



## Development of a Digital Entrepreneurship Learning Model Using the 4-D Method in Higher Education for Millennial Generation

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### ARTICLE HISTORY

### KEYWORDS

Digital Entrepreneurship, 4C  
competence, R&D



### ABSTRACT

This study aimed to develop a digital model of entrepreneurship in universities in realizing an entrepreneurial millennial generation Information System Design Analysis course with formulation of 4C competencies (Communication, Collaboration, Critical thinking, and Creativity). The problem that occurs is that the software produced by students is only limited to fulfilling course assignments, without thinking about the usability of the software they produce as a means of digital entrepreneurship for them. The research method used is a 4-D development model which consists of 4 stages, namely Definition, Design, Development, and Dissemination.. The literacy model testing carried out showed that the average score was 0.840, which stated that the model was distributed as valid and doable to use. The average results of the practicality assessment of the operation of the Digital entrepreneurship literacy model grounded on the perception of the experimental class scholars were 87 in practical order. The results show that the digital entrepreneurship model encourages students to open businesses by utilizing information technology.

Keywords: Digital Entrepreneurship, generasi milenial, 4C competence, 4-D

## 1. Introduction

The development of information and communication technology in the 21st century demands a change in the educational process because most of the work that humans usually do at this time has been replaced by machines with increasingly sophisticated technology. These changes lead to disruption. With the occurrence of a shift in the learning paradigm of the 21st century, Joseph Schumpeter, expert entrepreneurship, stated that creating entrepreneurship in the technological era will be a source of economic strength worldwide. Thus, the formation of entrepreneurial character in the educational process must be a concern to achieve excellence in 21st-century competition. Remote teaching is a specific concept born of the pandemic situation. It combines the features of distance and online learning. Although it has many possibilities (flexibility, individual learning paths), its limitations and difficulties may also arise (low digital competence of the participants; lack of tools and personal connection) (Jamalova, 2022) (Bereczki et al., 2020) (Nedda & Bernadett, 2020). Creativity, innovation, autonomy, and problem solving, it allows students to improve their skills. (Wickey et al., 2022).

The rapid development of technology cannot be denied bringing innovation that can play an essential role in education. In this case, technological advances touch various aspects of individual lives (W. Stone & Baker-Eveleth, 2013). To improve understanding and reuse of these resources, it can be done by adopting digital technology to analyze and manage learning resources. (Jiang, n.d.). The use of technology web and mobile applications has resulted in creating educational applications. (Engel et al., 2021). Technological advancements have an impact on the use of digital applications in education. (Sefriani et al., 2022). The ability to master digital technology is essential to keep up with the latest technological advancements (Chan & Zhang, 2019). For this reason, the government must be more responsive to adapting technology to the needs of the continuously updated people (Munafi'ah, 2021).

In the educational process, technology is used like any other tool, because technology is part of the learning process, and learning is a cognitive process to achieve knowledge. (Aparicio et al., 2016). The learning process consists of several elements that influence each other, namely educators, students, teaching materials, and the interrelated environment in achieving learning objectives (Susanti & Ummah, 2021). Teachers need to improve the teaching and learning system by providing valuable resources and activities for students through technology (Bousbahi & Alrazgan, 2015). Learning devices are arranged according to the learning model used by the teacher and are considered the most effective in achieving learning objectives (Candra et al., 2020). Many new types of learning have a deeper understanding of the discipline combined with emotional intelligence, critical thinking, and creativity (S. R. Ningsih et al., 2022).

Technological developments that very rapidly at this time, and the existence of internet facilities, the use of teaching media by utilizing E-Learning media can be done. By using this teaching media, the learning process can be carried out more effectively, efficiently, and practically. Not only that, the learning process can also be more interesting for students. Higher education needs to review the role of information and communication technology (ICT), in particular reviewing the effectiveness of online learning in higher education. The quality of Indonesian education cannot be separated from digital technology, so, naturally, there are differences in the quality of education in various regions of Indonesia. Regions with the support of adequate technological facilities, both infrastructure and technological devices in learning, have a better quality of education than regions with inadequate supporting facilities for the use of technology. Digital era makes knowledge available in the classroom, and anywhere there are digital technology devices. (Traverso et al., 2014).

An entrepreneur creates a new business by taking risks and uncertainties to achieve profit and growth by identifying opportunities and combining various resources (Sudarmiatin, 2009). This research aimed to develop a digital model of entrepreneurship in universities to create a millennial with an entrepreneurial spirit in the Information System Design Analysis course with the 4C competency formulation (*Communication, Collaboration, Critical thinking, and Creativity*). The main reason for developing entrepreneurship learning models in the digital era based on new literacy in the era of the industrial revolution 4.0 is the need for college graduates to survive in the digital era. It is by having a new set of competencies to be able and skilled to become a professional with critical and creative thinking as an industrial agent in the digital age. The learning model is a pattern always used to guide classroom learning and tutorials for university lecturers. The learning model must refer to the approach used, including learning objectives, environment, and classroom management (S. Ningsih et al., 2019). The digital entrepreneurship learning model in the 4.0 industrial revolution era is a design of learning steps with a syntax arrangement referring to project-based learning and product-based learning. The digital entrepreneurship model was developed with the characteristics of learning steps that lead students to have the ability to become entrepreneurs in the digital era by implementing new literacy skills 4.0. This model applies to courses or subjects taught in practical vocational schools.

The formulation of new literacy in education and the challenges of the 4.0 industrial revolution era, which has the concept Internet of Things (IoT) thinking, has given rise to the phenomenon of disruption. Disruption is understood as a fundamental change in the order of human life due to the evolution of information technology, which changes almost the entire order of human life, including in business and work activities. Therefore, this phenomenon must be taken seriously in the educational environment. Furthermore, with

significant changes in the era of disruption, the needs of student competencies must undoubtedly be adjusted to the demands of job competition.

The purpose of this study is to develop a digital entrepreneurship learning model in universities in realizing an entrepreneurial millennial generation in Information System Design Analysis (APSI) course with the 4C competency formulation (Communication, Collaboration, Critical thinking, and Creativity). The problem that has occurred so far is that the software produced by students is only limited to fulfilling assignments in the APSI course, without thinking about the use of the software they produce as a means of digital entrepreneurship for them. They should be able to use the software to open digital-based entrepreneurs. The digital entrepreneurship learning model encourages students to open businesses by utilizing the information technology, they have built in the APSI course. This research is important because by applying this model, it can encourage students to be entrepreneurial by building an information technology-based system according to their field.

