Techno-Entrepreneurship Course Instructional Model in Higher Education

Alfrina Mewengkang[1], Johan Reimon Batmetan[1]

[1] Department of Information Technology Communication Education, Universitas Negeri Manado, Indonesia

Email: john.reimon@unima.ac.id

ABSTRACT

Techno-Entrepreneurship becomes an important part of higher education based on information technology. This is useful to enhance the spirit of entrepreneurship, the ability to read opportunities and build information technology-based businesses. This study aims to examine the appropriate techno-entrepreneurship course instructional model in higher education. The research method used is action research with practice using lean canvas models for business models and design sprint method to build product prototypes. The results of this study show how to use practice and tutorials, students can create the right business model and be able to make a prototype of a digital product that is good in implementing business ideas. The conclusion obtained in this study is that techno-entrepreneurship is very appropriate to use lean canvas to build business models and more efficiently use sprint designs to build prototypes of digital products. This model is highly recommended for entrepreneurship learning in higher education.

Keywords*: techno-entrepreneurship, learning model, lean canvas, business model, design sprint*

INTRODUCTION

Higher education is an important part of producing successful entrepreneurs. The pattern of education applied in higher education should adopt a good pattern in producing entrepreneurs. Universities are very important institutions to produce entrepreneurs who have an adequate knowledge base to run a business. The role of universities in producing entrepreneurs is very strategic because of their role as a source of learning and research studies that are more complete and always updated. Various innovations were born from the campus and an innovative research process based on a strong knowledge base. Innovative products born from a strong research process, generate opportunities to apply these products to markets that need them. In this condition, the entrepreneur's role becomes very strategic to bring innovative products to the market and manage them into profitable products and answer market needs. Many universities in developing countries, including Indonesia, have programs to produce entrepreneurs through entrepreneurship courses that teach knowledge and skills to become

entrepreneurs. Many universities in developing countries teach students only in theory with traditional learning models. This model lecturers only explain theoretically with a little practice. This condition causes students to only have low competence in applying techno-entrepreneurship. This condition makes it difficult for students to apply and build their business independently. A way is needed to apply a model that comprehensively integrates theoretical and practice mastery. This integration model still needs a study to find the right model. The difficulty to find a model that is a problem that is difficult to find the right solution, especially for universities that have infrastructure and networking that are still developing. This Condition is complicated by the difficulty of the university bureaucracy in describing programs that support entrepreneurship learning. This difficulty makes many universities try to find better solutions in producing new entrepreneurs who are able to build businesses with agility and resilience in knowledge, attitudes, and skills. The solution made is to build an entrepreneurship coaching center or also called a business incubator. This program is very important because it plays a role

in being a place for fostering young entrepreneurs who will build businesses. This program was built to provide various types of business training, business mentoring, and access to venture capital financing. This business training and mentoring program are carried out in a guided manner and involves professionals and business people from outside the campus to become business mentors. This business incubator program is very good, but in its implementation, the campus experiences many difficulties in implementing it. Differences in mindset and approach are the initial problems that are often difficult to solve, the theoretical approach that is the basis for making decisions is often not in accordance with the practical conditions that are happening in a very dynamic market. This condition resulted in the training program experiencing many failures when the product was introduced to the market. Often the market does not respond well, so the product fails. On the other hand, the presence of practitioners, business mentors from outside the campus who are involved in the business incubator training process on campus often experience difficulties in the training process because of the long and difficult bureaucracy so that many important decisions are made late, making it difficult to build competitiveness. The convoluted bureaucracy as part of the implementation of laws and regulations made by the government as control over the process and quality of graduates has resulted in many campuses experiencing many failures in preparing graduates to become strong entrepreneurs. In addition, institutionally, the incubator that is built often loses its rights as an institution due to the lack of clarity of its position in the campus bureaucracy so that its accountability becomes unclear which results in poor management. This resulted in many failures in business incubators that were built on campus. It is very important to build a flexible, dynamic program with good management, leadership, and simpler bureaucracy to produce a really good entrepreneurship program at the university.

