Effectiveness of Entrepreneur Digital Learning Model in the Industrial Revolution 4.0

Erdisna, Ganefri, Ridwan, Raimon Efendi, Mardiah Masril

Abstract— This research is based on studies and preliminary research that has been done, the research problem is as follows: Prioirity (needs) lecturers and students in the learning process Analysis of Information System Design in Vocational Education which concluded that they have high expectations of the learning process. Where lecturers and students have expectations of the learning process that can improve 21st century competencies. This type of research is Research and Development which refers to the 4D model. The analysis technique uses the Aiken'V test, and validity uses expert testing and Focus Group Discussion (FGD). The research findings are an Entrepreneur Digitals Learning Model (ERDIS) that is equipped with model books, teaching material books, lecturer manuals and student manuals. Models and support systems meet the validity criteria, are based on research and development models and are suitable for use by experts. The results of the analysis of the effectiveness of the cognitive domain showed a t-count score of 3,252> t table of 2,010 which means that Hypothesis (Ha) was accepted, the affective domain hypothesis testing showed a t-count score of 3,688> t table of 2,010 which was meaningful.

Index Terms— Entrepreneur Digital, learning model, effectiveness, 4 competence, 21 st century learning

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1 INTRODUCTION

The 21st century, known as the century of openness, has fundamentally shifted the order of human life. This has resulted in demands for the quality of human resources that are required to have competencies that are in harmony with the spirit of entrepreneurship as a superior character that is highlighted to be able to become a strong, resilient and characterized person so that they can compete in the era of globalization [1]. Therefore the learning process carried out should refer to the preparation of learning outcomes that have the competencies needed to compete in the 21st century.

Higher Education as an educational unit that has a strategic role to provide quality human resources has the responsibility to solve the 21st century competency challenge [2], [3]. The 21st century learning paradigm emphasizes the ability of students to find out from various sources, formulate problems, think analytically and collaboratively and collaborate in solving problems [4]. Through the process of education in higher education institutions that are obliged to organize education in a professional manner through the learning process must make innovations through development that aims to create learning output that is ready in the 21st century challenge. Thus a breakthrough in the learning process is needed to shape people who have a mind set 21st century is the task of education and those involved in the education process. This breakthrough and

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innovation is a must so that the quality of higher education graduates is not oppressed from the changes and developments of the times.

A coalition of business communications, education and policy makers in America called Partnership for 21st Century Learning develops learning frameworks in the 21st century that require students to have skills, knowledge and abilities in the fields of technology, media and information, learning and innovation skills as well as life skills and career [5], [6]. Based on the developed P21 framework, it implies that students can master a skill as well as the process of producing, synthesizing and evaluating information from a variety of subjects and sources of understanding. Students must demonstrate the ability of 3R namely Reading, Writing and Arithmatic and 4C namely Communication, Collaboration, Critical Thinking and Creativity [3]. In addition there are also competencies in mastering digital literacy by being able to utilize information and communication technology to improve the ability and performance of daily life, be independent in learning activities and the ability to use communication media to be able to easily collaborate in activities.

The form of the P21 framework was then integrated into the Common Core State Standards (CCSS) known as the 21st Century Skills which have been developed which can be seen in Figure 1. Based on these frameworks it can be explained that in this 21st Century Competence a student is encouraged to have an integration of academic knowledge core, critical thinking, and social skills needed in mastering multidimensional capabilities in the challenges of the 21st century. The challenges of the 21st century have changed the concept of competency formulation which is mastered by tertiary education graduates.
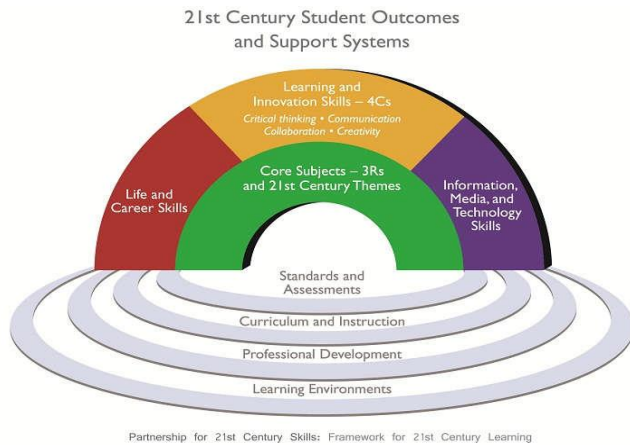
Fig.1. Partnership for 21st Century Framework
Source :Trilling and Fadel (2009)

The Industrial Revolution 4.0, universities are required to be able to produce quality and innovative generations and always learn to master the latest competencies. Not only that, universities are increasingly required to prepare their students for jobs that do not yet exist (future jobs). Graduates must start mastering new literacy in this era, namely data literacy, technology literacy, and human literacy. This new literacy in the Industrial Revolution 4.0 era encouraged implementation to become lifelong learners, to be able to adapt and develop well in facing global challenges in the Industrial Revolution 4.0 era and subsequent eras.