The main reason for developing entrepreneurship learning models in the digital era based on new literacy in the era of the industrial revolution 4.0 is the emergence of the need for university graduates to be able to survive in the digital era by having a new set of competencies to be able and skilled to become a professional who has critical and creative thinking as an industrial driver in the digital age.

The digital entrepreneurship learning model in the 4.0 industrial revolution era is a design of learning steps with a syntax arrangement referring to project-based learning and product-based learning. The digital entrepreneurship model was developed with the characteristics of learning steps that lead students to have the ability to become entrepreneurs in the digital era by implementing new literacy skills 4.0. This model can be applied to courses or subjects in practical vocational schools.

Theoretically, the results of this study further strengthen the argument of urgency and the allegation that it is necessary to develop a learning model to fulfill the needs of human resource capabilities in the 21st century which is getting stronger with challenges and global competition as well as responding to the demands of the ability of higher education graduates in mastering new literacy in the industrial revolution 4.0.

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work activities. Therefore, this phenomenon must be taken seriously in the educational environment. Furthermore, with the big changes in the era of disruption, the needs of student competencies must certainly be adjusted to the demands of job competition.

## 2 Literature Review

Researches that are relevant to the development of digital entrepreneurship models conducted are those presented by John P. Ulhøi (2021), Aarhus University, Business and Social Sciences, Department of Management, Aarhus, Denmark, with title Digital Perspective on Entrepreneurship. This study is about the wider impact of digital technologies on entrepreneurship has only recently begun to surface in the entrepreneurship literature. This situation invites for re-examining theory on digital technologies and theory on entrepreneurship, while at the same time asking where to find critical bridging points that may allow for integrating the two domains.

This paper answers this question by reviewing and subsequently analysing core constituents of digital entrepreneurship and its modus operandi. Analysis show that digital entrepreneurship not only involves entrepreneurial agency and digital technologies, but also affects previous conceptualizations of artifacts and of its modus operandi by applying a broader repertoire of architectural arrangements. This implies that the employment of digital technologies in entrepreneurial ventures has effects that go well beyond using digital technology as a means-to-an-end. Before closing, implications for future research and relevant policy makers are briefly sketched out. More specifically, it could be interesting in future research to test how more recent innovation approaches may affect digital entrepreneurship.

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Research from Mohd Zaidi Abd Rozan, Information Systems, Universiti Teknologi Malaysia (2022) with the title Evidence of Impact from a National Digital Entrepreneurship Apprentice Program in Malaysia. This study is about Impact Digital Entrepreneurship Apprentice Program (IDEA@KPT) at Ministry of Higher Education Malaysia 2021 is a comprehensive nationwide six-month program. Forty-three teams consist of 43 Academic Supervisors, 129 institutes of Higher Learning students, and 43 Micro & Small Enterprises (MSE) owners conducted by Universiti Teknologi Malaysia. The program is aimed to develop capable students in maneuvering the digital business world. Students underwent an online Business and Digital Training, with apprenticeship and formal reportings.

This article aims to present the impact of IDEA@KPT activities by analyzing 43 case studies

produced in the program. A pre-codification scheme that concentrates on the study goals was the method for data collection. Before the program, all the teams were informed of the required components to ensure uniformity of the report. The evidence of significant gain and impact on the MSEs businesses was drawn from the components. Other than the components, analytics hindsight, visual appeal, persuasion ability, perception on paid ads, posting timing, and synergies beyond the digital world activities were gathered, providing richer information and insights that increase business value. Such lessons are beneficial to all parties as all businesses are demanded to utilize digital platforms nowadays.

The most critical element for The success of IDEA@KPT or digital marketing internship program is the confidence of all participants. Businesses are looking for a change to become highly visible, likable, engaged and profitable online. By tweaking the intern's marketing elements, MSE owners must be ready to take over the role and transform digitally. This is important to maintain the business because it is considered to be able to realize higher success, especially after and after the Covid-19 pandemic. (Rozan, 2022).

Research by Muafi, Wirman Syafri, Hadi Prabowo, Sofyan Ashari Nur (2021) with the title Digital Entrepreneurship in Indonesia: A Human Capital Perspective. The purpose of this study is to Digital technology become a new economic and social force, reshaping traditional business models, strategies, structures, and processes. This is a challenge for human capital to develop continuously in this dynamic era; one of the solutions is digital entrepreneurship. Digital entrepreneurship focuses on creating new ventures and transforming existing businesses by developing novel digital technologies or novel usage. Further, digital technology has also enabled the growth of the sharing economy, linking owners and users, and disrupting the previous dualism of businesses and customers.

This paper provides a novel contribution regarding the emerging concept of Digital Entrepreneurship. Based on a qualitative literature review and interview with university staff, lecturers, and students in four large public and private universities in West Java and DIY Province, an interpretative framework for Digital Entrepreneurship has been proposed, which comprises of the following components: motivation (the rationale for the adoption of digital technology for academic entrepreneurship), stakeholders (the stakeholders involved through digital technology to achieve the academic entrepreneurship goal), process (the processes of academic entrepreneurship supported by digital technologies), and business form (the emerging forms of digital academic entrepreneurship).

This research also shows several alternative government policies to improve digital entrepreneurship in the academic environment. This study has provided theoretical implication that digital academic entrepreneurship can be developed by increasing the role of motivation and stakeholders, especially

those who will contribute to the process and business form of digital academic entrepreneurship.

The managerial implication provided in this study is that several things must be developed by universities in implementing and developing digital academic entrepreneurship. The first factor is motivation. In its implementation, the motivation that grows in students in digital academic entrepreneurship has been very good. Therefore, the next thing that needs to be done by universities is to maintain these motivations by continuing to motivate students in lectures and other agendas outside the campus such as seminars, workshops, student clubs, study groups, and others.

The second factor is a stakeholder. The implementation of the functions of stakeholders is generally good, but several things need to be improved, namely the low mentality of students and complicated administrative requirements. Therefore, universities should further stimulate and develop student mentality and simplify the administrative requirements for students who wish to submit entrepreneurship proposals. The third factor is the process. The implementation of the formation of digital academic entrepreneurship is still weak because although universities already have a good system, the implementation of student business ideas is still bad due to a lack of experience, knowledge, skills, and curiosity.

Therefore, universities need to provide more intense assistance and conduct regular entrepreneurial training and practice. Furthermore, the fourth factor is sustainability. The implementation of this factor is still very weak because many student businesses do not last long. Therefore, universities should think further about student business development, especially after the business is launched. Universities should form a team of experts in student business supervision so that business steps that are taken can be more focused and well-controlled (Muafi et al., 2021).

