Industry 4.0, means that technology is being a part of society life [1], [2]. The Society 5.0 aims to create a society conceptual that concerns on humanity, through the economic growth and society resolution, all the challenges are expected can be overcome, thus every phase of society may enjoy the quality of life which is active and comfortable [3]. The needs of society integration of Society 5.0 consist of 1) innovation policy, 2) entrepreneurial spirit, and 3) entrepreneurial skills [4]. In term of education, Society 5.0 requires the students to have the ability in solving complex problems, critical thinking, and creativity. Those abilities are required in order to adopt the development of science and technology, it is not only as a “taker” but also as a “maker” through entrepreneurial principles.

Higher education as an agent of change is a society maker that is capable in adopting Society 5.0 through learning system. The learning system in a higher education needs to be directed towards entrepreneurship-based learning. Entrepreneurship learning in a higher education is needed in any field regardless of one's field or profession [5]. The concept of integration between entrepreneurial values
and science learning materials (Scipreneur) is one of the efforts that have been made to form entrepreneurial competencies [6]. The benefits of integrating entrepreneurship in science learning (Scipreneur) are understanding material to be integrated, holistic, understanding the relationship between several subjects becomes deeper, the ability to think critically and systematically, creative and innovative, dare to take risks, has a competitive spirit, capable to see and create opportunities, responsive social spirit and character [7]. A learning model is needed that can integrate entrepreneurial values with science learning materials so it can empower entrepreneurial skills. The Scipreneur learning concept needs to be designed to accommodate the competency needs of graduates in accordance with the demands of Society 5.0.

The learning foundations needed in designing learning models include cognitive theory, constructivism theory and behaviour change theory as a result of learning [7]. Society 5.0 requires competences that capable to solve complex problem, think critically and be creative. Therefore, a learning model that can hone cognitive abilities, the ability to create or discover (constructively) and the ability to adapt to change is needed. The conceptual model that can be adopted in welcoming Society 5.0 is the Creativity-Based Learning Skill Entrepreneurship (CEL-BaDiS). The steps which are taken in CEL-BaDis include: (1) associating; (2) questioning; (3) analysis; (4) creating; (5) communicating; (6) persuasion and networking [8]. The six stages need to be combined with the abilities or competencies needed in the era of society 5.0. So, this research focuses on designing a framework for a science-based entrepreneurial learning model through the CEL-BaDiS UP model to create abilities that match the needs of society 5.0.

2. Theoretical Analysis
Scipreneur is a concept that integrates between entrepreneurship and science learning. Learning competencies to be achieved through the Scipreneur concept include: (1) Critical Thinking Skills; (2) Problem Solving Skills; (3) Communication Skills; (4) Collaborative Skills; (5) Observational Skills; (6) Creativity and Innovation [9].

The learning model that has been developed to increase creativity and entrepreneurial abilities is Creativity Based Learning Skill Entrepreneurship (CEL-BaDiS). The CEL-BaDiS Learning Model has 6 stages including (1) Associating; (2) Questioning; (3) Analyzing; (4) Creating; (5) Communicating; (6) Persuasion and Networking [8]. The 6 stages of CEL-BaDiS need to be synchronized with appropriate learning indicators so they are able to answer the competency needs of graduates in the Society 5.0 era, including: (1) Solve Complex Problems; (2) Critical Thinking; and (3) Creativity [10]. Indicator conceptual of Scipreneur, both the stages of CEL-BaDiS learning model and competence indicator of Society 5.0 have similarities that are shown through the diagram bellow;
3 scipreneur indicators on points of communication skills, collaborative skills, and observational skills intersect with the CEL-BaDiS learning model stage at points of communicating, persuasion & networking and associating. Meanwhile, the other points intersect among scipreneurs, CEL-BaDiS and Society 5.0. Because not all points overlap between the three, it is necessary to design indicators that can synchronize among Scipreneurs, CEL-BaDiS and Society 5.0. The first stage requires an indicator framework between CEL-BaDiS as a process and the competence of Society 5.0 as an output. In the following figure are the results of synchronizing each stage of CEL-BaDiS which can be used to achieve Society 5.0 competence.

![Figure 2. Framework between CEL-BaDiS and Society 5.0](image)

The associating stage is supposed to make students have the ability (1) reviewing data, information and references; (2) implementing procedures; (3) planning activities. Meanwhile, the indicators for Society 5.0 critical thinking competency points include (1) being able to identify problems; (2) being able to identify alternative solutions, and (3) being able to determine the priority scale. The associating stages and critical thinking indicators produce cognitive flexibility indicators. Cognitive flexibility is the human ability to adapt cognitive processing strategies to deal with new and unexpected conditions in the environment. This definition involves three important concept characteristics. First, the abilities that can imply a learning process meaning it can be acquired by experience. Second, it involves the adaptation of cognitive processing strategies. Strategy, in the context of this definition, is a sequence of searching through problem spaces [11], [12]. In the learning process, the goals of cognitive flexibility are supposed to make the students have the ability to adapt, open minded and master several superior competencies.