Lifelong learning is a concept, an idea, a main idea that takes place in an individual, in this concept learning does not only take place in formal educational institutions. Lifelong learning includes formal and informal patterns. It was also stressed that learning in the true sense is something that lasts throughout one's life [7]. Based on these ideas the concept of lifelong learning is often also said to be continuous learning. By continuing to learn, a person will not be out of date and can renew his knowledge, especially for those who are elderly. With this renewed knowledge, they will not feel competed by the younger generation, they will not become snile or senile early, and can contribute their expertise to life in their environment.

Challenges due to the changing view of education in the 21st century are also in line with Joseph Schumputer's view of world entrepreneurship experts who state that entrepreneurship is the engine of world economic power, therefore integration and creation of innovations in industrial units is needed as a result of the development of machines in technology [8], [9]. This view becomes valid at this time that creating entrepreneurship in the eyes of technology will seek sources of economic power in countries throughout the world. Entrepreneurship is the economic strength of a country, thus the formation of entrepreneurial character in the education process must be a concern in order to achieve excellence in 21st century competition [10].

Based on figure 2, its can be found that Lifelong Learning must support the goal of the Global EFA (Education for All), namely education for humans and the earth. In this 21st century tertiary education graduates must possess 16 skills consisting of basic literacy abilities, namely: literacy, numeracy, scientific literacy, ICT literacy, financial literacy, and cultural and civic

literacy. Ability or competence which consists of Critical Thinking,problem-solving, Creativity, Communication and Collaboration [11]. While the character values that must be possessed by graduates are Curiosity, Initiative, Persistence, Adaptability, Leadership, and Social and cultural awareness.
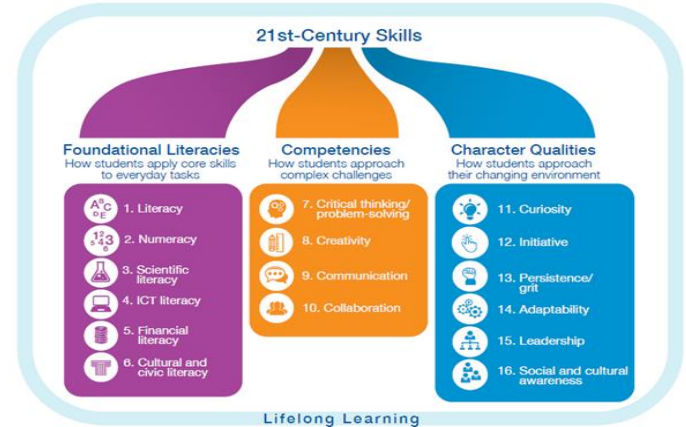

Fig 2 Lifelong Learning Chart (UNESCO, 2018

To realize government policies in order to support SDGs and global EFAs and lifelong learning, graduates must be prepared to become an entrepreneur (job creator) who has 21st century skills, then all courses are needed to be oriented towards entrepreneurship development. In this case, innovation and entrepreneurship provide a way to solve global challenges, build sustainable development, create jobs, generate and renew economic growth, and provide human welfare. Efforts to achieve the quality of vocational education graduates in accordance with the demands of the world of work, need to be based on a curriculum that is designed and developed with the principle of compliance with the needs of stakeholders. In line with a good curriculum design, the learning process carried out in class must also be designed as well as possible. This effort has also been carried out by many existing lecturers and researchers, but this long-standing phenomenon and discourse is still not in line with reality.

Changes in the order of life in this globalization era indirectly influence the reference and formulation of competencies that have been prepared in the Education curriculum. Especially the vocational higher education curriculum or vocational education traning. As a provider of Human Resources graduates at the professional level needed by the community with the philosophy of "ready to use labor". This is in accordance with the objectives of vocational education viewed from pragmatic is to meet individual needs for personal fulfillment and life preparation which is characterized by an emphasis on solving problems and thinking at a higher level, and the purpose of vocational education in terms of reconstruction pragmatism is to change work into more democratic, more proactive, fight against injustice and inequality in work problems [12].