### 3. Research Methods

Research and Development (R&D) is a development research used in this research. According to (Fransisca, 2017), The process of testing the validity, practicality, and effectiveness, is a particular product of the purpose of research and development. Research instruments are used to examine the learning model developed. Then, it is validated by experts (Isolihatun, 2012). The research instruments used were validation assessment sheets, student response questionnaire sheets, and test questions. The validation assessment sheet is a questionnaire for five indicators with an assessment using a Likert scale. The test questions are related to Information System Design Analysis textbook material. The response questionnaire using this model contains two types of statements given to the test subjects. The researchers created the questionnaire using the Guttman Scale in the positive and negative statements. The three instruments were analyzed using data analysis techniques: product validity tests, product practicality tests, and product effectiveness tests.

This digital entrepreneurship model was tested for validity to obtain good product development. The level of validity of the product developed resulted in percentage value. The achievement of learning effectiveness using the digital entrepreneurship model was said to be effective if all aspects of effectiveness were met (Wahyuni, 2017).

The main purpose of a development in education and learning is to stimulate the use of alternative learning methods in educational preparation to meet the challenges of developing learning needs. Research and development is carried out through the introduction of concepts, methods, and practices used by educators as instructional implementers. In this study, the course of information system design analysis produced a product in the form of a digital entrepreneurship model. Students' competence and level of entrepreneurship in these courses can increase through this developed digital entrepreneurship model.

This research is a development of previous research.. The learning device development model used was the Thiagarajan and Semmel learning device development model (Lawhon, 1976), namely the 4-D model. This 4-D development model consists of 4 stages: the definition stage, the design stage, the developing stage, and the disseminate stage (Sugiyono, 2006). The concept of the 4D model is illustrated in Figure 1.

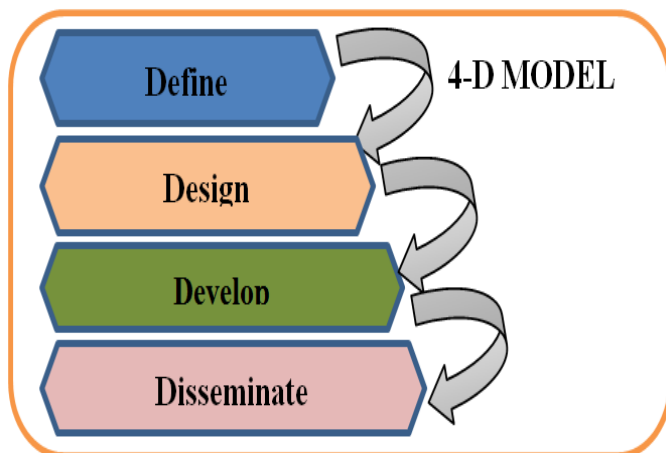


Figure 1. The concept of 4-D

a) Define; Define is the stage of establishing and determining the instructional requirements in the development it does. The researcher only carried out the analysis with the intention of suggesting instructional suggestions and limitations. There are four activity steps in the Define stage, namely: (1) Front-end analysis is the stage where researchers conduct studies on the basic problems faced by educators that cause low performance and achievement of educational outcomes. (2) Learner analysis is an action where researchers conduct studies on students who are the target of training to identify characteristics of students that are relevant to the instructional design and development that will be carried out. (3) Task analysis is an empirical analysis to identify

the main skills acquired by educators and their analysis into a set of required sub-skills. (4) Concept analysis is the act of identifying the main lessons that must be taught related to the learning objectives developed.

The Define phase shows that the achievement of learning outcomes for APSI courses is not optimal due to the frequent use of the application of student practice results, needs analysis in high category APSI learning,

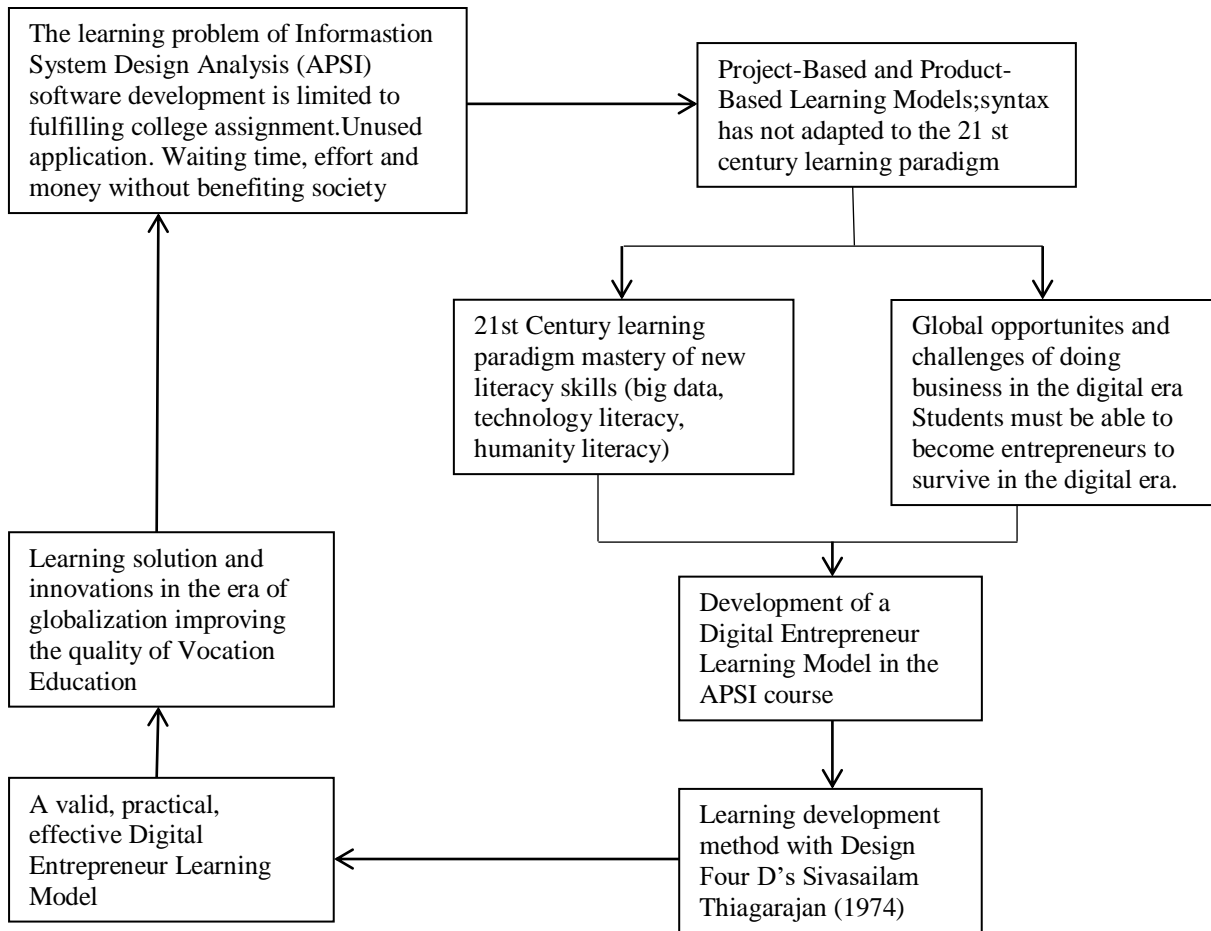
b) The purpose of this stage is to design prototype materials from the developed materials. The selection of learning media and formats is a major aspect of the design phase. The following activities are carried out in the Design stage: (1) The constitution criterion referenced test is a phase where educators prepare the criteria/standards for the specified test. This stage is the link between Stage 1 (Define) and the Design Process (Design). The preparation of test criteria is carried out based on Task Analysis (Define) referred to by references, educators carry out development by changing objectives into teaching outlines for the development of teaching materials. (2) Media Selection is the selection of the right media to be presented in the instructional. This process involves task matching and analysis, target-trainee characteristics, production sources, and dissemination plans with different attributes of the media. (3) Initial Design is the initial design through activities to adjust basic needs through appropriate models and media. Activities at this stage are the arrangement of learning activities and completeness of learning. (4) Forum Group Discussion (FGD) to solicit opinions of experts and practitioners regarding the product being developed. The results of the FGD became the design determination to be revised and prepared for testing. Design phase has designed the development of learning models and support systems through the stages of design, development, and revision.

