Research Article

Developing Blended Learning Model in Vocational Education Based On 21st Century Integrated Learning and Industrial Revolution 4.0

Nizwardi Jalinus[1], Unung Verawardina[2], Krismadinata[3], Rahmat Azis Nabawi[4], Yudi Darma[5]

[1]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., Padang Utara District, Padang City, West Sumatera 25132, Indonesia
[2]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., Padang Utara District, Padang City, West Sumatera 25132, Indonesia
[3]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., Padang Utara District, Padang City, West Sumatera 25132, Indonesia
[4]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., Padang Utara District, Padang City, West Sumatera 25132, Indonesia
[5]KIP PGRI Pontianak, Jl. Ampera No.88, Sungai Jawi, Pontianak Kota District, Pontianak City, West Kalimantan 78116, Indonesia
*[1] nizwardi@ft.unp.ac.id

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Abstrct: This study aimed to develop a blended learning model in vocational education. This research used the stages of ADDIE model. The research was carried out at Universitas Negeri Padang, Indonesia. The instruments used were questionnaires, observation sheets, and cognitive, affective, and psychomotor tests. The results were (1) Blended learning models include: (a) the philosophical component of essentialism and pragmatism; (b) learning theory: behaviorism, cognitivism, and connectivism (c) the 4C component of communication, collaboration, cooperation, and creativity; (d) component of the industrial revolution 4.0: includes learning with digital elements with data literacy, technological literacy, and human literacy. (2) The blended learning model is centered on learning done offline and online makes it has a clear proportion of learning patterns. The flexibility of learning anytime and anywhere through face-to-face communication, as well as online interactions using online chats and forums to explore critical thinking through discussion. It also includes elements of students to be creative and innovative in projects and project improvement, as well as online teaching materials that are made interesting by the presence of multimedia components (text, images, and videos). (3) The result product is in the form of a model book, lecturer manuals and student guides, and textbooks, which are declared valid and practical so that the blended learning model can be applied in learning. (4) The achievements found are related to cognitive, affective, psychomotor and 4C abilities.

Keywords: blended learning, vocational, HOTS, 4C

1. Introduction

Vocational education is an investment in the future because the skills learned by students in the entire process of vocational education can be utilized to enter the working world. According to (Sudira, 2018) vocational learning in the XXI Century is time to design, develop, and implement in response to the era of disruption, both on basic competencies, indicators of competency achievement, learning objectives, learning media, learning methods, and learning strategies that need to be developed and adjusted to the needs era of disruption (Novaliendry et al, 2015). Therefore, vocational education must be able to face the current era of disruption.

The development of the industrial revolution 4.0 enables the innovation of learning, one of which is online learning to facilitate learning activities without being limited by space and time. Through online learning, students are able to carry out education that can be accessed anywhere and anytime despite the Covid-19 outbreak that people must avoid direct contact. Learning in the current era requires a transformation of online learning in which the role of instructors as facilitators can easily update teaching materials and learn flexibly (Verawadina, et al, 2020; Krismadinata, et al, 2020).

The diverse needs of praxis in vocational learning encourage research and development of good learning model. The one that is needed in industrial revolution 4.0 is blended learning (Nasir, 2018). The concept of blended is known by different names such as hybrid, blended, mixed and mixed learning (Picciano, 2014). Blended learning itself is generally widely accepted as an integrated approach to learning with traditional face-to-face approaches and which is supported through web-based or online computers (Olivier, 2013).

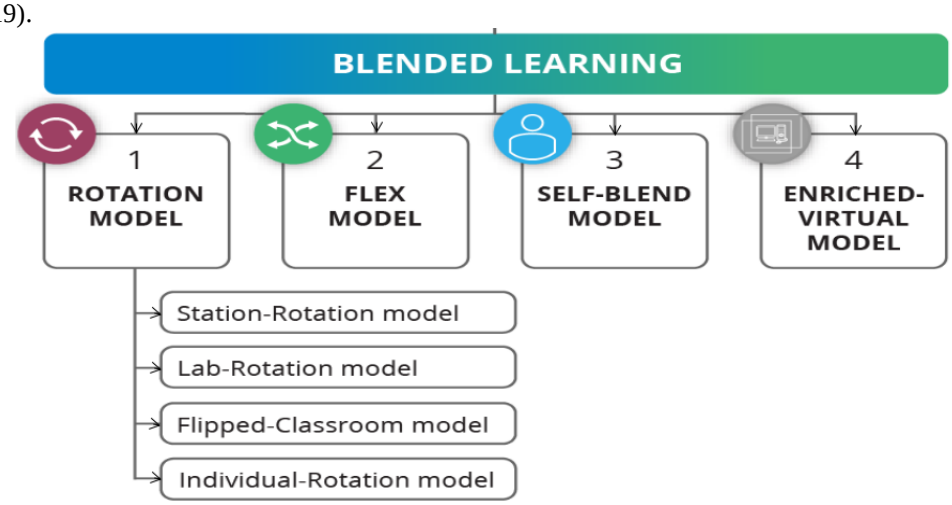
The blended learning model is a modern learning model that is popular in universities, which combines online and face-to-face environments, aimed at enhancing learning with the adoption of new web technologies (Bauk, Šćepanović, & Kopp, 2014).

Blended learning model has the advantage of being able to create a learning system that focuses on student centered learning (SCL). Therefore, so students construct their own knowledge with various sources such as textbooks, journals, CD ROMs, videos, television, websites, social media, blogs, LMS, and others (Zainuddin, and

Halili, 2016). Moreover, there is greater time flexibility in Blended Learning (Ho & Thurmaier, 2006); (Gedik, et al, 2006). Blended learning supports students to interact not only physically in the classroom but also through online connections via intrenet outside the classroom. (Zainuddin, & Keumala, 2018).

Therefore, this type of learning allows students to increase learning interactions with teachers and other students. The findings of (Muhamad Azhar., Mohamad, & Amri, 2013) stated that online learning gives a better impression to students in vocational and career matters. Other HOTS findings in students who have learned through blended learning are far better than traditional learning (Yaniawati, 2013). Blended learning plays an important role in providing effective learning in vocational education. The results of the study of (Sahin, 2010) revealed that blended learning plays a role in the scope of vocational, educational organizations and workplaces, so it can be used for vocational training based on the development of skills at whatever level is meant by the HOTS level.

Pre-existing blended learning models are divided into several categories consisting of rotation model, lab rotation, flipped classroom, individual rotation, then flex model, self-blend model, and enriched virtual model. (Staker, & Horn, 2012); (Graham, Henrie, & Gibbons, 2014); (Saadoon et al., 2017); (Kocour, 2019); (Shamad & Wekke, 2019).

