

speed [1][48][49][50][51][52][53][54][55]. Many universities implement a mixed learning process because it can promote effective learning and successfully integrate online and offline classes for adult students [2]. Teachers who are involved in mixed learning processes in vocational education, tend to adopt different approaches to teaching as well as mixed learning designs [3].

The advantage of blended learning is that students can learn flexibly, freely, and broadly wherever and whenever [4]. Blended models can improve student's performance in vocational education and lead to more effective learning. [5]. Blended learning can reduce the number of class meetings [6]. The blended learning model gives teachers more time in learning activities that involve students in improving their abilities.

The facts that occur in very boring learning activities will make students less enthusiastic about learning and even fall asleep [7] [8].

Learning that combines online and offline classes will be able to build interactions, create projects, be able to access materials in the form of online teaching materials such as percentages, videos, interactive multimedia, and others [4] [47]. The blended learning can also use Learning Management Systems (LMS) because it can distribute subject matter, manage tasks and assignments, and can discuss the subject. Implementing blended learning requires appropriate content through technology such as web 2.0, which can be a suitable choice to improve skills and as a motivation for students in vocational education [9]. Thus, 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 cafes, and others. Even with more teaching materials obtained, the knowledge gained is also broader; and teachers and students can be involved in the teaching and learning process. What needs to be considered in applying a learning model is the teacher's ability to understand the entire learning process according to the expected target [8]. The use of communication and information technology in education is very important in the digital era [10] [11] [12] [13]. The use of technology can increase the competitiveness of human resources in the 21st century [14] [15] [16].

In the learning process, it was found that there were some significant differences in digital literacy skills between the control class and the experimental class, which means that the application of a blended model can improve students' digital literacy skills in vocational education [17]. Blended e-learning does not have a significant effect on student achievement test scores, but it does significantly affect student self-assessment scores in vocational education [18]. The results showed that vocational students and teachers also agreed that there must be a development of critical thinking skills, learning achievement, and learning management in vocational education [19]. Based on these findings, blended learning is very influential in vocational education.

Blended learning can be applied as a supplement and complement or substitute in learning, which includes the content of teaching material in the form of documents, videos, animations, or simulations, and others [20]. Therefore, in its application, blended learning can be used as a supplement, complement, and substitute according to the needs [21][22]. In determining proportions, the characteristics of the courses applied to blended learning must be considered. The learning settings in the blended learning model consist of synchronous and asynchronous.

Direct synchronization is learning that occurs when being in the same location/space and time. At the same time, virtual synchronous is learning in the same space and time but in different locations. Then there is the term asynchronous independent learning that occurs in independent learning situations online. Meanwhile, asynchronous collaborative learning occurs when students collaborate with each other [23].

There are a framework and model of blended learning to carry out the learning process. The blended learning model is divided into several categories consisting of rotation model, lab rotation, flipped classroom, individual rotation, flex model, self-blend model, and enriched virtual model [24][25][26][27][28]. Therefore, the instructor can apply the blended models or even develop the model to be used in the teaching and learning process. To design and also implement blended learning, universities must pay attention to the interaction between student design features, and make learning outcomes an indicator of the effectiveness of the blended learning model [29].

Therefore, it needs to have exact steps to plan, develop, and implement a blended learning model using face-to-face and online learning to produce effective learning. This article aimed to examine the development of a blended learning model, to produce precise information and provide an overview of the blended learning model that is ideal for vocational education.

2. Methodology

This study uses a meta-analysis method, known as a systematic review, which contains explicit and detailed methods for the identification, selection and assessment of the quality of individual studies and overall evidence but does not incorporate the overall study results.

The meta-analysis uses data contained in published studies. Samples suitable for meta-analysis were collected through surveys, laboratory experiments, as well as field studies based on the results of literature studies from pre-existing research, using 45 publications.

Through the study of scientific sources, such as indexed international journals and relevant books, the findings can also summarize the search and assessment process as shown in Figure 1.