The condition of technological development has increased, has led to a collaborative learning model in realizing business ideas that can build good entrepreneurial conditions at the university. This collaborative model has led to an information technology-based entrepreneurship learning model called techno-entrepreneurship. It is important to build an information technology-based learning process so that there is an increase in competence in achieving success in learning techno-entrepreneurship [1]. Models like this can be found in several countries in Europe and Central Asia that require entrepreneurship learning at universities including advanced [2]. The problem is that the conditions of developing countries are different from those of developed countries so that the model must be reviewed to get the right model that can be applied in developing countries. In-depth investigations are needed to explain the factors that influence the learning process of techno-entrepreneurship [3], especially in its applications in suitable universities in developing countries. Skill enhancement is needed in building successful entrepreneurs since, at university, this skill is needed with an intensive mentoring program to obtain the desired competencies [4]. The right role is needed to achieve certain competencies, especially in engineering faculties that require high engineering skills [5], appropriate support is needed to improve techno-entrepreneurial skills in the engineering faculties. Techno-entrepreneurship requires the right process to produce reliable entrepreneurs. The selection of methods, learning models and the right personal approach can be obtained ideas that can produce a strong digital start-up and promise sustainability in the future [6]. The models and methods built have a big role in building a curriculum that accommodates appropriate techno-entrepreneurship learning at the faculty of engineering [7]. This model provides adequate freedom with an adequate division between theoretical mastery and balanced practice so that it requires greater attention by students who want to become entrepreneurs [8].

However, this is not sufficient to improve competence in developing adequate competencies. Integrated learning models that are designed per business model and proposal models to overcome the lack of mastery of business models that are very difficult to learn in the engineering faculty.

Techno-entrepreneurship learning models are not easy to formulate. The model must pay attention to the adoption of learning models for adults so that learning becomes more successful [9]. In addition to the learning process that uses modules, teaching materials, and assistance in producing technology-entrepreneurship products, it is also necessary to understand the cultural background that influences the ability to master competencies, especially learning that uses information technology tools [10]. Great attention must be paid to the content of the entrepreneurship curriculum, lecturer competencies that will guide the learning process so that students can have more attention in achieving the desired competencies [11]. The curriculum needs to be designed in such a way as to produce an interesting learning process, the use of adequate information technology and an appropriate evaluation model to produce techno-entrepreneurial products and competencies that have high competitiveness [5] [12]. To be able to overcome this problem, the right innovation is needed to create the right techno-entrepreneurship learning model. The innovation needed is a learning model based on information technology appropriately. This innovation model requires a simpler approach because universities in developing countries have limitations in terms of both the availability and competence of available information technology lectures and infrastructure. The right strategy is needed to carry out techno-entrepreneurship learning innovations in higher education. The impact of this innovation must be compared to the level of success with other fields so that it can be seen as its significance in the learning model and curriculum in the engineering faculty [13]. It is important to build a learning model using information technology because of the availability of many learning resources that can be used in supplementing the information in the learning process of techno-entrepreneurship [14]. This condition will encourage students to create their business ideas independently which is the beginning of the emergence of digital start-up [15]. This study aims to create innovations for techno-entrepreneurship course instructional models in higher education. This innovation is based on the use of information technology in the innovation of techno-entrepreneurship learning in the engineering faculty. This study limits the development of business products in the form of business prototypes that can be widely developed and continued in the future.

METHODS

This research uses a method developed qualitatively with information technology tools. The research method used is action research with practice using lean canvas models for business models and design sprint methods to build product prototypes. The lean canvas model is shown in Fig. 1.
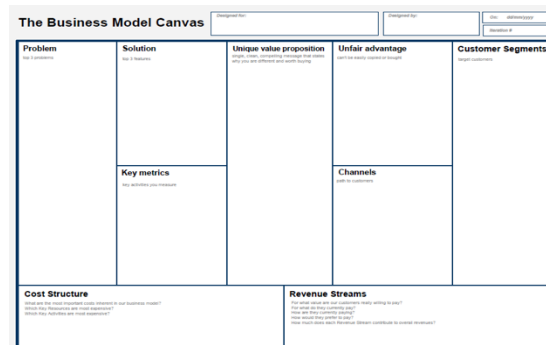

Figure 1. The lean canvas model

This model is used to build the right business model for a digital start-up. This model describes simply how to manage the customer segment, precisely describes the problem to be solved, the solution that will be given quickly and easily, how the uniqueness of the business that will be built and the value it has, also explains the uniqueness that cannot be imitated by other competitors so that the business becomes unique and has high values. This model

also explains in aggregate the value of money in the form of financing that will be spent in the form of cost structures for the business ideas and calculates the revenue that can be generated in the business. The aggregate of both will determine whether the business idea can be sustainable in the future. The channels section is used as a part that can be used to get customers and key metrics are used to measure indicators of success that the business will achieve. This model can be used online using applications that are available online or can be used offline by filling in every available section easily.