The fact to answer the question of the world's challenges in industrial revolution 4.0 makes observers and practitioners of Vocational education to be more detailed in developing new skills that are adapted to the learning needs of the globalization era

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adjusting to the new literacy era of the industrial revolution 4.0. Experts predict that changes in work patterns will continue to occur more quickly. The impact of the industrial revolution 4.0 on the state, society, industry and companies is speed, breadth and depth, with the systemic impact of inequality being the biggest challenge. For this reason, this paper will discuss New Literacy in the formulation of competencies for vocational higher education as a step to change the formulation of innovations in vocational higher education [13].

Literacy is the ability to read and write, the development of literacy is very important to note, because literacy is an initial ability that must be possessed by each individuals to live life in the future. Old literature includes the competence of read write count. Whereas new literacy includes data, technological and human literacy. Data literacy is related to the ability to read, analyze and make conclusions of thinking based on data and information (big data) obtained. Technology literacy is related to the ability to understand how machines work. Application of technology and technology-based work of products to get maximum results. Human literacy is related to communication skills, collaboration, critical thinking, creative and innovative.

Literacy is an important part of student growth and development as an educational subject. Literacy is the ability to read and write. It must be understood that literacy is only limited to reading [14]. The word literacy cannot be separated from the word book, because it is said to be literated when we read a book. Even though literacy is not only by reading books, it can also be done when we read events that are happening around us, because literacy is also the ability of every individual to use their expertise [15]. In the digital age full of millennials, to be able to read we don't have to go to the library and don't have to buy to be read a book. With smart devices that are in our hands equipped with a myriad of applications can certainly be used to titrate. We can use these facilities that we can easily access wherever and whenever they are. So, there is no reason not to titrate today.

The new literacy movement is intended to focus on three main literacies namely, digital literacy, technological literacy and human literacy. These three skills are predicted to be skills that are highly needed in the future or in the era of the industrial revolution 4.0. The new literacy provided is expected to create competitive graduates by perfecting the old literacy movement which only focuses on improving reading, writing and mathematics skills. technological literacy is the ability possessed by combining several abilities in recognizing, processing and using and evaluating technology so that a person can have a more integrative awareness and quality related to the distribution of skills and competencies in the context of duties and obligations to society. Because for the development of various skills needed, students can understand the scope of information channels and resources to gain confidence in having the accuracy, reliability, and accuracy of information obtained, having greater control over their own ability to learn.

The data from the work done in learning can be taken and analyzed personally, educators, students and parents can find out what has been learned and the obstacles in the learning process of students in more detail through learning track record. Based on the studies that have been put forward, it can be concluded that in the Educational process of the industrial revolution era 4.0 big data literacy is used as a medium in optimizing 21st century technology-based learning processes.

Indicators of learning activities using big data literacy are Sharing physical and teaching activities with activities taking teaching materials and following learning instructions through internet-based media, Obtaining information and accessing teaching materials to take teaching materials from various information related to learning to improve ability literacy as a basis for critical thinking on a subject, Documentation of the evaluation of learning outcomes documented learning activities as a track record of learning activities through internet media by uploading learning tasks. Get questions and evaluation instructions through internet media. Carry out evaluation of learning through internet media, and Share information as literacy on big data as a whole share information on learning outcomes that have been done to other internet users as a track record of learning outcomes

Technology is a formative part of society and is an important factor in life today, both for individuals and for professionals. Technology has an influence on the economy, environment, culture, health, ensuring sustainable development and becoming a center of innovation in a profession. Technology responds to fundamental social challenges and provides mobility, communication and innovation, technology changes human habits, lifestyles and work processes that become both a blessing and a burden on human life [16].

Undeniable technology holds a key position for social change and determines how a person and a group of people view themselves and the world. Technology literacy is The ability of a person to work independently or cooperate with others effectively, responsibly and appropriately by using technological instruments to obtain, manage, then integrate, evaluate, create and communicate information [11]. Technology literacy and communication media in the 21st century rainbow skills scheme proposed by Trilling and Fadel [17] consists of; Information literacy in which students are able to access information effectively information sources and time efficient; evaluating information that will be used critically and competently; use and manage information accurately and effectively to solve problems. Media literacy: students are able to choose and develop media used to communicate, and ICT Literacy: students are able to analyze information media; and creating appropriate media for communication.

The goal of sustainable development stated by UNESCO [16] in the Lifelong Learning chart which was formulated as a guide to the sustainable development agenda aimed at meeting the demands of global leadership, there are four competencies related to how students can face complex challenges with four abilities namely Critical thinking, Creativity, Communication and Collaboration. These four abilities are indicators for a human being believed to be humanly able to conquer the challenges of the 21st century, these four abilities are called 4C competencies [18].