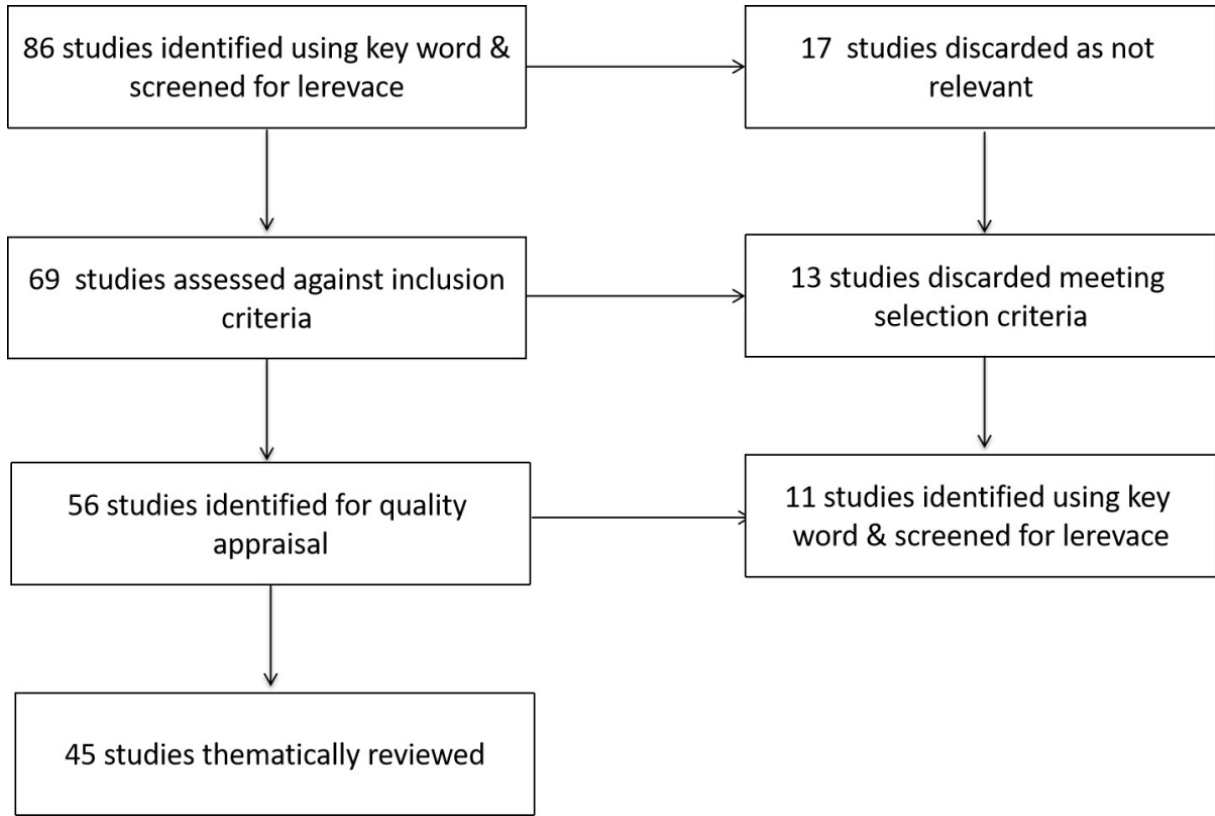


Figure 1. Summary of the search process

Based on Figure 1 about a summary of the search and assessment process, journal sources find studies that can be identified using keywords and are also filtered about blended learning, online, offline, online, blended models, vocational, traditional learning, learning flexibility for a total of 86 lessons. . The 17 lessons carried out were discarded because they were irrelevant, while the other 69 were assessed against the total inclusion criteria. 13 lessons were discarded to meet the selection criteria. Meanwhile, 56 other lessons were identified for quality assessment. A total of 11 studies were identified using keywords and filtered for relevance until finally using 45 thematic studies were reviewed.

3. Results

The articles that have been collected must be examined one by one. In the first stage, it must be ascertained whether all are in accordance with the predetermined selection criteria. If the initial search results are extensive, filtering can be done by assessing the abstract of each article. After making sure that it fits the criteria, each study report is assessed for its quality by the researcher.

The explicit criteria for assessing the quality of research articles included the design, implementation and topic analysis aspects of 45 published articles. The results summary of qualitative studies can be seen in table 1.

Table 1. Summary of qualitative studies

No	Author(s) year	Location	Sample size type and setting	Methodology	Publisher/Source	Key findings	Limitations
1.	Josephine Adekola, Vicki H.M. Dale and Kerr Gardiner. (2017)	University of Glasgow, Glasgow, UK	Anggota manajemen senior dan kepala dinas, guru, teknolog belajar, dan anggota Dewan Perwakilan Siswa sebanyak 20 orang	Descriptive	Research in Learning Technology Vol. 25, 2017	digital education; technology-enhanced learning; e-learning; higher education; change	little research sample No experiment
2	John Bailey, Carri Schneider, Tom Vander Ark. (2015)	-	-	-	by Digital Learning Now!	We are navigating The Digital Shift: Implementation Strategies For Blended And Online Learning. Provides specific guidance regarding the adoption of Common Core State Standards and the shift to personal digital learning.	Singel site, Reference book, No experiment
3	Banyen, W.; Viriyavejakul, C.; Ratanaolarn, T. (2016)	universitas Thailand	Teascher ans student	Exsperimental	International Journal of Emerging Technologies in Learning (iJET)	educational technology; Edmodo; information literacy; self-directed learning; social learning network	• Tool validity not discussed
4	Graham, C. R. (2013).	The pennsylvania state university	-Teacher and student	-	New York, NY: Routledge.	Distance education, Blended learning	Singel site, Reference book, No experiment
5	Hamilton, J., & Tee, S. (2013)		Teacher and student	Quantitative	Taylor & Francis, 2013	Biggs, blended, flexible, student learning outcomes, tertiary teaching modes, traditional	Singel site, Learning Method Comparison, No experiment
6	Hilliard, A. T. (2015).	-	Teacher and student	Qualitative	Journal of International Education Research	Leadership, Blended Learning, Expanding Globally, Faculty Development, Views of Student Learners, Policy and Evaluation	• No power analysis, Tool not validated after, modification, No experiment
7	Kintu, M. J., Zhu, C., & Kagambe, E. (2017).	-	238 respondent student	Survey	International Journal of Educational Technology in Higher Education	Blended learning effectiveness, Learner characteristics, Design features, Learning outcomes, and significant predictors	All in the form of a survey there were no experiments, no vocational data
8	Korr, Derwin, Greene, & Sokoloff,. (2012).	Brandman University	Student	implementation of blended learning		adult learning, andragogy, blended, hybrid, instructional design	no vocational data, Singel site, No experiment
9	Poon & Joanna. (2013).	NTU undergraduate SPUR	interviews with academics conducted by an NTU undergraduate SPUR award recipient and a questionnaire survey of students.	Survey	MERLOT Journal of Online Learning and Teaching	blended learning, hybrid learning, institutional approach, student learning experiences	No educator data collected, Tool validity not discussed, No power analysis.
10	Saliba, G., Lynnae, R., & Cortez, H. (2013)	Australia	-Teacher and student	-	University of Western Sydney	Fundamental blended learning, category blended learning	Singel site, Reference book, No power analysis