The sprint design method becomes the method that will be used to build product prototypes produced by this business idea. This method is shown in Fig. 2
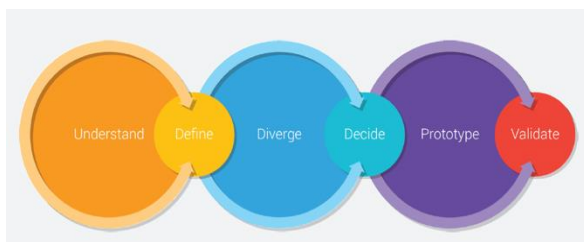

Figure 1. Design Sprint Method

This method uses 6 steps to create a business product prototype. This method is very appropriate for building information technology-based techno-entrepreneurship products. The first step, starting with understanding the problem, outlines the user's needs, business needs and the technological capacity to be used. Second, explain the strategy and focus to be worked on. Third, explore all possible ideas that will be used by the business model that has been developed previously. Fourth, choose the best idea that will be transformed into a prototype of a business product in the form of a digital model. Fifth, build prototypes using available information technology tools. Sixth, testing the users who will use the product, followed by tests to business stakeholders and technical experts to ensure product prototypes can be produced and used. This method is expected to be a model that

can produce a prototype of a sustainable business product.

This study uses 50 samples taken using purposive sampling with specified criteria. The criteria used are the conditions for participating in the initial selection and assessment, having an idea that can be implemented, being unique, having a passion for the field of entrepreneurship, and is registered as an active student. The research took place at the department of information and communication technology education, Universitas Negeri Manado. All collected samples are divided into small groups which must contain one Hasler, one programmer, and one designer. Each group must have at least one idea that can be built into a product. Hasler himself plays the role of the person who has the idea that is the basis for building his product. Every idea from Hasler must be communicated with group members, and the group will formulate it, have methods, and carry out analysis and development to make the idea into a real product. In running it, each group will be assisted by a mentor. The task of the mentor is to provide mentoring that is useful in building quality products and being able to solve a problem that forms the basis of an idea. The mentor himself must be experienced and competent in the field of entrepreneurship so that he is able to carry out mentoring duties.

The formed group requires teamwork to build each product idea that will be produced. The results of the team's work will be presented in a pitch session and will be assessed by the judges and the team will be given input, corrections, and directions to work on the product according to the needs and problems faced by the user. The measure of success is that the product is acceptable and provides a solution to a problem. In the entrepreneurship training stage, the resulting product is a product that can be produced that can enter the market so that it can be used by users. The resulting product can be a solution using information technology, services, or goods that can be continuously used.

This process will be carried out in several stages, namely, the first stage is the inspiration stage.

This stage is carried out by inviting previously successful business actors and sharing their success stories in building their business. This stage is carried out by conducting online and offline seminars. The second stage is done by gathering a team to work together, discussing to formulate what problems will be solved. It is hoped that the results of group discussions will produce product ideas to be built. The third stage is that each group will be given the opportunity to present their previously formulated ideas in front of the judges for evaluation. The results of this assessment will determine whether the idea can be continued or not. This stage is then followed by formulating a business model to be developed. It is hoped that each group will conduct an analysis for the continuation of the business to be built. The fourth step is that each group will be led to build a prototype of its product. Each group will be mentored to produce a product prototype that can be tested and then mass-produced. After the prototype is built, the fifth step is that each group will be given the opportunity to conduct pitch sessions and product demos in front of the jury, and certain communities. The final step is that each group will launch to introduce their products to the wider community and run their business in a guided manner until they reach maturity to be able to independently manage their business.

The entire research was conducted for four months or one semester, which was entered as part of the entrepreneurship course in the undergraduate program in the department of information and communication technology education. The entire course of entrepreneurship learning adopts this learning model as part of a one-semester learning model whose stages have been set for four months. The entire material was prepared by the research team and implemented in the entrepreneurship course. The research team also acts as a judge who assesses various learning outcomes. Meanwhile, mentors are taken from business actors who have experience in the field of entrepreneurship. They are invited to be involved in the entrepreneurship training program at the university.

