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Application of Blended Learning Model to Improve Online Learning Activities for Basic Computer and Networking for Students

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ABSTRACT

This study aims to (1) Design and implement Blended Learning model on the subjects of computer assembly for class X TKI at SMKN 2 Bandung. (2) Knowing the difference in outcomes activity learning of students who are using the Blended Learning model and those who do not use the Blended Learning model of learning in the subjects Computer Assembly class X TKI SMK Negeri 2 Bandung (3) Knowing the students' response to the learning model of Blended Learning using Moodle e-learning in the subjects Computer Assembly class X TKI SMK Negeri 2 Bandung. The stage of this study are: (1) Preparation and planning (2) Research (3) Presentation of the study results. The data analysis used t-test to determine differences in learning outcomes, and added with questionnaire to know the responses of the students. The results showed that: (1) The results of the validation study media get a validity of 83.6% with very valid criteria (2) The results of the validation RPP get a validity of 88.5% with very valid criteria (3) The results of the validation items to get the validity of 88.8% with very valid criteria (4) The results of responses of student about learning model of Blended Learning using Moodle e-learning media earned an average rating of 75.3% and is considered good.

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1. INTRODUCTION

The development of information and communication technology in the industry 4.0 era had a major influence on the teaching and learning process. Ease of access to technology has been used by teachers to facilitate the learning process and improve the quality of education. Nowadays, students can learn not only anywhere but also anytime with the existing electronic learning system facilities. E-learning is now increasingly recognized as one of the ways to solve education and training problems, both in developed countries and in developing countries, especially Indonesia. Many people use different terms for e-learning but in principle e-learning is learning that uses electronic services as a tool.

Keengwe & Georgina in their research has stated that technological developments provide changes to the implementation of teaching and learning (Keengwe & Georgina, 2012). Information technology can be accepted as a medium in carrying out the educational process, including assisting the teaching and learning process, which also involves finding references and information sources (Ternenge & Kashimana, 2019). Online material delivery can be interactive so that learners are able to interact with computers as learning media. As one example, students who use electronic media learning or establish relationships (video conference, browsing, chatting, video call) through electronic media, in this case computers and the internet will later obtain more effective and better learning outcomes than conventional learning.

The use of learning media in the teaching and learning process is one of the efforts to improve the effectiveness and quality of the learning process which in turn can improve the quality of student learning outcomes. The use of learning media in the teaching and learning process has several benefits including: (1) Teaching will attract more students' attention so that it can foster student learning motivation, (2) Teaching materials will be clearer so that students can understand and master teaching objectives well, (3) Teaching methods will be more varied, (4) Students will have more interaction in learning activities because they not only listen to the teacher's explanation but also other activities such as observing, demonstrating and others.

The world of education has benefited greatly from the advancement of information technology because it has gained tremendous benefits. The form of information technology development applied in education is E-learning. However, the implementation of the e-learning model has many limitations that can only be done with face-to-face learning in the classroom. The low quality and control of the e-learning model such as the inability of students to manage time and process information independently becomes a separate problem in organizing this learning model. Face-to-face learning also has weaknesses, which tend to make students bored and passive. Therefore, an alternative solution is to combine face-to-face learning model with e-learning based learning model. This learning model is called Blended Learning. In this learning model, the face-to-face learning process in the classroom allows teachers to assess students' affective competence, transfer values, and monitor students' moral growth. On the other hand, interactive e-learning will facilitate students during the learning process so that the benefits of learning can be achieved maximally. By applying the Blended Learning model there is a change in the learning process, where the learning process is not only listening to the description of the material from the teacher in the classroom but also students become more active in the learning process with e-learning facilities that can be accessed anytime and anywhere. Blended Learning does not mean replacing conventional learning models in the classroom but strengthening these learning models through the development of educational technology.