Table 1 continuous

11	Singh H 2003	-	-	-	<i>Issue of Educational Technology</i>	Blended learning, Effective Blended Learning	No educator data collected, Tool validity not discussed, No power analysis, No sample
12	Staker, H., & Horn, M. B. (2012)	Innosight institute	-	-	Innosight institute	Blended-learning taxonomy. Model Blended learning, category blended learning,	No educator data collected, Tool validity not discussed, No power analysis, No sample, Reference book, Singel site
13	Graham, C. R., Woodfield, W., & Harrison, J. B. (2013).	Brigham Young University, United States	Interviews with administrators at institutions of higher learning	Qualitative with Interviews	Internet and Higher Education, ELSEVIER	Blended learning Hybrid courses Institutional adoption Higher education policy	Tool validity not discussed, no statistical data, No experiment
14	McGee, P., & Reis, A. (2012).	Outside of class	Literature review/publication	qualitative meta-analysis design to answer one research question:	Journal of Asynchronous Learning Networks ERIC	blended, hybrid, course design, pedagogy, best practices	No educator data collected, Tool validity not discussed, No power analysis, No experiment
15	Verawadina, U., Jalinus, N., Krismadinata, Widy, R.N., & Simeru, A. (2020).	Indonesia	a) Male and female students b) Informatics Engineering and Automotive Education Study Programs c) Visual programming and Autotronics Courses	a quantitative descriptive study.	International Journal of Innovation, Creativity, and Change. w	Needs assessment, e-learning, blended learning.	Singel site
16	Verawardina, U., Asnur, L., Lubis, A. L., & Hendriyani, Y. (2020).	Indonesia	Literature review/publication	method of analysis of literature (Talent Development & Excellence	<i>Online Learning, Revolution industry 4.0, COVID-19.</i>	Singel site, No educator data collected, Tool validity not discussed, No power analysis, No experiment
17	Verawardina, U., Ramadhani, D., Susanti, W., Lubis, A. L., & Simeru, A. (2020).	Indonesia	Literature review/publication	method of analysis of literature (International Journal of Psychosocial Rehabilitation,	<i>XXI Century Learning, technology, Mooc, online learning</i>	Singel site, No educator data collected, Tool validity not discussed, No power analysis, No experiment
18	Clark, R. C., & Kwinn, A. 2007	-	-	-	Publishser by Pfeiffer.	The new virtual classroom, learning, synchronous	Singel site, Reference book, No experiment
19	Allen, I. E., Seaman, J., & Garrett, R. (2007).	the United States America	-	-	by Sloan-CTM ERIC	Blending, education, The Extent, and Promise of Blended Education	Reference book

Table 1 continuous

20	Caner, M. (2012).	-	Literature review/publication	method of analysis of literature (researchgate.net	The Definition of Blended Learning, Higher Education	not on-site, unclear data collection, unclear validity, unclear data analysis, No experiment
21	Dewi, Ciptayani, Surjono, & Priyanto. (2018)	Indonesia	Politeknik Negeri Bali (PNB), Indonesia	The study is done by research and development approach to develop a blended learning model in Vocational	TOJET: The Turkish Online Journal of Educational Technology ERIC	Modeling Vocational Blended Learning, Digital Learning Now Framework, Vocational	No specific sample, No experiment
22	Graham, C., Henrie, C., y Gibbons, A. (2014).	-	-	-	NY. P.: Routledge.	Model blended learning, theory blended learning	Reference book
23	Allen, I. E., & Seaman, J. (2003).	America	Public, student, teacher	Survey Study literature	ERIC	The Quality and Extent of Online Education	Singel Site, Reference book, No experiment
24	Chew, Eysin & Jones, Norah & Turner, David. (2018)	The United Kingdom,	-	It is an educational and critical review	researchgate.net	Hybrid Learning, Blended learning, Educational Theory, Higher Education	not on site, unclear data collection, unclear validity, unclear data analysis
25	Owston, R., & York, D. N. (2018).	university in Canada	Students in 20 undergraduate courses o	Survei	http://www.yorku.ca/ELSEVIER <i>The Internet and Higher Education</i>	Blending learning, Learning environment design Teaching	No experiment
26	Wena, M., 2010.	Indonesia	-	-	Bumi Aksara	innovative learning, learning strategy	References book, No power analysis, No experiment
27	Kamsin, Amirrudin. 2005.	Malaysia	Participants were 78 students, and one female lecturer	A survey was conducted for the students.	http://www.journal.au.edu/ International Journal of The Computer, the Internet and Management	E-learning, Conventional learning, knowledge sharing,	No experiment
28	Seninil, Mochamad Bruri Triyono, Asnul Dahar Minghat, Herman Dwi Surjono, Siti Salina Mustakim . 2018.	Indonesia	vocational high school (SMK)	Study literature	International Journal of Engineering & Technology	E-learning; Technical and vocational education; Vocational high school.	Singel site, Tool validity not discussed, No power analysis, No experimen
29	Syarifah, Mufarrhatus dan Handayani, Hany. 2019.	Indonesia	43 elementary school teachers	Descriptive	unri.ac.id Journal of Teaching and Learning in Elementary Education (JTLEE)	E-learning, blended learning, teachers' conception	Tool validity not discussed, No experiment, No power analysis