RESULT AND DISCUSSION

Innovation development starts with forming business ideas obtained from students who are studying the topic of techno-entrepreneurship. Techno-Entrepreneurship Learning This model pays attention to the condition of information technology infrastructure available in higher education and the competence of lecturers teaching this topic. This model divides the theoretical role by 40% and practicum 60%. As shown in chart 1. We have implemented it by regulating the role of lecturers as jurors who carries out assessments, supervision and become business mentors to provide views and directions for product development..
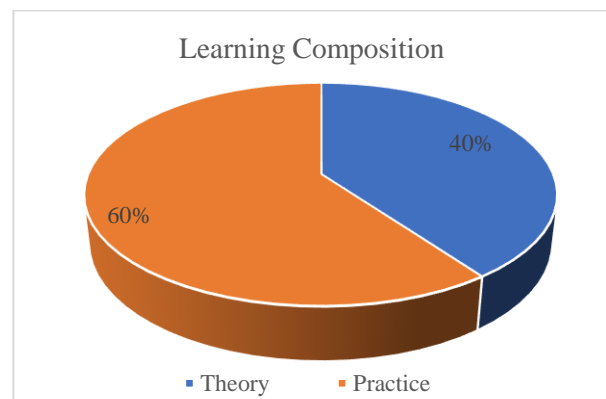

Figure 3. Chart of learning compostion techno-entrepreneurship

Students are allowed to observe objects that will be explored, interviews with users who will be stakeholders of their business. Observations and interviews by students aim to get data and a complete picture of the ideas that they will explore further. It is hoped that students find a significant problem affecting users and try to offer the right solution to the problem.

The six stages of innovation in this techno-entrepreneurship learning model can be explained as follows. Show Fig.4 :

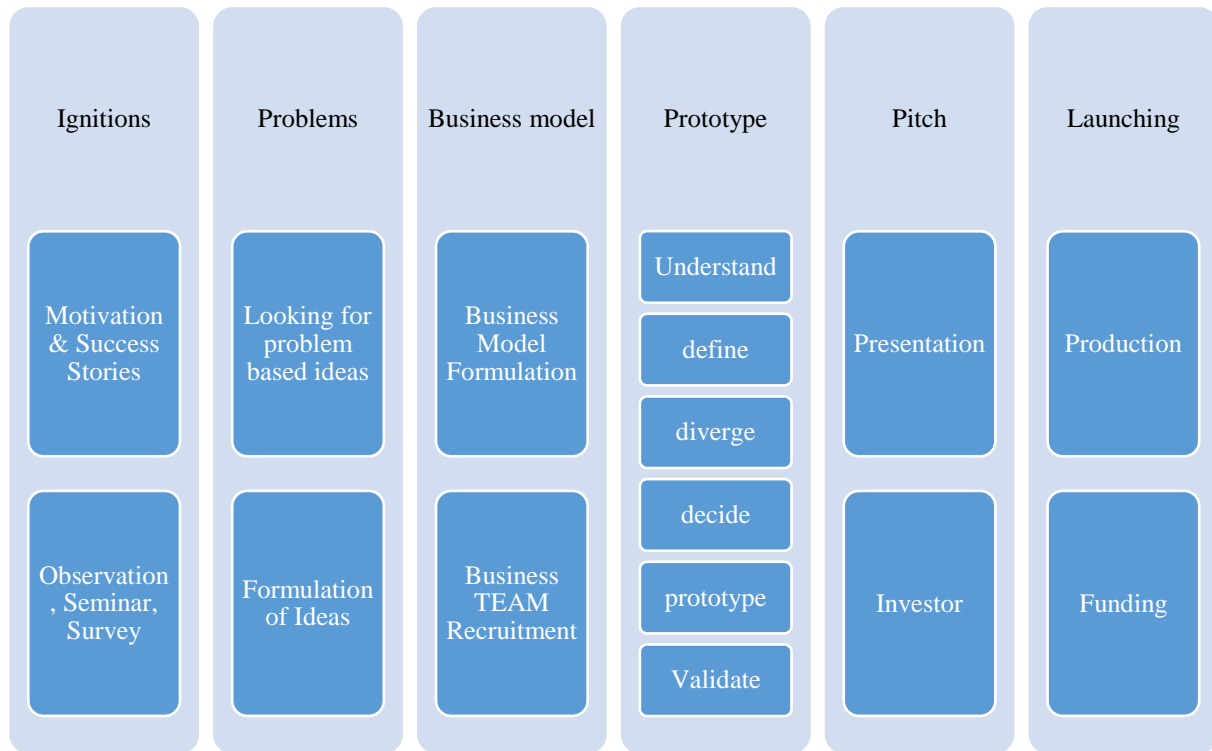| Ignitions	Problems	Business model	Prototype	Pitch	Launching
Motivation & Success Stories	Looking for problem based ideas	Business Model Formulation	Understand / define / diverge / decide / prototype / Validate	Presentation	Production
Observation, Seminar, Survey	Formulation of Ideas	Business TEAM Recruitment		Investor	Funding