c) At the development stage, feedback is received through formative evaluation. The two steps in this stage are: (1) Expert Appraisal is a technique to get expert judgment. A number of experts were asked to evaluate the initial design from an instructional and technical point of view. As a basis for feedback, the products developed are then modified to be more suitable, effective, useful, and of high quality and valid. (2) Developmental Testing: Developmental testing involves the efforts made by the researcher to find the parts that are not right. On the basis of feedback, reactions, and comments from users as a basis for improvement and modification. The assessment carried out is related to the practicality and effectiveness of product development to optimize learning outcomes. Development phase is the point of testing the validity and practicality as well as effectiveness through the application of learning models in the experimental group,

d) Disseminate; The development results reach the final production stage when the tests produce consistent

results and expert judgments produce positive results on the summative evaluation. The three steps at this stage are: (1) Packaging. Packaging is a preparatory activity before the product is distributed to users. (2) Diffusion. Diffusion is making efforts to distribute products to users. (3) Adoption. Adoption is the use of material through other developments. Disseminate phase is the phase which in this study was only limited to the experimental group as the research sample.

This digital entrepreneurship learning model is an entrepreneurial activity using electronic (digital) facilities included in the learning process with new literacy in the era of the industrial revolution 4.0, a 21st-century learning framework. The flow of this research can be seen in the conceptual framework of research contained in Figure 2.



**Figure 2.** Conceptual Framework of Research

#### 4. Results

This research and development have resulted in a valid, practical, and effective learning model called the Digital Entrepreneurship learning model. The research discussion followed the stages of research and development carried out in this study, namely define, design, develop and disseminate. The research subject is the Digital Entrepreneur learning model with new literacy in the era of the industrial revolution 4.0 in the Information System Design Analysis (APSI) course. The test subjects were UPI YPTK students

who took APSI lectures in the odd semester of the 2020/2021 academic year.

The Ministry of Education and Culture formulated that the 21st century learning paradigm emphasizes the ability of students to find out from various sources, formulate problems, think analytically and collaborate and collaborate in solving problems. The explanation of the 21st century learning framework according to (BSNP: 2010) is as follows: (a) Critical Thinking and Problem Solving Skills, (b) Communication and Collaboration Skills, (c) Ability to create and update (Creativity and Innovation Skills), (d)

Information and communication technology literacy, (e) Contextual learning skills, and (f) Information and communication skills media literacy.

#### 4.1 The Concept of the Entrepreneurship Digital

Responding to the challenge of mastering 21st-century competencies to adapt to new literacy in the era of the industrial revolution 4.0, the students can have global competitiveness by mastering significant data literacy, digital literacy, and human literacy to strengthen the entrepreneurial spirit through learning activities. Meanwhile,

educators must strive to improve quality learning becomes more effective and efficient. It aims to make learning more optimal and lead to the principles of vocational learning by familiarizing students with working in the learning process to achieve an ability to adapt to the needs of the world of work and society. The basic concept of Digital Entrepreneurship Model is 4C competencies (Communication, Collaboration, Critical thinking, and Creativity). Figure 3 illustrates the model concept.

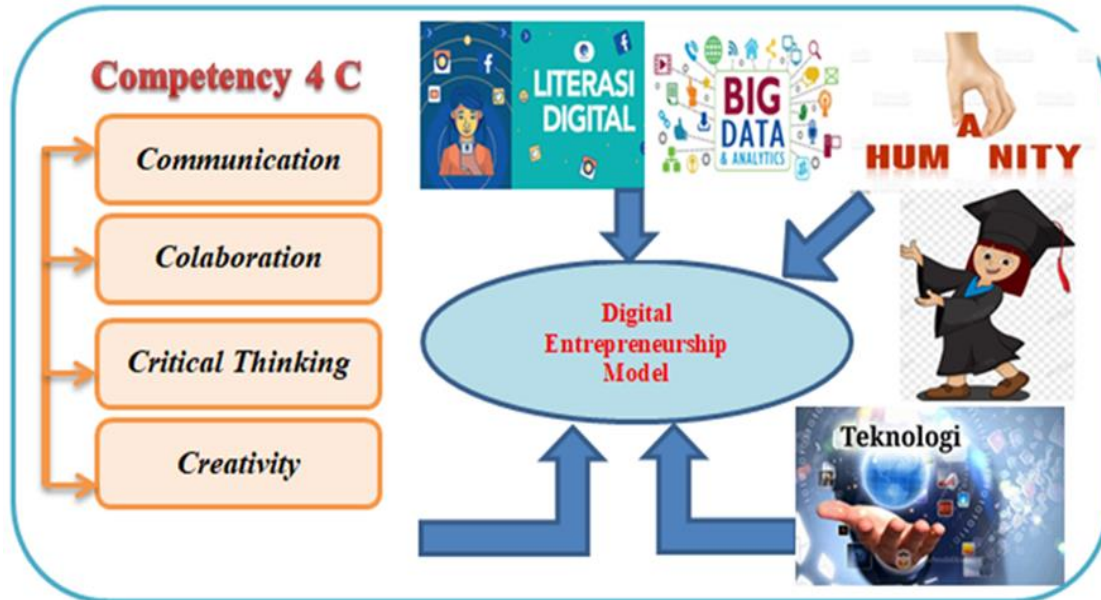
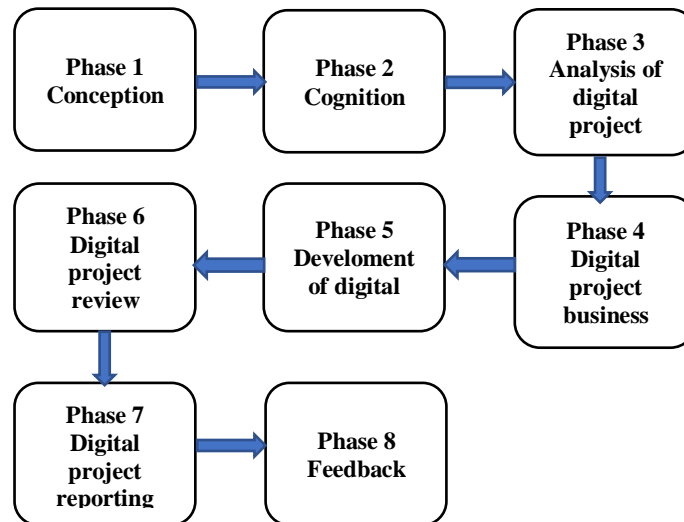