Table 1 continuous

30	Björg F. Oftedal, Kristin H. Urstad, Venche Hvidsten, and Brynjar Foss. 2015.	-	all nursing students enrolled in 2009 and 2010 attending the three-year on-campus program (OCP) or the four-year blended learning program (BLP)	The study had a descriptive quantitative design.	International Journal of Learning, Teaching and Educational Research	Blended learning; Bachelor in nursing; Learning outcome; Quantitative method	Singel site, Tool validity not discussed, No experiment.
31	Mestan, Kamran, 2009.	La Trobe University	Student 5,477,	The case study applied mixed methods	Australasian Journal of Educational Technology	Create a fine blend, blended learning, An examination of institutional	Singel site, Tool validity not discussed, No experiment
32	Menon, Sujatha Aravindakshan. 2019.	Jazan University, Kingdom of Saudi Arabia	Teacher and student	Study literature	Researchgate, Neliti International Journal of Linguistics, Literature, and Translation (IJLLT)	Teaching/ learning process, learners, BookWidgets, technology, online materials, blended learning	Tool validity not discussed, No experiment, No power analysis
33	Chairman, U.2017	Indonesia	-	Study literature, survey	Researchgate,	Online learning, blended learning. Hinger education	Reference book, Singel site, Tool validity not discussed, No experiment
34	Coronel, C., & Tan, D. A. (2019)	Valencia City, Bukidnon.	The experimental group were twenty-five (25) students, and the control group was twenty-eight (28)	Experimental	ERIC	mathematics performance, self-blend approach, 21st century skills	Tool validity not, discussed
35	Alnoori, B. A., & Obaid, S. S. (2017).	-	The sample consists of 20 students	The current study design consists of two tests: pre-test and post-test.	semanticscholar.org International Journal of Language Academy	blended Learning, reading Skills, secondary Schools, technology, method	Littel example, Singel site, Tool validity not discussed.
36	Kocour, N. (2019)	Northwestern College - Orange City	Thirty-five participants in the study, ranging in age from three to five-year-olds.	The purpose of this study was to determine the relationship.	[PDF] nwciowa.edu https://nwcommons.nwciowa.edu/	blended learning, student engagement, early childhood	Singel site, Tool validity not discussed, No experiment
37	Asia, A., & Wekke, I. S. (2019).	Indonesia	Lecture	This study, using the case study method,	Researchgate. Universal Journal of Educational Research (7)	Participation, Blended Learning, Industrial Revolution 4.0	Tool validity not discussed, Tool validity not discussed, No experiment
38	Bliuc, A. M., Casey, G., Bachfischer, A., Goodyear, P., & Ellis, R. A. (2012).	Australia	Teacher	Teachers' conceptions and their approaches were explored by asking participants to respond to the questions.	https://www.researchgate.net/ Aust. Educ. Res.	Blended learning, Blended learning design, Conceptions, Approaches, Vocational education, Teacher experiences	Tool validity not discussed, No experiment.