Figure 4. Techno-entrepreneurship learning innovation model

The first stage, Ignitions. This step is carried out with two learning models: lectures, motivational seminars, and success stories from successful business people. Businesses are presented in learning to learn from successful entrepreneurs and build high motivation so that students have a high will and spirit to develop their business ideas. Then students are allowed to conduct surveys, observations, and interviews on objects that will become the main business ideas. In practice, we conduct seminars by inviting business actors who have succeeded in building businesses and achieving success. The seminar focused on providing motivation, which aims to increase enthusiasm, willingness to solve a problem and see business opportunities that might be involved. An important part of the target is to grow motivation to become an entrepreneur. Seminar activities are carried out with several sessions including lecturer sessions, this session is carried out by giving lectures to students who are specially invited or who have contracted entrepreneurship courses. This session takes approximately one hour. The second session was in the form of a talk show where invited resource persons spoke and discussed certain pre-determined themes. These themes are compiled from the circle of entrepreneurship learning, the experiences of the resource persons, and the current conditions that are happening in society. The current conditions need to be described so that students are aware of the current conditions and open an opportunity that can be used as a business opportunity. The talk show session was held for one hour. The last session is a question and answers session. In this session, students were allowed to ask questions to resource persons about various matters related to entrepreneurship. Questions and answers were conducted for 30 minutes. At the end of this session, students are given the challenge to start identifying problems that are happening in society that can be used as business opportunities by providing the best solutions that will later be able to open up new business opportunities. In this session, students are expected to have the ability to identify problems and be able to see business opportunities that may occur. Students are expected to build a business idea from the

identified problem. Students are equipped to build a business opportunity by suggesting a solution to an identified problem.

The second stage, Problems. this stage the students identify problems and find the right business ideas that will be pursued into a sustainable business. Ideas that are built are ideas that are born based on the problems they find. From the problems found, students will be guided to formulate business ideas that have been identified so that they become business ideas to be worked on. In this second state, we divide the activity into three stages. We divided students into three categories in the first stage, namely Hasler, programmer, and designer. Hasler is an individual student who has an idea and will be used to build a product. Programmers become individuals who will be tasked with building the product into an application using the desired programming language to build the product. The programming language used can be based on mobile programming which can be used to build products based on mobile devices. Desktop programming for building desktop-based products. The desktop in question can be a personal computer (PC) device or it can also be a laptop/notebook device. Website programming is used to build website-based products that can be accessed using the internet, and the devices used can be based on mobile phones or PCs and laptops. The most important thing is that the device can access the internet using the browser available on the device. Designers are tasked with designing products for both the business process and the user interface that will be used in the product. We combined these three categories into one group. So in one group that is formed, it will consist of three individuals with different tasks, namely Hasler, programmer, and designer.

In order to be able to form groups in the large group of students who are netted in our program, we invite each student to choose which category is suitable according to his competence, and wishes. We found a large number of students who chose to be Haslers, programmers, and designers, but they have not formed into smaller groups. To be able to form smaller groups, we

invited students who chose to be Hasler to do a three-minute pitch (presentation of ideas) to attract programmers and designers to join him and form a group. After the team is determined in one group, we ask each group that has been formed to conduct analysis, discussion, and identify the problems that we want to find a solution for. The team will work together to carry out analysis and identification to clearly identify the problem and try to offer solutions and see the potential business that can be generated. We guide the team to generate business ideas based on the problems identified by them. In the last part of this second state, we ask the team to formulate their ideas into more concrete business ideas that can be continued in the third stage.