Figure 3. The Concept of the Digital Entrepreneurship Model

Figure 3 illustrates how competency 4-C shapes the development of this digital entrepreneurship, which consists of Communication, Collaboration, Critical thinking, and Creativity. In this case, students in the Information System Design Analysis course learn how to make an application of sale value to open a digital-based business.

#### 4.2 Steps of the Digital Entrepreneurship Learning Model

The steps taken in implementing Digital entrepreneurship learning model consist of 8 phases. They are (1) conception, (2) cognition, (3) analysis of digital project needs, (4) digital project business plan, (5) development of digital products, (6) digital project review, (7) digital project reporting and (8) feedback. The 8th phase is a procedure in the digital entrepreneurship learning model. This step starts from the procedure for opening the lesson, the core, and closing the lesson. Learning steps can be seen in Figure 4.



**Figure 4.** The Steps of the Digital Entrepreneurship Learning Model

The steps in this model are adjusted to the achievement of expected competency standards and learning need of the globalization era in 21st-century learning. It requires students to have the ability to apply new literacy in the era of the industrial revolution 4.0.

### 4.3 Use Case Diagram

Use Case Diagram describes the actors involved in the system and significant activities (cases) that will occur in the system (Ningsih S.R., et al., 2019). In this information

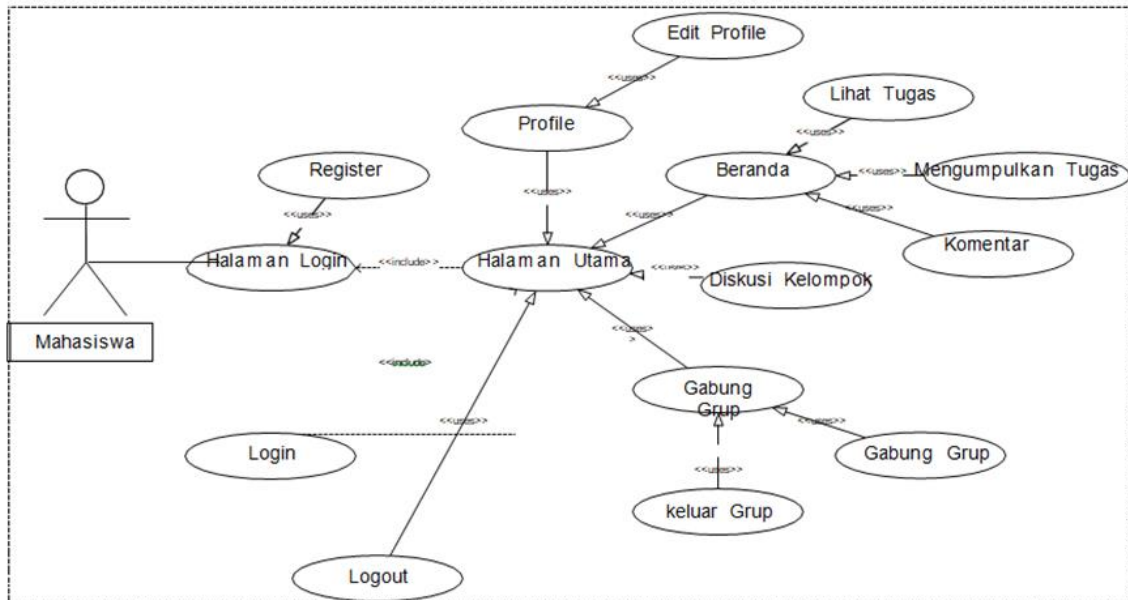
system, there are two users, namely lecturers and students. Lecturers are users who act as instructors who can create classes, accept students who join in their classes, give assignments, and give ratings and comments. In comparison, students are users who can register, join the class that the lecturer has made, collect assignments, and comment. Find out what interactions that occur between users and this information system and what functions that user lectures can perform can be seen in Figure 5.

**Figure 5.** Use Case Diagram Lecturer

From Figure 5, namely, when the lecturer opens the login page, then on the page, this login lecturer can register if the students do not have an account to log in. After registering, the lecturer can log in and select the menu available on the main page. The menu includes profiles to

view and edit profiles, the home page to see tasks, provide values and comments, create new classes, edit classes and delete classes, confirm students who will join the class, and log out to exit the main page. For interactions and functions that students can perform can be shown in Figure 6.





**Figure 6.** Use Case Diagram Students

In Figure 6, students open a login page to log in to the main page, and if they do not have a login account, students can choose to register to create a login account. On the main page, students can choose the menu profile to view and edit profiles, the homepage to view blunt tasks and comments, join groups to join groups and exit groups, and log out to exit the main page.

#### 4.4 Class Diagram

In this system, the user can perform several classes and functions. One of these classes is a profile class. This class is

used to edit and view profiles. Meanwhile, the homepage of this class serves to display assignments and comments, who have submitted assignments, view grades, and conduct assessments. Furthermore, class registration functions to register to the system, add classes, edit classes, delete classes and search for classes. Finally, the assignment class serves to view files, provide assessments and submit assignments. These classes can be seen in Figure 7.