Table 1 continuous

39	Şahin, M. (2010).	Turkey.	The study group consists of 56 students, 28 of whom are of the control group, and the other 28 students are experimental group.	The research involved an experimental model.	https://academicjournals.org/International Journal of Vocational and Technical Education	Blended learning, vocational education, experimental study.	Tool validity not discussed
40	Azhar, M., Mustapa, S., Ibrahim, M., & Yusoff, A. (2015).	Malaysia	vocational students and teachers in VC under the management of the Ministry of Education (MOE).	This study aims to investigate the use of e-learning using Web 2.0 technology-based applications.	Ademia.edu Conference proceedings of the 4th World Congress on TVET 2014	<i>Blended learning; Web 2.0; Vocational;</i>	Singel site, Tool validity not discussed, No power analysis, No experiment
41	Patmanthara, S., & Hidayat, W. N. (2018, June).	Indonesia	with 3 practical classes and three control classes.	The research method used was Pretest-Posttest Control Group Design.	IOP 2nd International Conference on Statistics, Mathematics, Teaching, and Research	Vocational High School Students, Digital Literacy Blended Learning Model,	Singel site
42	Machumu, H. J., Zhu, C., & Sesabo, J. K. (2016).	Tanzania	interview and focus group discussion was conducted with 15 VET educators in three VET colleges in both Morogoro	This is a study employed a qualitative single case study design.	International Journal of Multicultural and Multireligious Understanding (IJMMU)	Blended Learning; Vocational Education and Training; Learning Technologies and Professional Development; Tanzania	Singel site, Tool validity not discussed, No experiment
43	El Hajji, M., Bouzaidi, E., Drissi, R., Douzi, H., & Khouya, E. H. (2016).	Maroko	Teacher and student	Experiment	ERIC Journal of Education and Practice	Blended learning, flipped learning, vocational work-linked Training.	Tool validity not discussed
44	Chang, C. C., Shu, K. M., Liang, C., Tseng, J. S., & Hsu, Y. S. (2014)	Taiwan	the experimental group 33, and control group 32,	The pretest-posttest nonequivalent-group quasi-experimental	International Review of Research in Open and Distributed Learning	Blended e-learning; self-assessment; electrical machinery; learning performance.	-
45	Deechai, W., Sovajassatakul, T., & Petsangsri, S. (2019).	Thailand	random sampling 450 (student dan teacher)	evaluation	Mediterranean Journal of Social Sciences	Needs evaluation, Blended learning development, Critical thinking skills, Vocational students, Teachers at vocational level	Singel site, No experiment

Based on table 1 regarding summary of qualitative studies, a meta-analysis has been carried out on the publication, then the Limitations have been seen

The results obtained are considered that Blended learning is an activity that takes place in two different areas, namely in person and online. Locally designed mixed learning should fit the environment for both teachers and students [30].

Thus, combining online and offline learning requires a precise proportion of application. The proportion of learning using information technology can be seen in the classifications in integrated face-to-face learning & online can be see table 2.

Table 2. Porpation Blended learning

Online proportion	Learning Type	Details
0%	Traditional	Learning without using online technology, teaching material is delivered in writing or orally.
1 -29%	Web Facilitated	Learning that uses web-based technology to facilitate face-to-face learning (learning is enriched with internet access). Usually, use a learning management system and a website to post syllabus and assignments.
30 -79%	Blended	Learning that combines online and face to face. Content is sent online, usually discussion online, several face-to-face.
> 80%	Online	I am learning where most or all material is sent online. Do not have a face to face meeting.

Source: [21][22][31]

Based on table 2, it can be seen that the proportion of blended learning is in the range of 30-79%. Regarding the proportion of online activity, it appears that there is a relationship between the proportion of mixed and perceptions that result in Mixed Moderate (36% - 40% online) and High (50% online) and High (50% online) tend to have the most positive perceptions of blended learning, compared to Low proportion (27% - 30% online) [32]. The result is in line with government policies that allow universities to implement blended learning.

Several universities in Indonesia have implemented blended learning with a range of 50% online and 50% offline. And also 60% enrolled in college offline and the others studied online. These proxies can adapt to individual courses and other considerations. Meanwhile, according to Saeman, theoretical subjects for online proportions are certainly more dominant or whereas practical subjects use offline learning more. The combination of face-to-face and online was done in a complementary manner, while activities and online communication and face-to-face adjustments are needed. In results, teachers must be able to identify the characteristics of the courses applied.

In general, e-learning can be used as a supplement,

complement, and substitute.

The functions of e-learning are 1). E-learning can be used as an addition so that students get additional knowledge, 2). Complementary materials, 3). can be a substitute for learning in the classroom [33].

Online learning is better as a supplement for classroom teaching, and the level of e-learning as a classroom teaching supplement can be determined according to the ability of institutions and developers and the ability of the users to adapt [34]. The use of e-learning serves as a complement in the effectiveness of learning in the classroom, which is able to increase knowledge about the material as well as students' learning motivation in vocational schools [35]. Blended learning is developed to replace lectures and provide support for and complete courses [36].

Blended Learning can complement direct learning [37]. The function of e-learning itself in learning is only as a complement. Blended learning plays more of a supplementary or a complementary role. Moreover, there is the existence of synchronous and asynchronous learning settings that contain face-to-face learning in class and online makes learning can happen flexibly anywhere and anytime with being connected to each other in digital form, and in which there are also collaborative discussions, projects, interactions, evaluations and various learning resources that can stimulate students [23].

The results of the study of [38] suggest that ongoing professional developments, institutions must support online design facilities, blended learning in vocational. According to [39], many programs at tertiary institutions use blended learning covering.

To be able to carry out blended learning well, it is necessary to make policies, plans, resources (such as human resources, equipment, technology), set of schedules, and support system initiatives to be successful. In order to carry out development programs, universities must also educate academics, for example instructors in using blended learning, redesigning online courses to be effective, and effective use of technology [40].