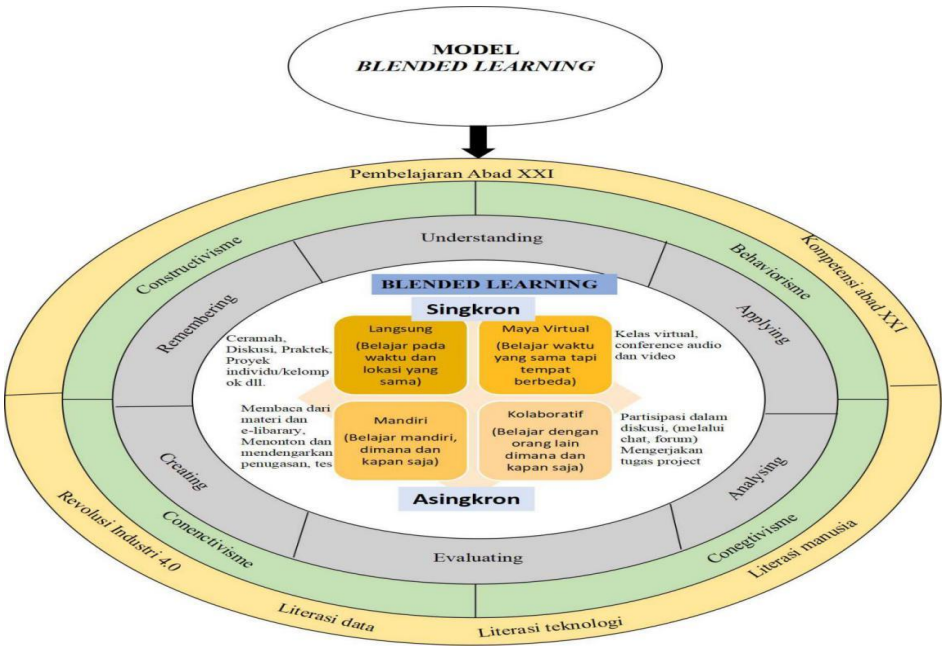


In general, the blended model in Figure 1 has various limitations from the pre-existing blended learning model. There are gaps that have some weaknesses in developing a blended learning model such as learning stages, the proportion of blended learning, the application of blended learning as a supplement, complement, and substitution. Online-based learning that only uploads material online other than interaction through discussion which is still minimal, for example, there is no video conference that can be a virtual discussion, feedback has not been measured in the form of HOTS evaluation, blended learning that does not contain elements of XIIcentury competence like critical thinking, creative, problem solving, and others. To answer the problem of the blended learning model, the development of a capable model that includes novelty from previous research has been carried out, which provides a solution to the limitations and weaknesses that occur.

Furthermore, as another example the development of the flipped classroom model that has been developed by (Boa, et al, 2018) about Blended Socratic Method of Teaching (BSMT), the development of this model departs from blended learning to improve critical thinking, in which this research is based on the lack of Critical thinking skills of students so as to develop a BSMT learning model intended to foster critical thinking skills, the model produces learning syntax that is able to foster critical thinking, such as syntax 1). Group assignment, 2). Analysis and writing of case studies, 3). Group presentation of case analysis in class; 4), Socratic discussion/questioning in class and posting the case study on the class Facebook account; 5). Online Socratic discussion/questioning. This model also positions students as the center and teachers as facilitator. The discussion can motivate the learning environment and stimulate students to develop and improve their critical thinking.

There is a gap from the limitations of research that is the need for the concept of blended learning patterns when learning in the classroom and outside the classroom/online. Teacher must be able to become a facilitator in student centered learning so the teacher must be able to provide feedback. The form of discussion which is only in the form of text alone is not an interesting content and the unavailability of supporting resources in the form of references in carrying out online discussions. This model is not favored by the students.

From the various advantages of blended learning that have been revealed by experts, it makes one of the important recommendations for developing a blended learning model especially in modern learning model to use in the era of the XXI century and the era of the industrial revolution 4.0. The following concept is adapted to develop a blended learning model:



Based on Figure 2, the concept of the modern blended learning model isbased on XXI century learning that occurs in vocational education which contains various competencies such as critical thinking, able to solve problems, creative, innovation and others. In addition, the transformation of teaching and learning activities in the industrial revolution 4.0 such as data literacy, technology literacy, and human literacy. Then, related to cognitive such as low order thinking (remembering, understanding and applying) to high order thinking (analyzing, evaluating and creating), and there are settings for learning synchronous and asynchronous learning that includes face-to-face learning in class and online, so learning can occur flexibly anywhere and anytime connected with each other in digital form. There are also collaborative discussions, projects, interactions, evaluations and various learning resources that can stimulate students. It also positions students who are able to construct their knowledge independently. This independent spirit will make students more adaptable, focused on learning, able to complete all assignments and increase learning achievement (Lubis et al., 2019; Vitriani, et al, 2019; Nofrianto, et al, 2020).

The basic framework for developing the model can be seen in Figure 3

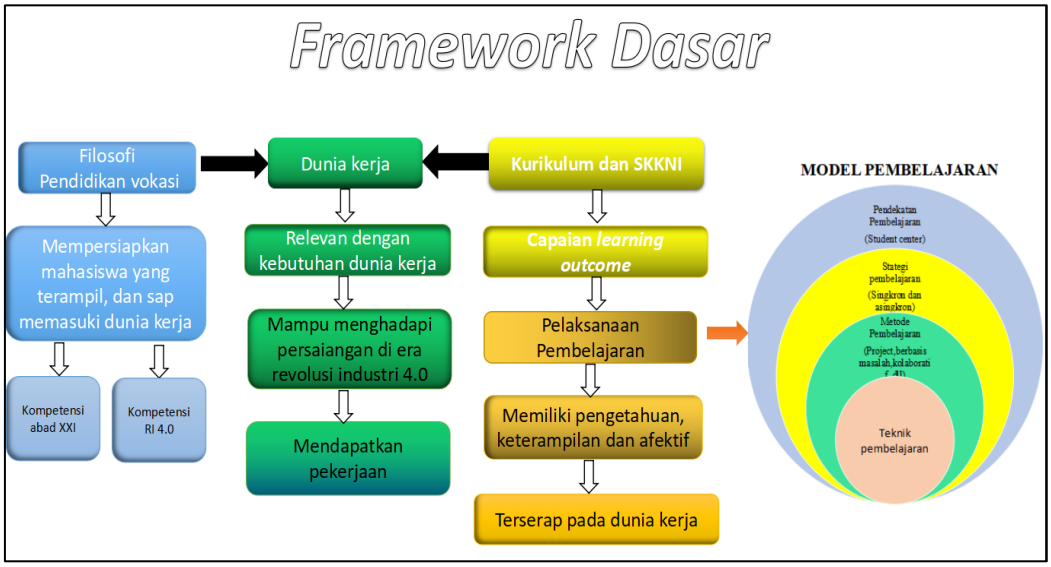


Figure 3. Basic framework of model development

Based on Figure 3, the basic framework in developing this blended learning model is based on the philosophy of vocational education that prepares students to be ready to enter the working world that fosters the competence of the XXI century and the industrial revolution 4.0. These competencies are relevant to the needs of the world of

work that are integrated in the curriculum and learning outcomes of the course. To achieve learning outcomes of the course in the implementation of learning in accordance with the stages in the right learning model, so that learning outcomes are achieved, until finally students have the competency to be absorbed in the working world and be able to compete in the current era. It is also based on a unity in the learning model that includes approaches, strategies, methods, learning techniques and elements of application and model development. The aim of the research was to develop instructional designs of blended learning models in vocational education that contain elements of learning in the XXI century and the era of the industrial revolution 4.0.

2. Literature Review

1. Blended Learning Model

The need for the development of vocational learning concepts in the XXI Century to face the era of the knowledge-based working world, the digital era, the ICT era and the era of disruption is very urgent and essential (Sudira, 2018). Therefore, redesigning the basic model of vocational education needs must be done. Vocational education requires changes in the way of teaching and learning, changes in technology, skills in accordance with industry needs, work skills and life-long learning skills, teachers guarantee the need for design, adoption and implementation of blended learning (Machumu et al., 2016).

Based on research by (Sahin, 2010) on blended learning in vocational education: An experimental study, revealed that blended learning can play an important role in the scope of vocational, educational organizations and workplaces. Therefore, this can be used for vocational training based on the development of skills at any level, and the results of implementing

the blended learning model in the vocational field itself can produce positive results. With Blended learning model students can learn anytime and anywhere, can access material repeatedly, do exercises and discuss and communicate with teachers outside of online learning hours via the internet, students also get more learning material both face to face and online (Utami, 2018). Further findings from (Utami, 2018) in his research revealed that the blended learning model is effectively used as a learning model in vocational schools.