The third stage, the business model. Students are guided to formulate a business model that will be created. This stage students are equipped with lean canvas business model tools to build business models that are born from problems that have been identified previously. Then students will be invited to choose a Team that will join together in their business. Students will find the right people in developing their business ideas with the role of each person recruited in the team. We provide mentoring at this stage. Mentoring is carried out by mentors that we have formed before. They are tasked with conducting business mentoring, especially in the business model analysis section. Business ideas that have been preformed by the team, we guide them to analyze these ideas using the tools we have prepared. The team works by conducting various analyzes according to the lean canvas business model tools. We guide them carefully to assess whether their idea can be turned into a business product or not and they conduct an independent assessment to assess whether their business model has profit potential and what parts need to be considered to increase the capacity of their business model. At the end of this third state, each team conducts personal recruitment to strengthen their team. Team members are recruited according to the needs of the business stage they will do. At this stage,

each team has produced a business model according to their respective ideas.

The fourth stage, prototype. Students will use the sprint design method to build prototypes of their business products, starting with understanding users, define, diverge, decide, build prototypes, and carry out the product validation. This stage, students are equipped with comprehensive sprint design tools with the help of information technology. We provide mentoring so that each team can build prototypes of their products. We accompany them with the mentors we have prepared in advance. We provide tools to build their prototype. We use tools like mockups, and mockplus. We provide mentoring, according to the existing stages, starting from understanding to developing prototypes on an ongoing basis. After the prototype is built, the last step is that we provide a special time for each team to carry out the product validation process directly to their prospective customers. The main goal is to conduct product trials with customers to ensure the product can be well received and get various direct inputs from product users. This becomes very important to improve product quality and improve user experience for the product itself. For teams who are ready, we provide mentoring to build the product in reality, even though not all of the features are fully built.

The fifth stage, Pitch. Students will be conditioned to make a comprehensive business presentation and be assessed by experts. Then students will build links to meet potential investors who will decide whether investors are interested in financing the business after seeing the business model that will be developed. At this stage, business ideas that are approved by investors will get capital to build and finance products and run the business. We carry out the process of selecting potential products through pitch/presentation sessions. Each of our teams/groups provides an opportunity to speak and demo the products they have built in front of the judges. In addition to the jury who evaluates the products presented, we also present potential investors who have the opportunity to invest in the products they choose. There are difficulties in bringing in large-scale investors with international and national reputations, so in this study, we present several local investors who have an interest in start-up products.

The sixth stage, Launching. This stage is the last in the process of learning techno-entrepreneurship. At this stage, students will conduct product launching and enter the production stage and conduct financing to run the business. We conduct intensive mentoring on the selected products and carry out the product development process, including full development of the product. After the product is developed, we conduct a product launching session so that it can be mass produced and marketed. In that section, we also held a contract signing session with investors who were interested in the products that were successfully built. For products that have not yet reached this stage, we evaluate and provide mentoring to improve the parts that are considered to be lacking. The process continues and is further managed in the entrepreneurship program managed by the campus.

This learning model will produce entrepreneurs who directly have a business and practice the ability to build start-ups. This is in line with what was stated by Kainde that the business model that adopts the lean canvas business model is very appropriate for digital startups built in the industrial era 4.0 [16]. In order to be successful, the resulting digital product needs to be simulated with a prototype product so that it can be tested before being mass-produced. This model can be adopted into entrepreneurship learning at universities so that it can create new, quality entrepreneurs. The learning model can be simulated in learning as suggested by Belloti, et.all [17]. The results of the analysis are in the form of a lean canvas business model, so the product can be continued by building a prototype. This prototype, can be built using the design sprint method. Design Sprint is a fast method for building prototypes which will be followed by digital products after being properly validated. After the product is

produced, the next step is to present the product design to potential investors. This is a startup that will be built to get funding from investors who are interested in the product. The final step in this entrepreneurship learning model is to carry out a launch, namely mass production and marketing activities to get customers. This model is very appropriate to be implemented in entrepreneurship learning so that it can create successful entrepreneurs. This model produces sufficient competence in making students as successful entrepreneurs. One of the considerations that must be considered in the implementation of this Techno-entrepreneurship learning model is the timing that must be completed within one semester of learning. Need arrangements for more intensive learning in order to succeed on time so that it can succeed optimized.

CONCLUSION

The course instructional innovation model that has been developed can build student competencies to learn techno-entrepreneurship and help students become successful entrepreneurs. This model has succeeded in building a model that is reliable and can be implemented in learning in higher education. The conclusion obtained in this study is that techno-entrepreneurship is very appropriate to use lean canvas to build business models and more efficiently use sprint designs to build prototypes of digital products. This model is highly recommended for entrepreneurship learning in higher education.