Factors considered in implementing blended learning are the ability to combine instructional modalities or media, the combination of online and face-to-face learning [25]. There are factors for creating a blended learning environment, including institutional, pedagogical, technology, interface design, evaluation, management, resource support, and ethics [41]. One problem that must be taken into account is the cost for each technology needed in integrating blended learning in vocational education. Other findings showed that the most crucial determinant of blended learning would succeed in vocational education as well as the ability of teachers to design learning models. Teachers must increase capacity by developing the ability to take advantage of technology and accept technology learning culture so that they can be

easily understood by students.

According to [42]; [6], there are four typologies of the level of implementation of blended learning:

1. Activity level. Blended learning activities combine elements of face-to-face with elements of communication that are mediated through computer devices.
2. Course level. Blended learning courses combine face-to-face activities with activities in virtual classes online and can be done from a specific time.
3. Training program level. Blended learning can be programmed to be done online both at the beginning and end of the program or combining online activities with internships or offering online learning plans for students with limited attendance.
4. Institutional level. In this case, the tertiary institution applies for a reduction of face-to-face time in class, arranges curriculum periods for one semester, and offers online learning plans.

The blended learning standards are focused on four standards: a). Mixed learning is designed with a learner-centered pedagogy principle. b). Assessment and mixed feedback, c). Student interaction and engagement is facilitated by online communication and network channels via the internet. d). Students have access to a variety of quality resources and support (Saliba., Lynnae, & Cortez, 2013).

Therefore, the typology of standard application of blended learning and blended learning which contains several principles, can be used as a reference for vocational education in developing a blended learning model with existing standards. Blended learning frameworks and models in producing novelty blended learning models in visual programming subjects.

There are a framework and model of blended learning to carry out the learning process. Here are some frameworks sourced from relevant books and research:

a. Khan’s Octagonal Framework

The Khan's Octagonal Framework is used for blended learning programs that can be used in educational institutions in general, both in vocational education and in other tertiary institutions, even in schools. Khan's Octagonal Framework can be seen in Figure 2.

Based on figure 2, the framework has eight dimensions, namely: institutional, in this case, institutions and tertiary institutions; pedagogical that includes elements of learning; technological regarding the use of technology such as computer devices, LMS, computer networks, and others; interface design regarding the appearance and interface design of blended learning that adjusts the needs of each institution; evaluation; management to manage the running of the blended learning program must be appropriately managed which involves various elements in the education institution; resource support related to resources such as

human resources and others; and requires ethical such as learning culture and attitude.

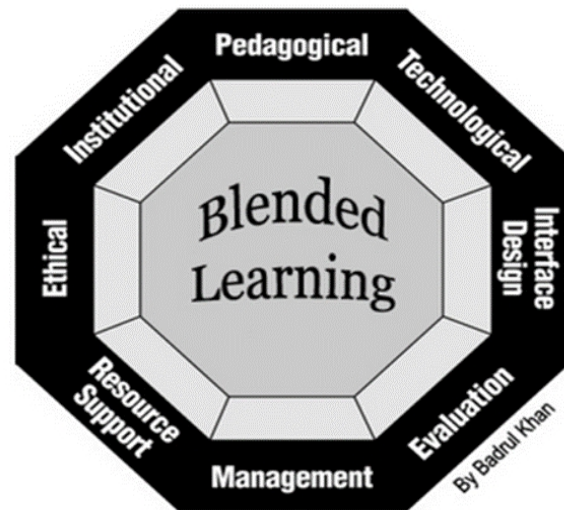


Figure 2. Khan's Octagonal Framework [44]

b. Blended Learning Guide 3

This blended learning model is in accordance with the digital learning framework used in education. The stages of creating conditions for success, planning, implementing, and improving can be seen in Figure 3.

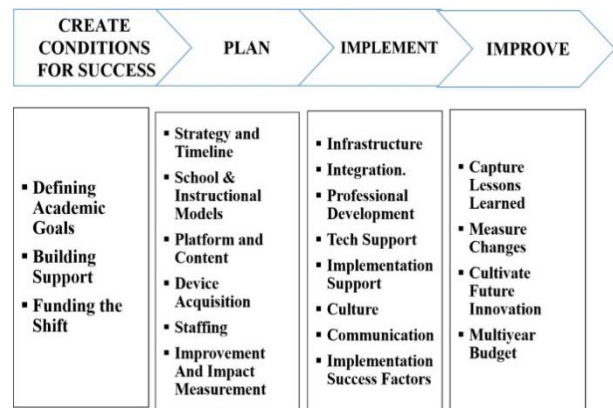


Figure 3. Framework of Blended Learning Guide 3 [45]

Digital learning framework guide 3 describes four phases starting from creating the conditions for success, planning, implementing, and improving.

In the first phase, the conditions for success are created, in which the shift in blended learning varies; need to build support, set academic goals, and need funding to make these learning changes. In the second phase, the application of the blended learning model needs to be planned which requires good planning. Preparing a good plan can be done by answering questions in six primary areas, such as a). strategies and timelines, b) school models, c) platforms and content, d) devices, e) staffing and development plans, g) improvement, and impact measurement.