2. Learning in the XXI century

In the XXI Century, innovative capacity and creative enthusiasm are fast becoming a requirement for personal and professional success. The competencies are critical thinking, communication, collaboration, and creativity. The importance of critical thinking skills is to ensure students can achieve success inside and outside the classroom. Communication skills are needed to produce graduates who are able to articulate thoughts and ideas effectively using verbal, written and nonverbal communication skills, listening effectively to decipher meanings, including knowledge, values, attitudes and intentions, using communication to inform, instruct, motivate and persuading, using various media and technology, communicating effectively in diverse environments (Trilling, & Fadel, 2009).

The power of collaboration is to improve efficiency not only in teaching and learning but also in all paths of life after graduating from school. (Killen, 2013)

The ability of student to work together to solve problems and to work effectively and respectfully in teams to achieve shared goals and to assume joint responsibility for completing assignments (Hixson, Ravitz, and Whisman, 2012). Creativity is defined as a way of thinking that uses various techniques to create new ideas and useful concepts, describe, refine, analyze, and evaluate original ideas for maximum results (Roekel, 2011).

3. Industrial Revolution 4.0

Vocational education must be able to face the transition of the industrial revolution 4.0, therefore, the learning also includes XXI Century learning competencies that are in line with the role of vocational education to produce labor according to the needs of the working world (Verawardina and Jama 2018); (Giatman et, al, 2019); (Kiong,et al, 2020).

In the era of the industrial revolution 4.0, higher education is demanded to be able to overcome the turmoil of changes that occur due to digital transformation. To face the challenges, universities need to have successful strategies (Hussin, 2018). Data literacy, technological literacy, and human literacy are considered to be the competencies needed to face the industrial revolution 4.0 (Wahidin, 2018). Therefore, vocational education in this case must have thought about the stages that must be taken in the learning process, which integrates digital learning, such as data literacy regarding the availability of broad information such as big data, technology literacy such as using technology in learning and students produce a product of technology and human literacy where students can work together and have a sense of responsibility.

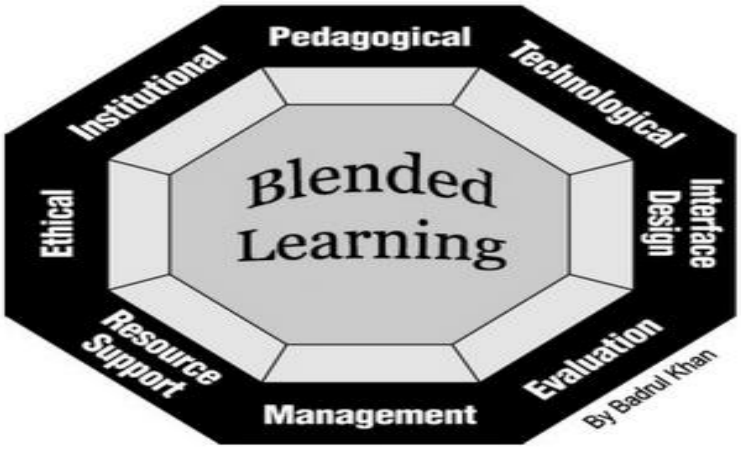
4. High Order Thinking Skill (HOTS)

The development of technology and the occurrence of economic changes shaped the work outlook for students in vocational education who prepare themselves to instill high-level thinking (HOTS) in preparing for labor according to the needs of the XXI Century. It is no longer enough for vocational education graduates to know basic facts and skills. In order to be successful students must master in decision making, prioritizing, developing strategies and collaborative problem solving.

According to (Anderson, & Krathwohl, 2001), thinking skills include higher order thinking and lower order thinking. HOTS involve higher level thinking that involves something new with facts, understanding them, drawing conclusions, connecting them with other facts and concepts, categorizing them, manipulating them and uniting them in new ways (Thomas, & Thorne, 2009). HOTS in the cognitive domain is analyzing, evaluating, and creating (Susilaningsih, Setyowati, & Diputera, 2018) while thinking at the lower level is to remember, understand, and apply (Anderson, & Krathwohl, 2001). Characteristics of high-level thinking is critical thinking and creative thinking (Conklin, & Manfro, 2012). One way to improve HOTS is the application of student-centered learning (Lubis et al., 2020).

5. Blended Learning Model

The Khan's Octagonal Framework is used for blended learning programs that can be used in educational institutions in general, which have eight dimensions namely institutional, pedagogical, technology, interface design, evaluation, management, resource support, and ethical (Khan, 2005)**.**



The relation with educational practice can be seen as follows (Staker, & Horn, 2012):

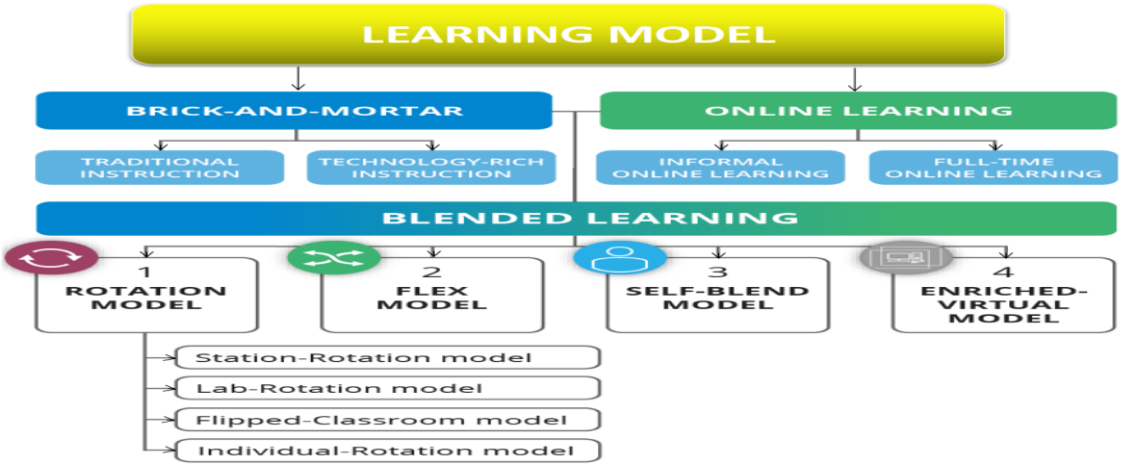


Figure 5. Blended learning in relation to other education practices

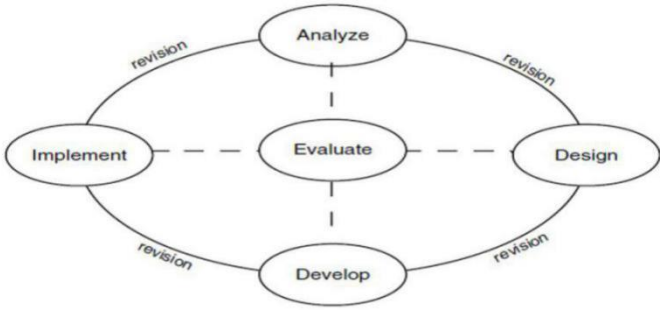
Based on Figure 5, the Brick-and-mortar section is a traditional instruction and an instruction using technology, both of which are combined learning to create a blended student learning experience. In traditional instruction learning activities are centered on the teacher. Learning takes place using textbooks, lectures, and individual

written assignments. Learners are adjusted for their age and abilities. Whereas Technology-rich instruction is learning that occurs with traditional teaching, but uses digital enhancements such as electronic whiteboards, broad access to Internet devices, cameras, digital text books, the Internet, and online lesson plans.