REFERENCES

[1] A. Sahin Ornek, and Y. Danyal, "Increased Importance of Entrepreneurship from Entrepreneurship to Techno-Entrepreneurship (Startup): Provided Supports and Conveniences to Techno-Entrepreneurs in Turkey", *Procedia - Social and Behavioral Sciences,* vol. 195, p. 1146–1155, 2015.

[2] S. Yolaç, "An Empirical Study Regarding Entrepreneurship In Europe and Central Asia", *Procedia - Social and Behavioral Sciences,* vol. 195, p. 1097–1103, 2015.

[3] M. Hasril Amiruddion, N. Abd. Samad, and N. Othman, "An Investigation Effects Of Mastery Learning Strategy On Entrepreneurship Knowledge Acquisition Among Aboriginal Students", *Procedia - Social and Behavioral Sciences,* vol. 204(November 2014), p. 183–190, 2015.

[4] B. Hj Din, A. Rahim Anuar, and M. Usman, "The Effectiveness of the Entrepreneurship Education Program in Upgrading Entrepreneurial Skills among Public University Students", *Procedia - Social and Behavioral Sciences,* vol. 224(August 2015), p. 117–123, 2016.

[5] V. Barba-sánchez, and C. Atienza-Sahuquillo, "Entrepreneurial intention among engineering students : The role of entrepreneurship education", *European Research on Management and Business Economics,* vol. 24, n° 1, p. 53–61, 2018.

[6] D. H. B. Welsh, W. L. Tullar, and H. Nemati, "Entrepreneurship education : Process , method , or both ?", *Journal of Innovation,* vol. 1, n° 3, p. 125–132, 2016.

[7] M. Sufian Abdul Karim, "Entrepreneurship Education In An Engineering Curriculum", *Procedia Economics and Finance,* vol. 35 (October 2015), p. 379–387, 2016.

[8] M. Küttim, M. Kallaste, U. Venesaar, and A. Kiis, "Entrepreneurship education at university level and students ' entrepreneurial intentions", *Procedia - Social and Behavioral Sciences,* vol. 110, p. 658–668, 2014.

[9] S. Harkema, and F. Popescu, "Entrepreneurship education for adults : a case-study", *Procedia - Social and Behavioral Sciences,* vol. 209 (July), p. 213–220, 2015.

[10] B. L. Goldstein, M. Ick, W. Ratang, H. Hutajulu, and J. Urasti Blesia, "Using the action research process to design entrepreneurship education at Cenderawasih University", *Procedia - Social and Behavioral Sciences,* vol. 228(June), p. 462–469, 2016.

[11] C. Gervase Iwu, P. Abdullah Opute, R. Nchu, C. Eresia-Eke, R. Khan Tengeh, O. Jaiyeoba, and O. Abdullateef Aliyu, "Entrepreneurship education , curriculum and lecturer-competency as antecedents of student entrepreneurial intention", *The International Journal of Management Education,* vol. March, 2019.

[12] S. Robinson, and W. Shumar, "Ethnographic evaluation of entrepreneurship education in higher education ; A methodological conceptualization", *nternational Journal of Management Education,* p. 1–11, 2014.

[13] D. Maresch, R. Harms, N. Kailer, and B. Wimmer-Wurm "The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business studies university programs", *Technological Forecasting & Social Change,* vol. 104, p. 172–179, 2016.

[14] P. Rippa, and G. Secundo, "Digital academic entrepreneurship : The potential of digital technologies on academic entrepreneurship", *Technological Forecasting & Social Change,* vol. (November 2017), 2018.

[15] R. Badri, and N. Hachicha, "Entrepreneurship education and its impact on students ' intention to start up : A sample case study of students from two Tunisian universities", *The International Journal of Management Education,* vol. 17, nº 2, p. 182–190, 2019.

[16] Q. Conferti Kainde, "Digital business model for digital startup in industrial era 4.0", *International Journal of Advanced Trends in Computer Science and Engineering,* vol. 8, nº 1.5, p. 177–181, 2019.

[17] F. Belloti, R. Berta, A. De Gloria, F. Dagnino, M. Ott, M. Romero, M. Usart, and I.S. Mayer, "Designing a Course for Stimulating Entrepreneurship in Higher Education through Serious Games", *Procedia Computer Science,* vol. 15, p. 174–186, 2012.