The third stage is implementation which includes

infrastructure, integration, professional development, support by paying attention to institutional culture, communication needs, and implementation success factors as well as considering how blended learning is implemented. It is important to remember that the overall goal of this shift to blended learning concerns teaching, learning, and design. The last phase is continuous improvement. Teachers and administrators in implementing blended learning must be able to make continuous improvements. This phase includes learning lessons, changes in size to measure changes in teaching and learning, future cultural innovations offering improvements in learning, developing multi-budget, and monitoring multi-year budgets [45].

c. Vocational Blended Learning Modeling

One of the developments of blended learning in vocational is Vocational Blended Learning (VBL) modeling. The results showed that in order to determine the learning model, it needs to consider the suitability of the educational model, techniques, teaching methods, facilities, and infrastructure. The framework of Vocational can be seen in Figure 4.

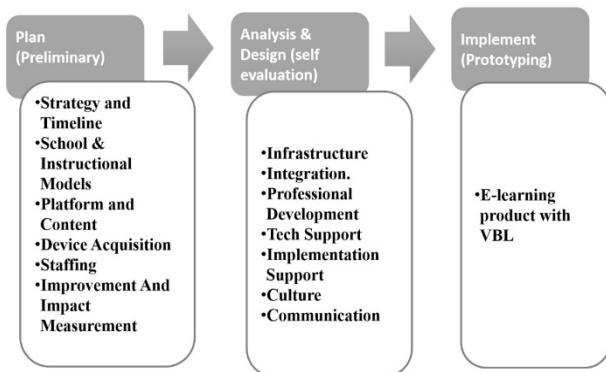


Figure 4. A framework of Vocational Blended Learning Modeling [46]

A framework of Vocational Blended Learning Modelin, describes three phases starting from plan, analysis, and design or self-evaluation and prototyping as the implementation phase as shown in figure 4. This framework requires 1) Infrastructure (technical) to measure the availability of information system hardware such as computer and server bandwidth. 2) Integration between content and the ICT learning process.

The development of professionalism and the successful application of blended learning depends on the abilities of human resources, lecturers, and students. It is also necessary to design lesson plans according to the needs of the model and select materials that are in accordance with the characteristics of vocational education. In the case of learning media, props are needed that can simulate actual working conditions.

Developing pedagogy in the use of information technology is instrumental in increasing teacher capacity. 4) Support (policy and financial), other factors that can

support the successful use of blended learning are in the form of institutional policies and financial support.

The support provided can be in the form of strengthening infrastructure and also offering a budget for the development of teaching materials for lecturers, as well as related to policies in the use of blended learning such as guidelines that regulate the learning system between online and offline learning. 5). Culture, namely attitudes, readiness, and technological skills as a facilitator. Therefore, all factors significantly influence the successful use and development of information technology-based learning. The attitude towards acceptance of change is a factor that can encourage the successful implementation of blended learning. The blended learning model in education can be seen in Figure 5.

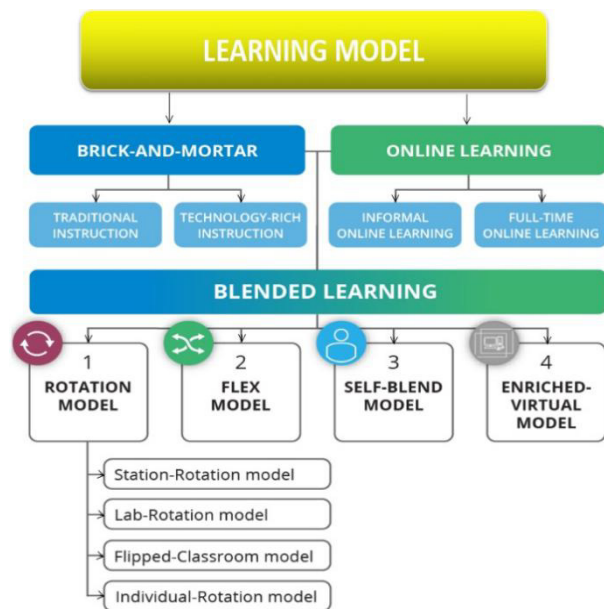


Figure 5. Blended learning in relation to other education practices [24]; [26]; [27], [28].

Based on Figure 5, blended learning in relation to other education practices. The Brick-and-mortar section is a traditional instruction and 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. Students are adjusted to their age and abilities. Technology-rich teaching, however, is learning that occurs with traditional teaching but uses digital enhancements such as electronic whiteboards, extensive access to internet devices, cameras, digital textbooks, the internet, and online lesson plans.

The online learning section consists of informal online learning, which is an educational program where students can use technology to study outside of the classroom at any time. For example, students use online videos to view course material. Full-time online learning is a structured education program where content and instructions are

delivered via the internet. The students do not need to come to school. They can be remotely monitored online; however, at the time of the exam, students should come to school.