Online learning section consists of Informal online learning. An educational program where students can use technology to learn outside the classroom at any time. For example, students use online videos to view subject matter, whereas Full-time online learning is a structured educational program where content and instructions are delivered via the Internet, and students do not need to come to school, they can be remotely monitored online. However, during the exam, students can attend directly to school. Based on Figure 4, it can also be seen that the types of blended learning model are divided into several categories consisting of rotation model, lab rotation, flipped classroom, individual rotation, then flex model, self-blend model, enriched virtual model (Staker, & Horn, 2012); (Graham, Henrie, & Gibbons, 2014); (Saadoon et al., 2017); (Kocour, 2019); (Shamad & Wekke, 2019).

3. Methododolgy

Research and development is the process of researching and developing a product so that it can be used in educational institutions. (Gay, Mills, & Airasian, 2011). Thus, Research and Development is identical to conducting a research related to product development with various processes or stages that must be carried out. This research used ADDIE stages as follows (Branch, 2009).



In detail the implementation of the study is illustrated in the following Fishbone diagram.

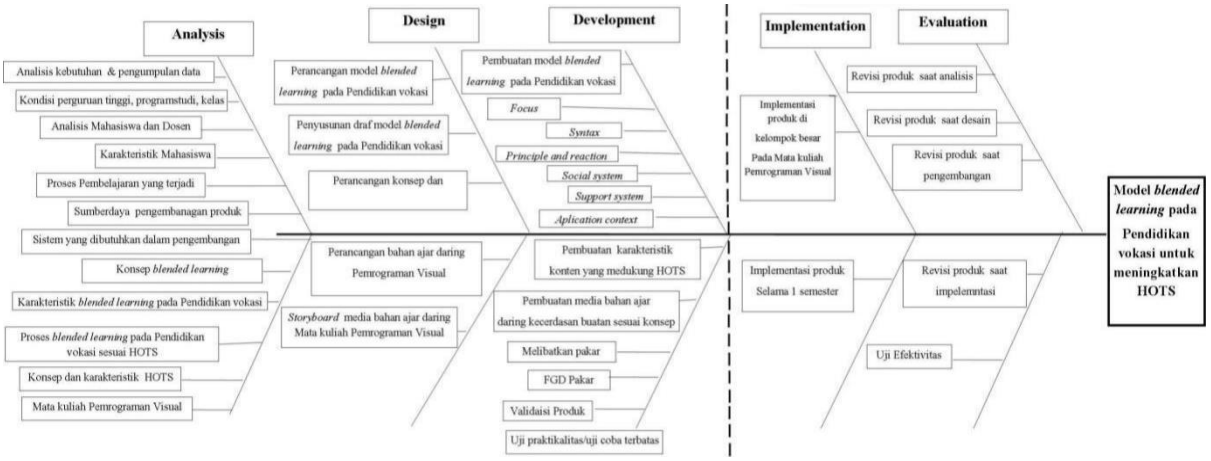


Figure 7. Fishbone Diagram

The research was carried out with ADDIE stages (analysis, design, development, implementation and evaluation). The research was carried out in the Informatics Engineering Education Study Program at Universitas Negeri Padang. Subjects are experts in the field of learning models, experts in vocational education, media experts, and linguists. It also involves subjects from students and lecturers. The instruments used were questionnaires, observation sheets, and cognitive, affective and psychomotor tests. The data analysis was done using literature content analysis which is reviewed according to the needs of developing a blended learning model. The model validation used focus group discussion (FGD) techniques. The data needs for model development were collected using literature studies on types of blended learning, CAR philosophy, CAR theory, learning theory, XXI century learning that includes 4C competencies (critical thinking, communication, collaboration, and creativity), learning elements of the industrial revolution 4.0, HOTS, as well as using descriptive and infinite statistical analysis.

4. Results and Discussions

A. Model Concept Framework

The basic framework in developing this blended learning model is based on the philosophy of vocational education that prepares students to be ready to enter the working world that contains the competence of the XXI century and the industrial revolution 4.0. Through online learning students can still carry out education that can be accessed anywhere and at any time despite the Covid-19 outbreak that people must avoid direct contact. The starting point for the development of blended learning is adjusting to the standards of blended learning that contain principles of pedagogy, assessment, interaction and involvement, having access to various resources (Saliba, Lynnae, & Cortez, 2013).

The location of the variables developed by this blended model, online and offline learning, the HOTS element, includes elements of 4C competencies and the industrial revolution 4.0. This research adopted some researches and combine several pre-existing frameworks. Contains novelty by taking slices of the existing blended learning model namely flipped classroom and self-blend with the existence of a learning orientation that prepares the scheduling of offline and online learning through clear learning instructions, such as material learned each week, and there are instructions for learning activities online and offline. Contains project making where each project topic is interrelated with the previous project material and there is an increase in the project. Then, there are online and offline group discussions in the presence of an element of critical thinking (making assumptions, decision making, etc.), adding a virtual discussion element through video conferencing and discussion forums. Collaborate through groups on projects that contain elements of collaboration in the XXI century on 4C competencies. Working on project assignments so students can innovate and be creative in making projects. There is an element of technological literacy in producing products through projects and related data literacy in accessing material as a complement to be accessed online. There are online teaching resources and teaching materials such as YouTube, sites, etc.

The model is supported by learning theories such as constructivism, behaviorism, cognitive, and connectivity. By learning online through blended learning independently, students can construct their knowledge by accessing the materials and resources available with the instructor as a facilitator. Blended learning is able to provide a stimulus that is expected to change the behaviorism of students through stimuli that are in e-learning. It is also supported by connectivism learning theory which in this case is related to digital learning where blended learning is that students are able to connect with one another globally through technological assistance. Through blended learning, a lot of materials are provided so that students can learn to find broad information so as to increase their knowledge broadly.

In addition, in applying and developing a model is inseparable with the approach, strategies, methods, and learning techniques (Sudira, 2018)(Novaliendry et al, 2015). The learning model must contain five elements in the development of models such as syntax, social system, support system, reaction system, instructional impact, and accompaniment impact (Joyce & Weil, 1980).

The syntax of the blended learning model has 6 syntax of the learning model, namely 1) Learning Orientation; 2) Access content material and activities; 3) Group assignment project; 4) Discuss offline and online to project monitoring; 5) Test the results of the project face to face in class and 6) Evaluation. The learning approach to applying the model is through a student-centered learning, which encourages students to learn independently and capable of constructing their own knowledge.