The main reason for developing the learning model of entrepreneurship in digital diera based on the new literacy era of the industrial revolution 4.0 is the emergence of the need for college graduates to be able to survive the digital era by having a new competency set to be able and skilled to become a

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professional who has critical and creative thinking as a driver of the digital diera industry. In addition, the emergence of the problem of weakening human interaction with fellow human beings as a bias from the use of technology that limits communication and collaboration between fellow human beings is also a matter of concern and finding a way out through a learning process that is laden with the cultivation of attitudes of interaction between fellow human beings. Another reason that is no less important is the emergence of new opportunities in digital diera with the internet of things that cause students to prepare themselves through innovative education based on the new literacy industry revolution 4.0 based on realistic activities in life.

2. METHOD

This research method is research and development. Development research is a model or research method used to produce certain products and to test the effectiveness of these products. This research intends to develop Entrepreneur Digitals Learning Model (ERDIS) to adjust the new literacy in the era of the industrial revolution 4.0 in the Information Systems Design Analysis (APSI) course.

The design or research design conducted refers to the development model proposed by Thiagarajan [19] which states that the development procedure with the Four D's framework is a modeling system that develops from previous models based on actual experience consisting of the stages of designing, developing, evaluating, and Deploying instructional products in education and training, FourD's model divides the instructional development process into four stages from Define, Desing, Develop to Disseminate.

Data collection techniques in the form of a questionnaire. Questionnaire is a data collection technique that is done by giving a set of questions or written statements to respondents to answer [20]. The questionnaire can be in the form of a multiple choice questionnaire and can also be in the form of an attitude scale. In this research, a questionnaire in the form of attitude and multiple choice scales will be used. The research instruments developed to collect data in this study are as follows; (1) Validation sheet, to determine the validity of the ERDIS model by experts. The validity analysis of the developed model was carried out using the Aiken's formula [21] based on the validation sheet, (2) The practicality sheet of the competency based learning model based on the lecturer and student responses was described using a Likert scale, (3) The effectiveness sheet to see the effectiveness of the model developed This is seen from the results of student learning and observation sheets by the observer of student activities when using the ERDIS model, the analysis is done by looking at improving student learning outcomes and activities before and after using the ERDIS model.

3. RESULT AND DISCUSSION

Data on the effectiveness of learning tools can be obtained from the analysis of several data collection instruments, including Analysis of Student Learning Outcomes, which include cognitive aspects of learning outcomes (knowledge). Assessors of learning outcomes from the general cognitive aspect are students'

intellectual abilities that can be grouped such as Higher Order Thinking Levels, Middle Order Thinking Levels, Lower Order Thinking Levels. Which consists of 6 levels that are revised anderson's including Remembering, Understanding, Implementing, Analyzing, Evaluating, Creating

Assessment data is also obtained from the affective aspects of learning outcomes (attitudes), where the assessment of learning outcomes of students of computer networks using Competency Based Learning models, in the affective domain (attitude) consists of several categories including; Critical Thinking, Communication, Collaboration, creativity.

Assessment data Psychomotor aspects of learning outcomes are abilities related to muscle and physical activities EJ Simpson [22] suggests that psychomotor aspects consist of seven levels of learning objectives such as origination (new movement patterns creativity), adaptation (modifies for special problems), complex over response (skillful performance permissions of complex, mechanism (performs simple acts well), guided response (performs as demonstrated, sets (relates cues/knows), perception (awareness of sensory stimulus). The learning outcomes of psychomorphic aspects in this study begin with students finding problems until the student makes a decision.

The cognitive domain is the domain of knowledge students possess after participating in the learning process. To test whether there are different levels of student knowledge in the control and experimental groups an assessment is carried out through an objective test on the competencies that are each presented in module 1 and module 2. Table 1 is the result of a description of the data level of student knowledge:

Table 1   Description of the Average Data on Learning Outcomes of the (Cognitive0

Statistics

		Eksperimen	Kontrol
N	Valid	25	25
	Missing	0	0
Mean		81.08	75.60
Median		81.00	75.00
Mode		79^a	75
Std. Deviation		5.283	6.564
Minimum		70	62
Maximum		92	87
Sum		2027	1890

a. Multiple modes exist. The smallest value is shown

Based on Table 1 above it is known that the average cognitive learning outcomes of the Experiment group (N = 25) was 81.08 and the control group was 75.60. The data was obtained from the sum of module 1 cognitive test results with an average score of 83 for the experimental group and 77 for the control group, while the results of the module 2 cognitive test obtained an average score of 80 for the experimental group and 73 for the control group. The description of cognitive learning outcomes shows that the experimental group has better learning outcomes than the control group.