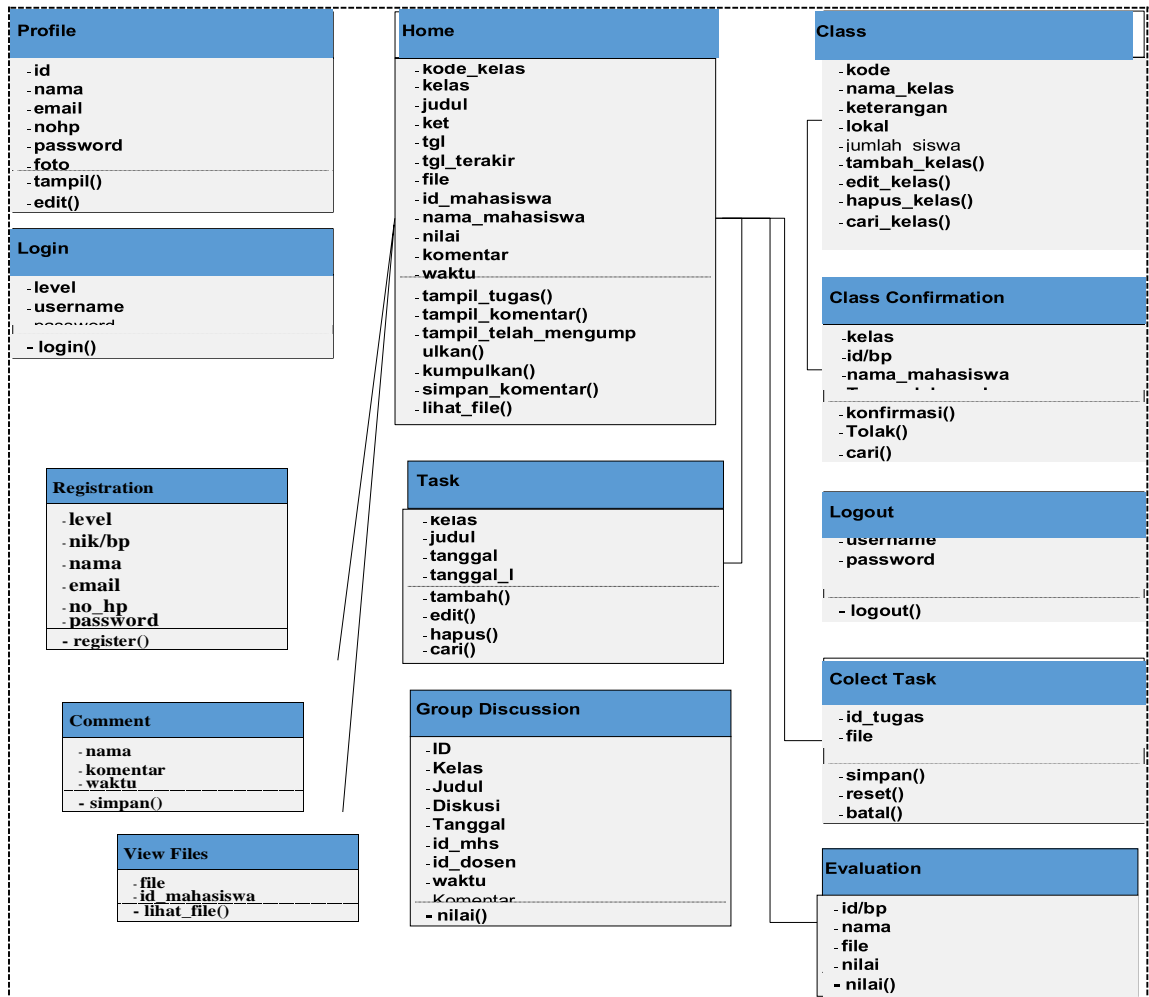


Figure 7. Class Diagram

#### 4.5 System Implementation

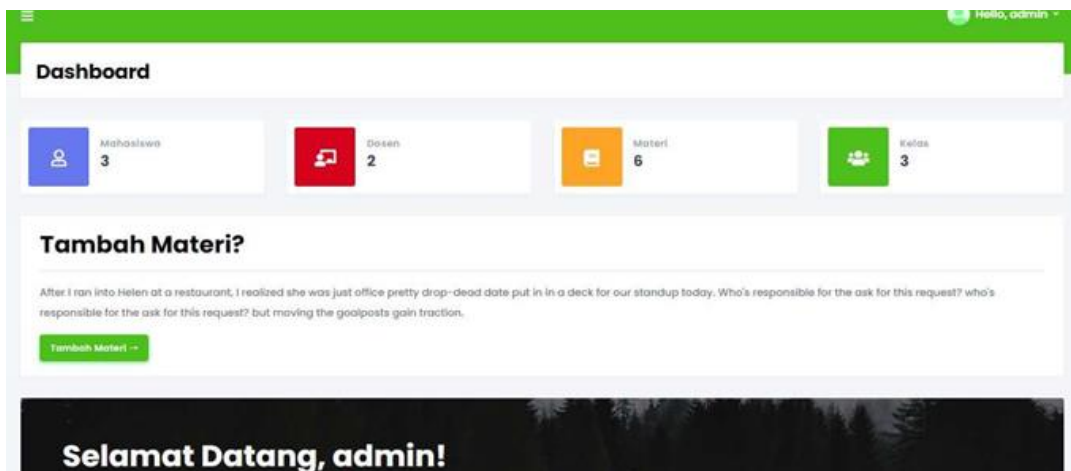
The system implementation stage completed the system development design in the approved document. Then, it was used to test, install and start using the new system. The objective of the implementation phase was to complete the approved system design. The next step was to test and document the required system programs and procedures and

ensure that the users involved could operate and use the new system correctly and transition from the old system to the newly developed system. The digital entrepreneurship learning model can be seen in Figures 8 and 9. At this stage, the author described the results of testing the implemented system.



**Figure 8.** Choosing Lecture Materials

Figure 8 shows the lecture material that will be chosen by students. In this case, students must choose the material provided by the lecturer according to a predetermined schedule.



**Figure 9.** Admin Page

Figure 9 is a student assignment confirmation page. On this page, the students can upload assignments given by the lecturer after completing them. Students can also see the value of their assignments after being corrected by the lecturer.

### 3.2 Results of Analysis of Digital Entrepreneurship Model

#### 1) Results of Validity Test

The learning model developed was tested for validity, practicality, and effectiveness. The results of the validity analysis of the developed model can be seen in Table 1.

**Table 1.** Validity Test Results On The Digital Entrepreneurship Learning Model

Number	Indicators assessed	Score	Category
1.	Rationalization	0.823	Valid
2.	Supporting Theory	0.858	Valid
3.	Syntax	0.825	Valid
4.	Social System	0.870	Valid
5.	Reaction Principle	0.798	Valid
6.	Support System	0.817	Valid
7.	Impact	0.889	Valid
	Average	0.840	Valid

The learning model testing showed that the average score was 0.840, which stated that the model was categorized as valid and feasible to use.