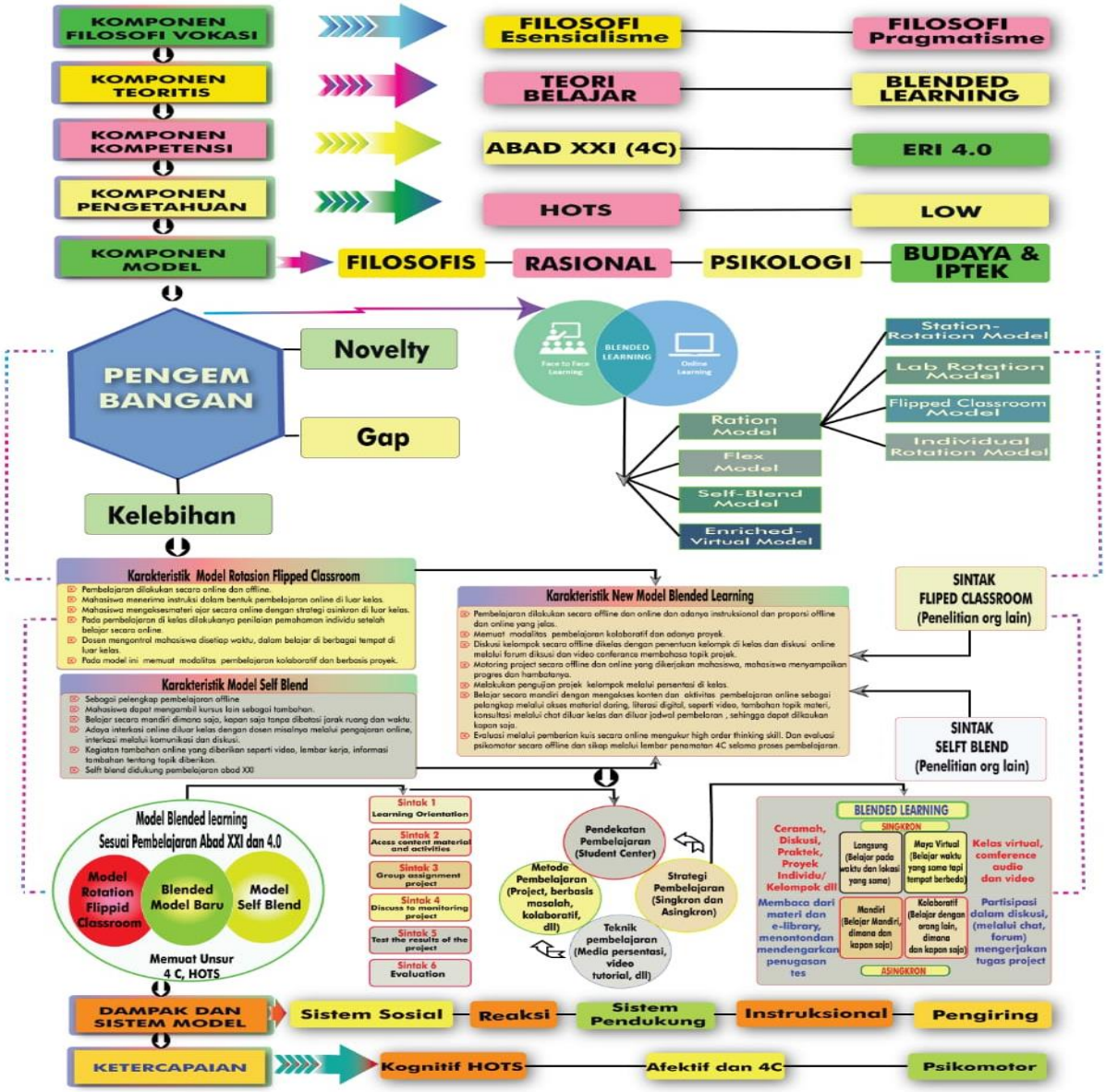
Blended learning strategies can be synchronous and asynchronous, and even both can be combined, so that learning can occur in class together and outside the classroom individually and real-time together. Blended

learning has the potential to combine the power of synchronous and asynchronous learning (Ho, et al, 2006). On one hand, synchronous tools are very important to support students in getting to know each other and for task planning, on the other hand, for discussing complex problems, when it is time for reflection is needed, asynchronous tools are preferred (Genís Pedra, M., & Martín, 2013). One can use project-based and collaborative learning for learning methods. As for learning techniques using media in the form of e-learning websites, material in the form of PowerPoints, videos.

The contribution of this research can create blended learning that is in line with learning in the industrial revolution 4.0 and XXI century learning. For instructional impact, students gain abilities such as: a). able to analyze concepts, solve problems, identify, so that they can distinguish and organize, b). able to evaluate problem solving and evaluation programming, able to reason, make assumptions, able to make conclusions and critical thinking, c). able to create a program project in which there is an element of creativity and creative thinking, such as planning, building and producing products in the form of programs and can have a high level/HOTS.

Other impact of students can learn online and offline, flexibility occurs in learning, group discussion, collaboration, responsibility, ability to solve problems, and critical thinking. Students also make products from field studies with innovative student creations.

The conceptual framework of the blended learning model is as follows:



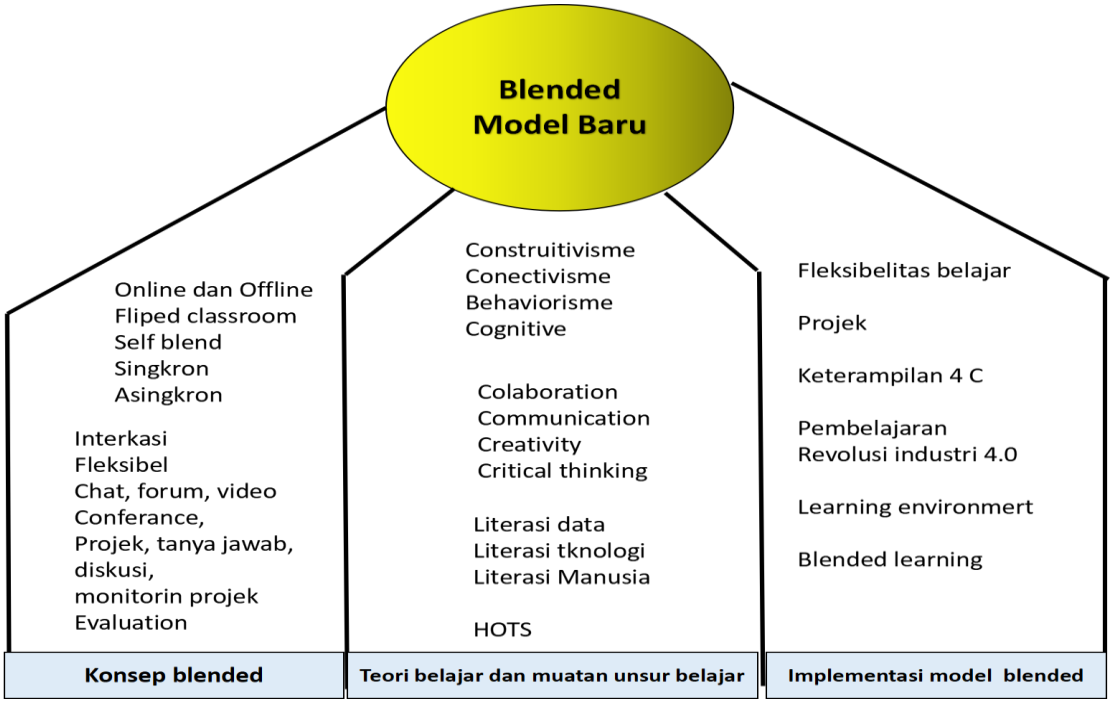


Figure 9. Blended learning Hypothetical Model

Based on Figure 9, in this blended learning model where learning is done face-to-face offline and online, learning can be flexible, with face-to-face communication facilities, as well as online interactions using chat and forums, evaluation in the form of questions according to HOTS, assignment activities to collect student assignments to create programs and links as sources of information, as well as online teaching materials. With this model, the existence of projects raised student HOTS, students can produce a creative product, able to solve problems through case studies in the field outside the classroom, able to learn relevant to the needs of the product in field. Students can also learn to collaborate with each other for mutual discussion. Able to hone to communicate for example through teamwork and when doing a presentation.

Being able to think critically through analyzing problems, through discussion that builds critical thinking ideas, able to make conclusions. On the other hand, students can also interact with each other face to face in class and online. Students implement learning in the industrial revolution 4.0. with digital learning, the existence of data literacy through learning sources, technology literacy using technology for example using e-learning websites, publishing products made to YouTube to be shared with outside audiences.

To innovate, it requires learning skills of the XXI century, expressed as learning skills for life from time to time that requires the development of creativity, critical thinking, collaboration, communication, celebration (Sudira, 2015). In addition, it is also a provision to be able to compete in the future era, meant in the industrial revolution 4.0. Produce achievements that are able to think with high order thinking skill which include being able to analyze, able to evaluate problem solving, able to make conclusions by making decisions such as critical thinking, able to create a program in which there are elements of creativity such as formulating, planning, producing.