Based on the blended learning model categories that are composed of rotation models, flex models, self-blend models, enriched virtual models, the following are the explanation:

a. The rotation model is a program in a subject whose learning process can adjust to the schedule set by the lecturer. The learning process takes place through extensive group teaching, small group teaching, peer activities, group projects, individual tasks which can be done via computer. In this rotation model, there are several implementation settings as follows:

- 1) Rotation model: Students learn through a series of learning activities in class during specific scheduled periods. There is a rotation for online instructional activities. There are activities such as small group instruction as a whole, group projects, individual guidance, and assignments. Collaborative learning activities are carried out through small groups at each station.
- 2) Lab rotation: Students learn according to a predetermined schedule by working on individual instructions and dominant online learning done in the laboratory both throughout the class or in small groups.
- 3) Flipped Classroom: Students learn inside and outside the classroom with instructions and projects. Students individually access the content of teaching materials sent online with asynchronous strategies outside the classroom. The content of teaching material is accessed by students before face-to-face class meetings so that learning in the class evaluates individual understanding after learning online. The role of the lecturer is to control the student at any time when studying online in various places outside the classroom. This model contains the modalities of collaborative and project-based learning.
- 4) Individual Rotation: Students learn based on individual perceptions determined by the lecturer with the help of technology-based assessment equipment.

b. The flexible model is a learning program where content and instructions are delivered online, the teacher remains in place, while students study independently on a predetermined schedule. This model provides flexibility in learning, where the teacher can act as a guide. Other teacher-of-records offer flexible and adaptive offline support as needed through small group instruction activities, group projects, and individual mentoring.

- c. Self-Blend Model: Describes a scenario where students choose to take one or more lessons that all instructions are carried out online to complement their traditional courses. Teachers act as online instructors who are not on campus [24]. The Self-Blend Model is a fully individualized approach that allows students to choose to take one or more online courses to complete their traditional school catalog. Most part of the learning is done online, but students will still attend face-to-face classes. Self-blend is popular learning among students and teachers because it gives students the freedom to complete instructions that occur in class. Classes are combined with instructions and take part in online classes that help students hone their digital literacy skills, and this model is in line with entering the XXI century. The implementation of the self-blend discussion takes place to open up previous knowledge and concepts to students. Then the additional online activities provided, such as videos, worksheets, additional information about the topic, are given. This gives students the opportunity to take classes outside of what is already offered at their school. Individuals who attend classes in a traditional school environment choose to supplement their learning through online activities and videos.
- d. The Enriched-Virtual Model is a learning implementation, where students are asked to be able to conduct face-to-face sessions with instructors, and then students can complete their assignments online. Students are not required to attend face-to-face classes. There are also face-to-face but optional classes [24].

The Digital Learning Now Framework can assist in planning and combining learning development in accordance with institutional conditions [46]. The blended learning model also applies to vocational education that regulates Vocational Blended Learning (VBL) by implementing a rotational learning model and supported by content developed by teachers [46].

Blended learning that is relevant to vocational, for example, is a polytechnic called a rotation model. Therefore, to implement this rotation model, the following aspects need to be considered:

- a. Course content and analysis of learning units,
- b. including content, coverage, topics, and semester credit;
- c. Student analysis, such as students' educational background, age, gender, employment status;
- d. Learning context analysis, on what kind of desired learning competition, must be discussed in depth.
- e. Instructional analysis, regarding instructional materials grouped by interests, arranging tasks from easy to difficult;

- f. State the teaching objectives that can be arranged based on the results of the analysis of learning.
- g. Create criteria test items. Test preparation should be based on the teaching objectives and test criteria should be established.
- h. Create criteria test items. Test preparation is based on the teaching objectives and test criteria that must be made.
- i. Choose a learning strategy. Teaching strategies can be established based on existing facilities [46].

It was concluded that the Digital Learning Now Framework could be used as a necessary foundation for developing blended learning in vocational education.

4. Conclusions

The original finding after conducting a meta-analysis of various published results was that blended learning is learning that combines offline learning as well as online learning.

This can create flexible learning, and can be done at any time in various places, also where there are interaction facilities and activities in it. The application of blended learning has its own proportion between offline and online. Before implementing blended learning in vocational education, it is necessary to pay attention to the things that are needed in the implementation of blended learning, such as the normal development of the blended learning model, application of topology, and also knowledge of the characteristics of the institution.

In particular, vocational education must adapt to vocational education, infrastructure, technology, learning, pedagogical principles, assessment of activities and baiting processes, interactions, resources, activities, infrastructure, culture, management and organization, ethics, and others. It is also necessary to develop blended learning stages so that they can be more systematic, starting with the stages of creating conditions for success, planning, implementing, and improving with various sub-stages. Blended learning can also increase the effectiveness of learning in vocational education as well as improve HOTS and skills.

Next, develop a blended learning model from Classifying K-12 Blended Learning that has four blended learning models to choose from, namely the rotation model (consisting of rotation model, lab rotation, and flipped individual classroom rotation), flex model, self-blend model, and enriched-virtual model. However, the rotation model is recommended for Vocational Blended Learning.

From the research results of this blended learning model, where vocational education applies blended learning, it can be suggested that it is not only limited to face-to-face and also online. There are several factors that must be considered in the development of blended learning, such as the proportion that must be correct. It is also hoped that the government, educational institutions, universities, and

teachers to be able to develop a blended learning model using existing development stages must also go through the selection of a blended learning model from K-12 Blended Learning, so that blended learning can be found as a relevant vocational education model, practical, and effective to apply.

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