## 2) Practicality Test Results

The practicality test is based on student perceptions. The assessment was carried out by filling out questionnaires to experimental group students who learned to use the Digital entrepreneurship model. The summary of the results of the practical analysis can be seen in Table 2.

**Table 2.** Results Of Practicality Analysis Of Student Assessment

Number	Practicality on Product	Score	Category
1.	Learning model	89	Practical
2.	Module	85	Practical
3.	Learning Guide	87	Practical
	Average	87	Practical

The practicality test results presented in Table 2 showed the average results of the practicality assessment of the Digital Entrepreneurship application based on the perception of experimental class students was 87% with the practical category.

## 3) Effectiveness Test Results

To determine the success of designed product development, the researchers analyzed learning outcomes to see the effectiveness of test results in the cognitive, affective, and psychomotor domains. The experimental research method for seeing the learning model's effectiveness was the experimental research method.

### a) Cognitive

The cognitive domain is the area of knowledge possessed by students after participating in the learning process. To test whether there was a difference in students' level of knowledge in the control and experimental groups, the researchers conducted assessment objective tests on the competencies presented in modules 1 and 2. Table 3 shows the data results described on the level of student knowledge.

**Table 3.** Data Description Of Average Learning Outcomes In The Cognitive Area

Descriptive Statistics					
Class	N	Minimum	Maximum	Mean	Std. Deviation
Experiment	50	70.00	95.00	83.44	5.56
Control	44	65.00	87.00	77.54	5.83

According to Table 3, the average cognitive learning outcomes of the experimental group were 83.44, while the control group was 77.54. The data were obtained from the combined cognitive test results of module 1 and module 2. The description of cognitive learning outcomes indicated that the experimental group had better learning outcomes than the control group.

### b) Affective

The average results of the description of affective learning based on new literacy behaviour in the 4.0 industrial revolution era taken from the experimental class and control class data can be seen in Table 4.

**Table 4.** Description of Average Learning Outcomes Affective Area

Descriptive Statistics					
Class	N	Minimum	Maximum	Mean	Std. Deviation
Experiment	50	67.00	91.00	80.50	7.20
Control	44	52.00	89.00	68.70	10.62

Based on Table 4 the average affective learning outcomes score based on humanity in the experimental group was 80.50 and 68.70 in the control group. The affective learning outcomes described that the experimental group has better affective learning outcomes than the control group. For affective domain learning outcomes for each indicator can be seen in Table 5.

**Table 5.** Affective Area Learning Results In Each Indicator

Experiment		Control	
1	Literacy Big data	80 % Literacy Big data	73%
2	Technology literacy	83% Technology literacy	66%
3	Literacy Humanity	85% Literacy Humanity	70%
	Critical thinking	Critical thinking	
	(80%)	(65%)	
	Creativity (85%)	Creativity ( 66%)	
	Communication	Communication	
	(89%)	(78%)	
	Collaboration	Collaboration	
	(86%)	(71%)	
	Average	82.67 %	Average 69.67 %

Table 5 displays the data on the effectiveness test results in the affective domain for each indicator. The test results of the effectiveness of the affective domain of each indicator for the experimental group showed an average of 82.67%, compared to the control group with an average result of 69.67%.

### c) Psychomotor

The psychomotor domain is the area of skills shown by students in the practice of learning APSI. The description of the basic statistics of the psychomotor domain research results for the experimental and control groups can be seen in Table 6.

**Table 6.** Data Description of Average Psychomotor Learning Outcomes

Descriptive Statistics					
Class	N	Minimum	Maximum	Mean	Std. Deviation
Experiment	50	73.00	96.00	87.20	5.28
Control	44	56.00	96.00	74.79	11.00

Based on Table 6, it was known that the average psychomotor learning outcomes score of the experiment group was 87.20, and the control group was 74.79.

The explanation of learning outcomes in the control and experimental groups in the psychomotor domain for each indicator can be explained in Table 7.

Table 7. Psychomotor Learning Outcomes on Each Indicator

	Experimental		Control
Correctiveness	85%	Correctiveness	78%
Consistency	88%	Consistency	80%
Treacebility	86%	Treacebility	75%
Usability	87%	Usability	81%
Reliability	88%	Reliability	70%
Effectiveness	89%	Effectiveness	65%
Average	87,2%	Average	74,8%

The most prominent difference in psychomotor learning outcomes is the effectiveness indicator with a difference of 24%. Learning outcomes in the psychomotor domain were assessed through an assessment of the results of student practice in project work 1 and 2. The assessment was carried out on three project planning activities, project assessments and project activities which were only assessed to the experimental group. Rating result presented in Table 8.

Table 8. Project Assessment

Group	Project Planning		Project Result		Project Activity	
	Project 1	Project 2	Project 1	Project 2	Project 1	Project 2
	1	80	84	75	76	80
2	84	80	76	82	76	76
3	88	84	84	82	87	84
4	88	88	84	82	80	80
5	72	72	78	89	87	84
6	84	92	85	95	76	93
7	72	84	71	85	71	87
8	80	92	87	78	87	84
9	72	88	75	84	78	80

10	92	92	89	93	93	93
Average	81,2	85,6	80,4	84,6	81,3	84,7
	83,4		82,5		83,0	

The accompanying impact data was obtained through direct observation in the field when students carried out project 1 and project 2 in groups. The results of the observations made can be seen in Table 9.

Table 9. Observations on New Literacy Abilities in the Industrial Revolution 4.0

Literacy	Indicator	Average Score
Big data	Download, Upload, Sharing	87
Tecnology	Media, tecnology, information	85
Humanity	Critical thinking	74
	Creativity	83
	Collaboration	80
	Communication	86
Average		82,5

#### 4. Discussion

This research and development has resulted in a valid, practical and effective learning model called the Digital Entrepreneur learning model. The research discussion is in accordance with the stages of research and development carried out in this study, namely define, design, develop and disseminate.

The results of the Digital Entrepreneurship Model Analysis show that this learning model is valid to use. According to (Dewi, 2018), validity is the accuracy or accuracy of an instrument in measurement. In testing the data collection instrument, the validity is divided into factor validity and item validity. Validity the learning model that has been developed and improved according to expert input is tested to experts with a total of 5 experts, all of whom are experts who have provided input during the Focus Group Discussion (FGD). The results of the learning model testing carried out showed that the average score was 0.840 which stated that the model was categorized as valid and suitable for use in research.