C. Resulted Product

The resulted product from the development of blended learning model are in the form of (1) model book: exploring the development of blended learning model, types of pre-existing blended learning model, blended model developed, containing the stages or syntax of blended learning that contains syntax. (2) lecturer handbook: which contains teaching stages for the lecturer to apply the blended learning model, includes an instructional analysis concept map, the application of the blended learning model, syllabus, semester learning plan, instructions for using the lecturer guidebook in visual programming learning, evaluation of unit learning events lectures and use of e-learning. (3). student handbook: contains learning activities of the blended learning model in visual programming courses, an explanation of the implementation of the blended learning syntax model, evaluation of learning, student learning activity sheets and the use of e-learning students. (4). Visual programming textbook: contains the subject matter of visual programming that discusses the introduction of java programming, the concept of object-oriented programming, the basic concepts of visual programming, components and objects, attributes and variables in visual objects, giving methods, the concept of even handlers programming, visual based

application design, visual programming (java) connectivity with database (MySQL), data base creation and report system.

D. Product Validation Results

The validity of the learning model as outlined in the products in the blended learning model is done through an assessment of the validator.

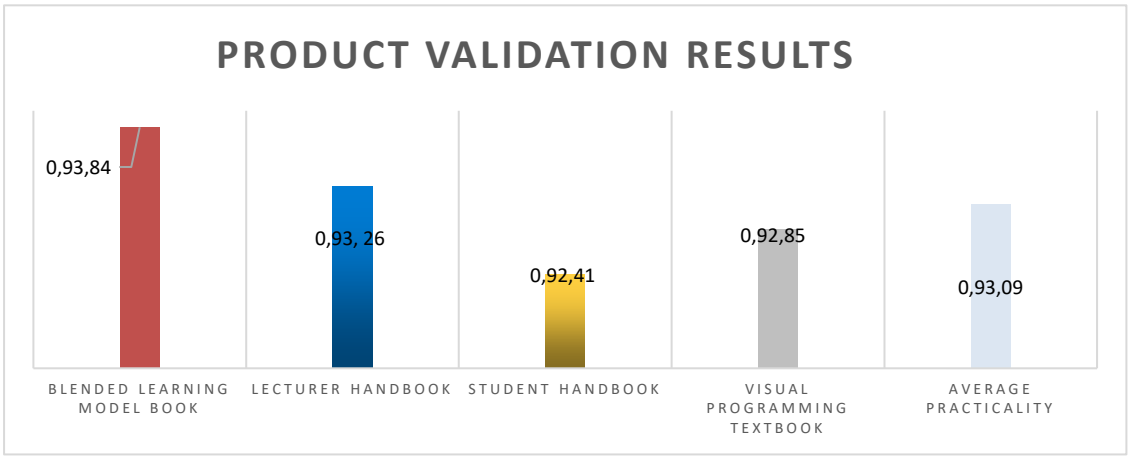


Figure 10. Product Validation

Based on Figure 10, the blended learning model book that has been developed is declared valid from all aspects of the assessment with a value of 0.93.84 with a very valid category. For the lecturer handbook, it is declared valid from all aspects of assessment with an average of 0.93.26 with a very valid category. While the student handbook is declared valid from all aspects of assessment with an average value of 0.92.41 with a very valid category. Last, the textbook is declared valid from all aspects of assessment with an average of 0.92.85 with a very valid category. The conclusion of validation level of the blended learning model in the blended learning model book, lecturer handbook and student handbook, and textbook average 0,93,09. Based on the results of the validity of a learning model developed in line with Aiken (1985) that the learning model > 82, the validity criteria can be interpreted to be very high, so it is concluded that the blended learning model developed is declared valid and can be applied in learning.

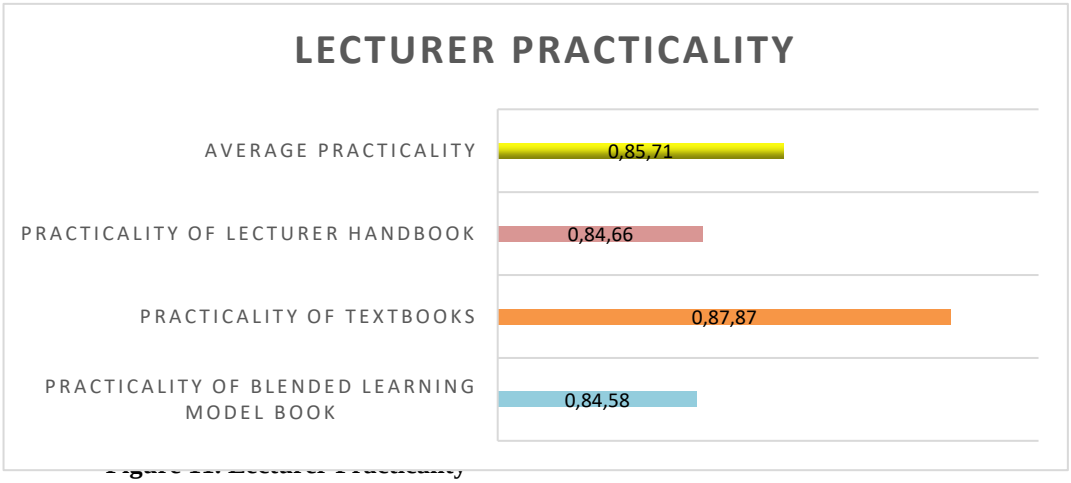
E. Product Practicality Results

The results of practicality based on the assessment of lecturers and students are as follows.

1) Practicality Based on Lecturer Assessment

For practicality results based on the assessment of 2 lecturers of Informatics Engineering at Faculty of Engineering, Universitas Negeri Padang, and 1 Lecturer at IKIP PGRI Pontianak, based on filling out the questionnaire conducted by three lecturers of visual programming courses.

For the results of testing the practicality of each product shown in Figure 6 as follows:



Based on Figure 11, it is known that each practicality result in the model book is 0.84.58, while the practicality in the textbook is 0.87.87 and the practicality in the guidebook is 0, 84.66. The results of overall practice have an

average value of 0.85.71 with the Practical category of all the products developed, so it can be said to be feasible to be applied in learning.

2) Practicality Based on Student Assessment

For practicality results based on the assessment of 5 students of Informatics Engineering Education Study Program, Faculty of Engineering, Universitas Negeri Padang, based on filling out questionnaires in visual programming courses. For the results of testing the practicality of each product shown in Figure 7 as follows:

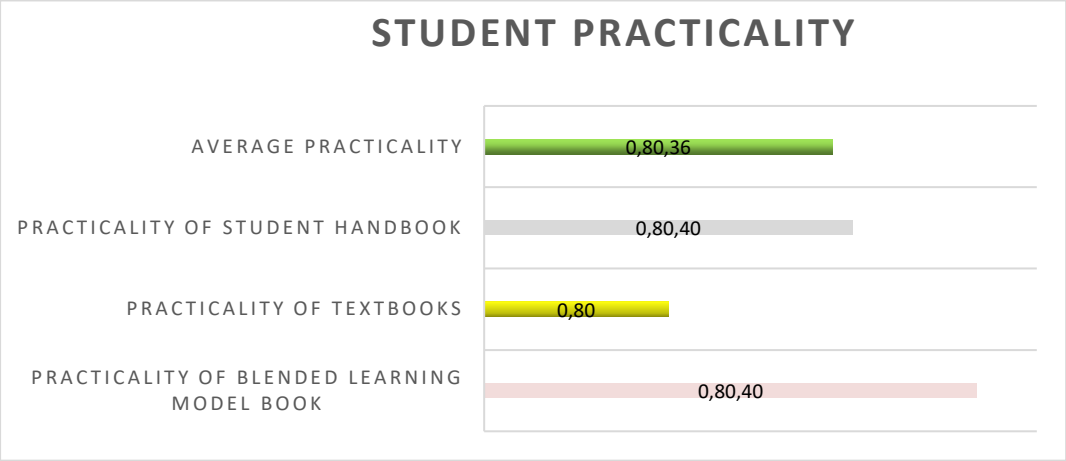


Figure 12 Students Practicality

Based on Figure 12, it is known that each practicality result in the model book is 0.80.67, while the practicality in the textbook is 0.80 and the practicality in the guidebook is 0, 80.40. The overall results of the practicality have an average value of 0.80.36 with the Practical category of all the products developed, so it can be said to be feasible to be applied in learning.