The questioning stage aims to foster curiosity, foster courage in asking questions and deepening problems also knowledge. The questioning stage is in line with critical thinking of competency points to produce competency indicators of information verification. Information verification is a process of determining the truth of a statement using an empirical method (based on experience). In information verification, students are required to have the ability, among others (1) to be able to sort and select credible data, information and references; (2) able to reduce irrelevant information or data; (3) foster a deductive thought process.

In the analyzing stage, students need to develop a systematic mindset, organize data, information and reference also process them into a model. In Society 5.0's competency, solve complex problem points requires the ability to formulate problems, be able to set goals and be able to determine methods or ways of solving problems. The combination of analyzing stages with the competence to solve complex problems produces learning indicators of judgment and decision making. Judgment and decision making is the process of choosing between alternatives to carry out work in decision making with a consideration so the decisions are made correctly, and have several objectives, including (1) being able to unravel
problems and justify solutions; (2) able to determine effective and efficient decisions; (3) able to arrange the steps to be implemented [13], [14].

The creating stage has learning targets so the students can visualize information or data, capable to apply the ability to collect information and be able to make activity designs. While the competency point of Society 5.0 is creativity, which is being able to imagine information, being able to innovate or create new solutions and being able to come up with ideas also being able to test those ideas. The stages of creating and points of creativity competency produce emotional intelligent ability indicators. Emotional Intelligent is the ability to recognize feelings and their meanings then use these feelings to think and solve problems [15], [16]. Emotional intelligent targets include: (1) being able to identify, understand and manage emotions; (2) being able to put ideas into the product; and (3) being able to organize activities according to the timeline.

The communicating stage has learning targets so students are able to communicate problems, being able to communicate opinions or ideas, and being able to communicate contextually and efficiently. The communicating stage is related to solve complex problem points to produce competency indicators in coordinating with others. Coordinating with others is something that appears implying the use of strategies and patterns of behaviour, directed towards the integration and alignment of one's actions in relation to the actions and results of others [17], [18]. The targets of coordinating with others indicators include being able to empathize with others, being able to communicate and be professional and being able to understand rights and obligations.

The persuasion and networking stage have targets to achieve the ability to determine personal branding, being able to form networks and partnerships and being able to convince others. The stages of persuasion and networking are related to creativity points produce indicators of people management. People management is a process of optimizing the productivity of team members by providing motivation, training, and mobilizing or directing others. The achievement targets of people management competency indicators include: (1) able to work together in teams, (2) able to determine roles; and (3) able to apply leadership spirit. The following is a chart of the results of synchronization of each stage of CEL-BaDis with Society 5.0 competencies in producing indicators as competency concepts for scipreneurs.

**Figure 3. Results of synchronization**

The merger between CEL-BaDiS stages and Society 5.0 competencies into 6 competency indicators will be applied to the Scipreneur concept. Cognitive flexibility and information verification indicators will produce critical thinking skills competencies; judgment and decision making indicators will produce competency of problem solving skills and observational skills; emotional intelligent indicators will produce competence for creativity and innovation; coordinating with others indicators will produce competency of problem solving skills and communication skills; and people management indicators will produce collaborative skills competencies.

Learning stages to achieve the competency target of Scipreneur through the integration of science and entrepreneurship learning in each indicator as follows.
Indicator of Competency | Learning Stages
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**Cognitive Flexibility** | - The students do an observation toward the problem of customer.  
- The students look for some article or reference based on the problems found.  
- The students identify the alternative solution which has been implemented or product that has been sold.

**Information Verification** | - The students validate customer problems and needs  
- The students determine a specific customer segment  
- The student determine the focus of the problems to be solved

**Judgment and Decision Making** | - The students brainstorm do brainstorming with other groups about customer problems and alternative solutions or products to be offered  
- The students determine the superiority of the product to be offered  
- The students make a plan of production strategy

**Emotional Intelligent** | - The students make a product innovation and packaging depends on the customer psychology  
- The students design the creative marketing model depends on the customer psychology  
- The students design the operational procedure which is effective and efficient

**Coordinating With Others** | - The students rise communication and relationships with customers  
- The students rise cooperation with production and distribution partners  
- The students offer or market products

**People Management** | - The students make a team, structure, and job description  
- The students cooperate with team design the budget plan  
- The students arrange the activity report

### 3. Conclusion
Based on the results of the study, it can be concluded that The merger between CEL-BaDiS stages and Society 5.0 competencies into 6 competency indicators will be applied to the Scipreneur concept. Cognitive flexibility and information verification indicators will produce critical thinking skills competencies; judgment and decision making indicators will produce competency of problem solving skills and observational skills; emotional intelligent indicators will produce competence for creativity and innovation; coordinating with others indicators will produce competency of problem solving skills and communication skills; and people management indicators will produce collaborative skills competencies.

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