Hypothesis testing for cognitive domain learning outcomes

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is performed using the independent sample t test. The results of data normality show the Asimp score. the significance of the KS test (Kormogorov Smirnov) was 0.865 for the experimental group data and 0.891 for the control group data, meaning that the data was assumed to be normal (the results of data analysis can be seen in the appendix). Hypothesis testing shows the t-test score of 3,252> t table of 2,010 (df = 48) which means that the Hypothesis (Ha) which reads there are differences in cognitive domain learning outcomes in the experimental and control groups at a significance level of 95%. The results of testing this hypothesis states that the ERDIS learning model is effective in optimizing cognitive learning outcomes.

The Affective Domain is the realm of attitude shown by students in following the learning process. To test whether there are different affective levels of students in the control and experimental groups an assessment is conducted through a Likert scale questionnaire referring to the assessment of the new literacy era of the industrial revolution 4.0, especially humanity literacy with C4 indicators namely critical thinking, creativity, communication and collaboration. Table 2 is the average result of the affective domain learning outcomes data description based on humanity literacy behavior of the industrial revolution era 4.0:

Table.2. Description of Learning Outcomes (Affective) Humanity Literacy assessment

Statistics

		Eksperimen	Kontrol
N	Valid	25	25
	Missing	0	0
Mean		82.24	67.68
Median		85.00	66.00
Mode		85	73
Std. Deviation		6.450	10.152
Minimum		66	54
Maximum		91	87
Sum		2056	1692

Based on Table 2 it is known that the average affective domain learning outcomes are based on the humanity literacy of the Experiment group (N = 25) of 82.24 and the control group of 67.68. The description of affective learning outcomes shows that the experimental group has better affective learning outcomes than the control group.

Hypothesis testing for affective domain learning outcomes is carried out using the independent sample t test. The results of data normality show the Asimp score. the significance of the KS test (Kormogorov Smirnov) was 0.355 for the experimental group data and 0.750 for the control group data, meaning that the data was assumed to be normal (the results of data analysis can be seen in the appendix). Hypothesis testing shows the t-count score of 3,688> t table of 2,010 (df = 48) which means that the Hypothesis (Ha) which reads there are differences in the learning outcomes of the affective domain in the experimental and control groups at a significance level of 95%. The results of testing this hypothesis states that the ERDIS learning model is effective in optimizing affective learning outcomes.

Learning outcomes in the psychomotor domain are assessed through assessments on the results of student practice in working on Digital Entrepreneur (ERDIS) projects 1 and 2. The assessment is carried out on three project planning activities, project appraisal and project activities. Each assessment result is:

Table 3. Project Asessment

Group	Planning of Project		Result of Project		Activity of Project	
	Proj 1	Proj 2	Proj 1	Proj 2	Proj 1	Proj 2
1	84	92	85	95	76	93
2	72	84	71	85	71	87
3	80	92	87	78	87	84
4	72	88	75	84	78	80
5	92	92	89	93	93	93
Avrg	90	81	87	81	87	90
	85,5		84		88,5	

Psychomotor learning outcomes show that students who learn to use the ERDIS learning model who have worked on Digital Entrepreneur (ERDIS) 1 and 2 projects show a very good average ability in project planning 1 and good in project 2, project results 1 and 2 show the categories good and project activities 1 have good and very good results on project 2. Thus based on psychomotor learning outcomes show good average results on all aspects of the assessment assessment of digital entrepreneur projects. Thus the ERDIS learning model and model devices have effectiveness in optimizing psychomotor learning outcomes.

4 CONCLUSION

The development of the Digital Entrepreneur learning model (ERDIS) has a syntax with 8 learning phases namely: conception, cognition, needs analysis, business plan, product development, product revision, reporting, feedback. This learning is carried out to build a broad social system through learning interactions conducted between lecturers and students, students and students, students and the community as product users and students with the wider community in the concept of sharing and track record of learning outcomes uploaded on the ERDIS Model website. The social system that is built through this comprehensive learning is not limited in the classroom, but to the user community (consumers) in entrepreneurial digitals transactions, even in the unlimited form in the social system in the era of globalization through internet media through a track record of learning on big data.

The results of the analysis of the effectiveness of the cognitive domain showed a t-count score of 3,252> t table of 2,010 which means that Hypothesis (Ha) was accepted, the affective domain hypothesis testing showed a t-count score of 3,688> t table of 2,010 which meant that Hypothesis (Ha) at the 95% significance level . The results of research in the psychomotor domain through the ERDIS 1 and 2 project appraisal are in the Good category, this means the product is worth the effectiveness.

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