Based on the results of practicality to the lecturers and students in developing the blended learning model, the results show the overall practicality of the blended learning model book, student handbook, lecturer handbook, and textbook classified as practical. While the results of practicality of students classified as practical, in line with Purwanto (2010) that if categorized as practical, the product can be used to be applied in learning.

F. Effectivity Results

1). Cognitive

Test analysis for the improvement of HOTS student learning outcomes using the results of the pretest, post-test, gain and N-gain. Gain is the difference between the pretest and posttest scores. To show the quality of HOTS improvement and cognitive learning outcomes of students in visual programming subjects used the normalized average gain formula. Ngain (normalized gain) is used to measure the increase in HOTS results between before and after learning. To show the increase in HOTS the difference between the scores of the two groups of students can be seen in the following histogram:

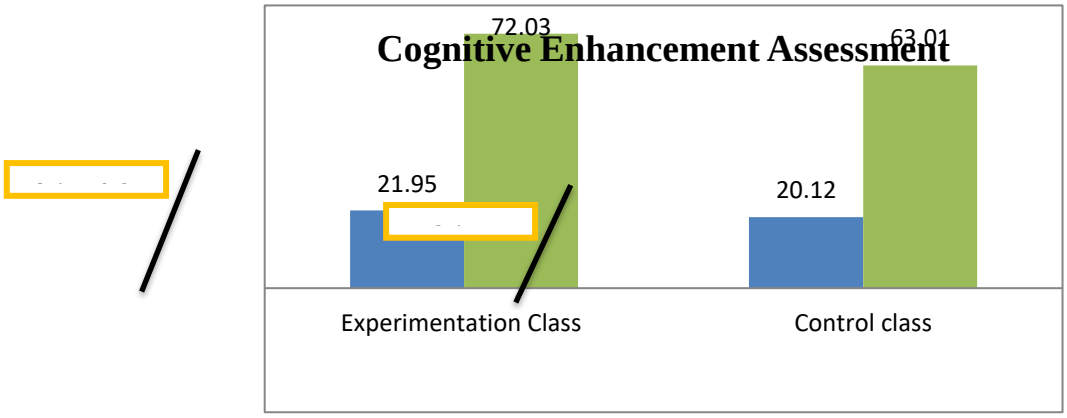


Figure 13. Histogram of Cognitive Aspects of Improved Learning Outcomes

In the pretest experimental class of 21.95 and posttest of 72.03 for the improvement of the HOTS the value of 0.64 is in the medium category. While in the control class, the pretest value was 20.12 and the posttest was 63.01 for the increase of 0.53 in the medium category.

2). Affective

In the affective assessment to determine the extent of student mastery of the attitudes and behavior of students in learning in visual programming courses as follows:

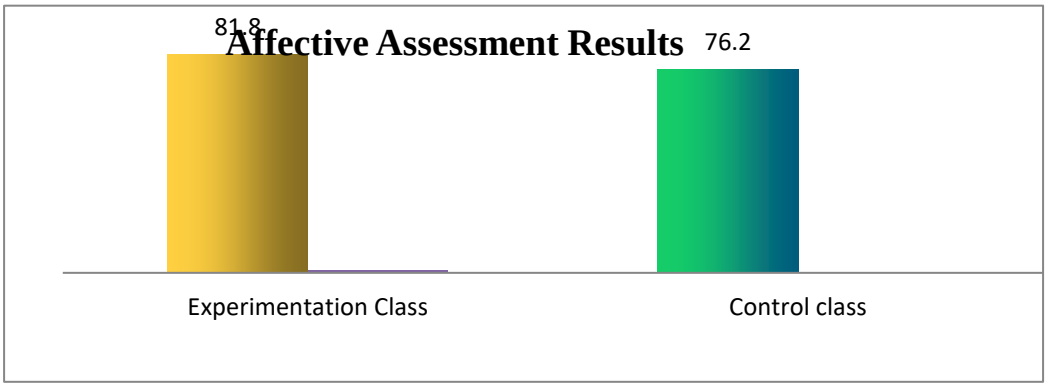


Figure 14. Affective Results Chart Bar

Figure 14. Bar Chart Affective Results

Based on Figure 14, it is known that the results of the experimental class student attitudes get an affective average of 81.8 and while the control class is 76.2.

3). 4C Competencies

Based on the observation sheet to find out the 4C students in the experimental class who took the visual programming course, the results are as follows:

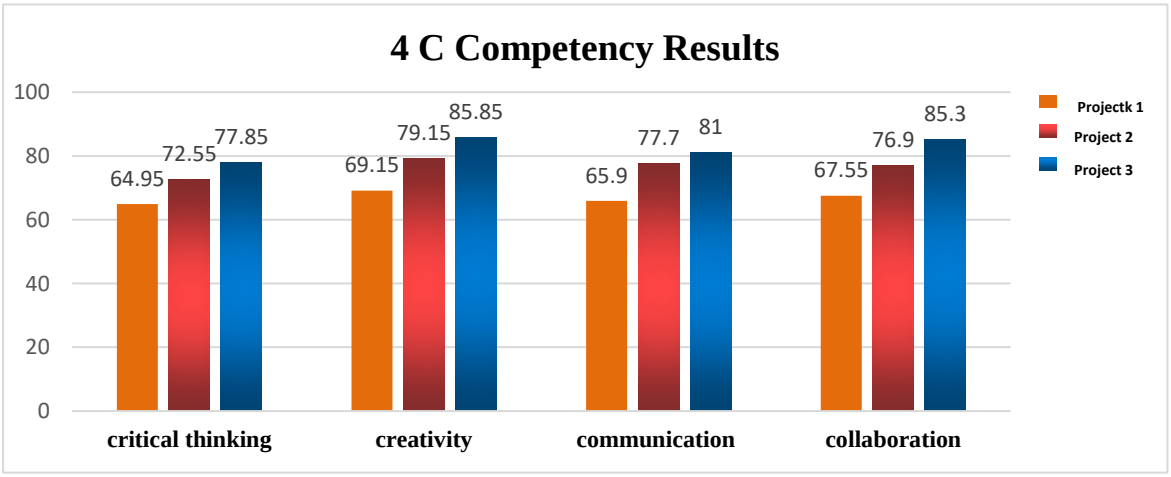


Figure 15 Chart of Students 4C Competencies

Based on Figure 15, it is known that the 4C results containing competence in the blended learning model obtained 4C results (Critical thinking, Creative, Communication, and Collaboration on project 1 on average each of 64.95, 69.15, 65.9, and 67.55, while the 4Cs in project 2 averaged 72.55, 79.15, 77.7 and 76.9 respectively, while for 4C in project 3 each averaged respectively of 77.85, 85.85, 81 and 85.3. From these results the creativity and collaborative abilities are higher.

4). 4C Competency

In the psychomotor aspect, it is done through the project task assessment. For the assessment of student project was done on three projects. Of the three projects that have been carried out by students in visual programming courses in the four groups have shown an increase in psychomotor learning outcomes.