According to (Sugiyono, 2006), practicality, it is a calculation process related to the practicality of an instrument to be used by researchers in implementing research methods, so the terminology related to practicality itself refers to the part of a situation that involves a part that makes sense or is useful for doing something. According to the Big Indonesian Dictionary (KBBI), practicality is everything that is practical because it comes from the basic word practical, which means that it is easy and easy to use.

Practicality test based on student's perception to the

practicality assessment was carried out through filling out a questionnaire to the experimental group students totaling 50 people who learned to use the Digital Entrepreneur model. The results of the average practicality assessment of Digital Entrepreneurship applications based on the perceptions of experimental class students are 87% in the practical category.

Effectiveness is a measure of the success or failure of achieving a goal organization in achieving its goals (Chandra et al., 2020). Effective in the Big Language Dictionary Indonesia is defined that there are the effect, the impression. Can be concluded that effectiveness is something that have an effect or effect bring results from a business or action. When an organization achieves its goals, then the organization has been running effectively.

The greater the contribution of the resulting output to the achievement of the specified goals or objectives, the more effective the work process of an organizational unit. Indicators of effectiveness describe the range of effects and impacts (outcomes) of the program outputs in achieving program objectives. The effectiveness test is seen and assessed from the cognitive, affective and psychomotor domains. After testing, the cognitive value obtained is 83.44 for the experimental class and 77.54 for the control class in the APSI course. The result data on effectiveness test results in the affective domain for each indicator, indicated differences in the affective learning outcomes of students who studied using the Digital Entrepreneur model in the experimental group, with an average of 82.67%, with the control group who learned using the ordinary learning model applied in APSI learning with an average result of 69.67%.

The results of the psychomotor domain test were carried out using an independent sample t test. The results of the normality of the data show the Asimp score. The significance of the Kormogorov Smirnov test is 0.784 for the experimental group data and 0.352 for the control group data, meaning that the data are assumed to be normal. The results of the t-test analysis for the different test show that the score  $t_{count} = 3.715$  and  $t_{table} = 2.010$  ( $df = 48$ ) which means that the Digital Entrepreneur learning model is effective in optimizing psychomotor learning outcomes because the learning outcomes of the two groups have different learning outcomes and the experimental group has the same score. higher than the control group.

Based on the description of the results of research in the psychomotor domain, it can be explained that there are differences in student learning outcomes who study using the Digital Entrepreneur model in the experimental group with an average of 87.2% with the control group who learns using the ordinary learning model applied in APSI learning with

average results by 74.8%.

Psychomotor learning outcomes show that students who learn to use the Digital Entrepreneur learning model who have worked on projects 1 and 2 show a good average ability in planning project 1 and very well in project 2, the results of projects 1 and 2 show good categories and project activities. 1 and 2 show good category. Psychomotor learning outcomes show good average results in all aspects of the assessment of the digital entrepreneur project assessment. Thus the Digital Entrepreneur learning model and effective model tools for optimizing psychomotor learning outcomes.

The affective learning outcomes described that the experimental group had better psychomotor learning outcomes than the control group. Based on the three test results in the cognitive, affective, and psychomotor domains, it is possible to conclude that this learning model was effectively used for experimental classes in APSI courses that use digital entrepreneurship learning models.

A previous study stated in his research that students tend to learn the most in schools because it provides a formal learning environment but because schools have closed and most learning has become home based so students spend very little time in study. This has a negative impact on students for their learning achievement (Khan et al., 2022).

The expected accompaniment impact in implementing the Digital Entrepreneur learning model is the ability to carry out entrepreneurial activities through learning activities for the APSI course by applying literacy skills in the 4.0 industrial revolution era, namely big data literacy, technological literacy and human literacy.

The results of observations made to students who carry out learning activities for digital entrepreneur projects 1 and 2 show the ability to apply big data literacy. Students download the assignments given by the lecturer and upload assignments and reports through the website. The things that students do in this learning activity show that students have implemented big data literacy skills. Observations that have been made on technological literacy can be explained that students use information media with various technological media that can be accessed and operationalized. Students carry out business promotion activities using technology-based media, students direct the information obtained and sort the information before use, this shows that students

## 5. Conclusion

The development of the Digital Entrepreneur learning model shows the results that: a) The Define phase shows that the achievement of learning outcomes for APSI courses is not optimal due to the low use of application of student practice results, needs analysis in high category APSI learning, b) The Design Phase has designed learning models and support systems through the design, FGD, and revision stages, d) Develop is the phase of testing the validity and practicality as well as effectiveness through the application

already have the ability to assess technology-based information media by doing wise things in using technology.

It is known that students are proficient in using technology media, students can use digital tools in developing the projects they carry out, students carry out business promotion activities through technology-based media and show an attitude of understanding the benefits of using technology for entrepreneurship.

Humanity literacy can be observed through learning activities demonstrated by students in practice. Students demonstrate critical thinking skills through reasoning of the projects that will be chosen to be implemented, students' critical thinking can be demonstrated through sensitivity to business opportunities that will be carried out. Thinking about the possible risks that can arise from the selection of business opportunities made by students is shown by students in project selection and project planning. Creativity that appears in the form of ideas and ideas by optimizing the ability to create innovative ideas in the business being developed. When running a project students are trained to think of solutions to problems that arise during project work. Creative thinking is shown to solve problems in completing projects.

The ability to communicate that is seen in project activities is the main task of the lecturer in directing. There is still a sense of wanting to stand out in groups, as well as between groups, it can be seen that students are still not very capable of managing conflict in solving peer problems. Students should be trained more strongly in communication techniques in learning environments and activities. Meanwhile, some of the students' collaboration abilities appear to be able to contribute to learning. Oral and written communication through technological media has been demonstrated by students by training them to promote projects on community through social media and websites. The collaboration shown by students in groups increases during project work, students better understand the function of collaboration in groups to achieve project goals and success.

Analysis of competencies that must be achieved by students is carried out by reviewing the curriculum used and analysis related to what competencies must be mastered by students after using development products (Nuryadi et al., 2022).

of learning models in the experimental group, e) Disseminate is the dissemination phase which in this study was only limited to the experimental group as the research sample.

Learning evaluation is carried out by properly integrating the APSI learning section and the objectives of the learning model in training students' digital entrepreneurship skills in improving 21st century literacy skills.

From several analyzes carried out, the affective learning outcomes on each indicator showed an average result of

82.67 for the experimental class and 69.67 for the control class. It can be concluded that this digital entrepreneurship model can increase student motivation to become entrepreneurs with applications that they build themselves. The results showed that the digital entrepreneurship learning model was effective for use by students in higher education.

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