The results of the improvement are illustrated in the following bar chart:

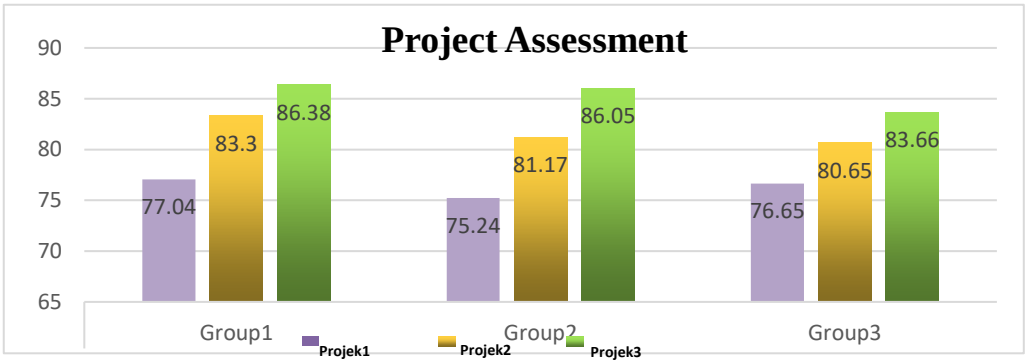


Figure 16. Improved Psychomotor Learning Outcomes

Based on Figure 16, it shows that of the 3 groups of students who carry out
blended learning in visual programming, the results obtained in group one has an average of the three projects namely: 77.04, 83.03, and 86.38. Whereas the second group had an average of the three projects, namely: 75.24, 81.17, and 86.05. For the third group has an average of the three subjects, namely: 76.65, 80.65, and 83.66. It was concluded that the average results of student projects from these 3 groups out of 3 projects there was an increase in each project.

The following are the psychomotor results:

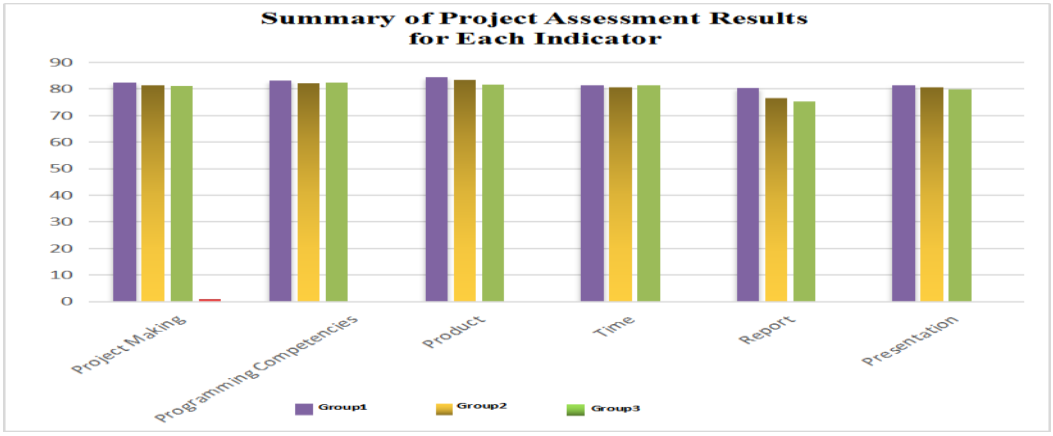


Figure 17. Histogram Summary of project evaluation for each aspect

From Figure 17, it can be seen that the overall results of student projects for each aspect start from making projects, project competencies, products, time, reports and percentages.

Blended learning model of learning in visual programming courses is designed for students to be able to learn anywhere and anytime through online and offline. Blended learning is a formal education program through the delivery of content and instruction through digital and online media that control elements of students over time, place, and speed (Banyen et al., 2016). Many universities applied blended learning to have a mixed learning because it promotes effective learning and successfully integrating online and offline classes for adult students (Korr, et al, 2012). Blended learning has more learning time and can involve students (Hamilton & Tee, 2013). With this, students become more flexible in choosing the time and place of study, for example in parks, libraries, at home, on trips, in places to hang out like in cafes, and others. In addition, even then with more material obtained, the knowledge obtained is also broader, and teachers and students can be involved together in learning.

Five important elements in the application and development of learning models are syntax, social systems, principles of reaction, support systems and instructional and accompanying impacts (Joyce and Waile 1980). Those five elements have also been tested in the development of the blended learning model so that all components of the model have been declared valid. Based on the results of research on the development of blended learning models based on visual programming courses, which adopt the ADDIE

stages development model, through the stages of analysis, design, development, implementation and evaluation (Branch, 2009).

The conclusion from the developed model is classified as a valid blended learning model that produces blended learning model book, textbook, lecturer handbook and student handbook. The developed model is also quite practical; therefore, it can be used in learning.

For the final achievement of students, the implementation of the blended learning model increased students' HOTS in the course of visual programming. After students learn through blended learning, there is an increase in HOTS for students than in traditional learning (Yaniawati, 2013). Therefore, blended learning plays an important role in providing effective learning in vocational education. In line with the findings by (Sahin, 2010), blended learning in vocational education can be used to develop HOTS level capabilities. In learning to contain elements of skills in the industrial revolution 4.0 such as data literacy that is able to access various learning resources on big data, technology literacy that is able to use technology, and create programs which are then shared online, and contain elements of human literacy that students are able to take responsibility, cooperate, and discipline. Blended learning is a combination of old literacy and new literacy namely human literacy, technology and data literacy (Lase, 2019). The next achievement contains elements of XXI century which are classified as good 4C competencies. Blended learning can support the competence of the XXI century and the industrial revolution 4.0 era. (Fulton, 2012).

The next achievement is the attitudes and psychomotor results of students classified as good, where students are skilled in creating creative programs that are able to make products, and the products are made copyright in the form of intellectual property rights from the Ministry of Law and Human Rights. Based on achievements in cognitive, affective and psychomotor aspects, it can be concluded that the blended learning model developed is effective. In accordance with (Graham, Henrie, & Gibbons, 2014); (Sahin, 2010); (Boa, Eugenia Arazo, Amornrat Wattanatorn, 2018) who stated that blended learning that combines online and offline is able to create learning that provides learning effectiveness.

This developed model also has limitations on internet access networks and the solutions that are offered when there is an internet connection trouble, the researchers have anticipated it with copying e-book files which contains material and tutorial videos so that students can continue to learn. The file given in the form of a copy in flash disk and in the form of CDs/DVDs. Finally, there is a need for intense efforts to motivate students to learn independently so that the learning model applied between theory and implementation is synchronous.

5. Conclusions

Based on the results of the study of the development of the blended learning model, the following conclusions can be drawn: (1) The components of the blended learning model include: (a) the philosophical component of essentialism and pragmatism; (B) learning theory: behaviorism, cognitivism, and connectivism (c) the 4C component of communication, collaboration, cooperation and creativity; (d) component of the industrial revolution 4.0: includes learning with digital elements with data literacy, technological literacy and human literacy. (2) The blended learning model is learning done offline and online so that it has a clear proportion of learning patterns. The flexibility of learning anywhere and anytime through face-to-face communication facilities, as well as online interactions using chat and forums to explore critical thinking through discussion. Also includes elements of students to be creative and innovative in producing products through projects and project improvement, as well as online teaching materials that are made interesting by the presence of multimedia components (text, images, and videos). (3) the resulted product is in the form of a model book, lecturer handbook, student handbook, and textbook, which are declared valid and practical so that the blended learning model can be applied in learning. (4) The achievements found are related to cognitive, affective, psychomotor and 4C competencies.

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