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Overall, based on observations, students have good achievements but are still less active in the learning process, it can be seen in classroom observations that student learning activities when in class are still low (Guilloteaux & Dörnyei, 2008). One of the factors that cause low student learning activity is the teacher's teaching model which still uses the lecture method in delivering material, teacher-centered learning. This makes students feel bored and less active. This is reflected in the actions of students who do not respond to the material provided, occasionally chatting with their friends, and the lack of preparation of students with the material provided. The expected learning solution must be able to provide an increase in student activity. Learning that can increase student activity in the learning process is Blended Learning (Moskal, 2013).

Blended Learning provides opportunities for students to become active learners who understand their needs and strive to achieve an understanding of knowledge independently. The blended learning model provides opportunities for students to develop individual abilities without leaving social interaction in the classroom, so that in this system students play a more active role in learning while the teacher is a facilitator. In this online-based learning, online media used are such as WhatsApp group, google classroom, and quizzes. Materials are provided in the form of power points, short videos, and reading materials. However, in the implementation of online learning, it is necessary to conduct an evaluation to obtain clear improvement steps based on data.

However, learning is not solely based on technology because learning is essentially more of an interaction process between teachers, students and learning resources. Although e-learning can be used independently by students, the existence of teachers becomes very meaningful as adults who function to provide support and accompany students in the learning process. In other words, the face-to-face process is important and should not be abandoned in learning. Therefore, a learning model that combines (blending) face to face learning methods with e-learning integratively and systematically will make the learning process more meaningful.

Learning is done to seek changes in behavior in individuals who learn. The change in behavior is an acquisition that becomes a learning outcome. That learning outcomes are achievements in acquiring abilities in accordance with the specific objectives planned. Learning outcomes can be explained by understanding the two words that make up it, namely "results" and "learning". Results point to an acquisition because of an activity or process that results in a functional change in input. In the input-process-outcome cycle, results can be clearly distinguished from inputs due to process changes. Likewise, in teaching and learning activities, after experiencing learning, students change their behavior compared to before. That learning outcomes are the realization or expansion of potential skills or capacities that a person has (Hayati *et al.,* 2022). Mastery of learning outcomes by a person can be seen from his behavior, both behavior in the form of mastery of knowledge, thinking skills and motor skills (Jihan *et al*., 2023). Based on some of the above opinions, it can be concluded that learning outcomes are a measure of the success of students after carrying out learning activities. Students are said to be successful in learning if their learning achievement shows a high value or in accordance with the targets that have been formulated in the teaching objectives.

This is what urges the researcher to find out the effect of "The Application of Blended Learning Models to Increase Online-based Learning Activities of Basic computers and networks for class X TKI 4 SMKN 2 Bandung".

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2. LITERATURE REVIEW

2.1. Definition of Learning Methods

Method is described as a way to achieve predetermined goals. In teaching and learning activities, methods are needed by teachers in teaching and it varies according to the objectives to be achieved after teaching ends (Mihardi, 2013). Learning method is a strategy or tactic in carrying out learning and teaching activities in the classroom that is applied by teaching staff so that the learning objectives that have been set can be achieved properly. A teacher must be able to apply the right method in teaching and learning activities, according to the character of the students. That way, the teaching-learning process becomes more enjoyable, and students can absorb lessons more easily.

The use of a method in learning must be adjusted to the characteristics of the subject matter to be taught so that not all lessons can be taught with the same method. Therefore, teachers must have the ability in several teaching methods. Therefore, to encourage the success of teachers in the teaching and learning process, a teacher understands the functions and steps of implementing these teaching methods. To achieve maximum learning results, the right learning strategy is needed. When determining the strategy used, the teacher must carefully choose and determine the method to be used.

2.2. Definition of Blended Learning Method

The Blended Learning model is basically a combination of face-to-face and virtual learning advantages (Al Rawashdeh, 2021). Blended learning combines the best aspects of online learning, structured face-to-face activities, and real-world practice. Online learning systems, classroom training and on-the-job experience have major weaknesses. A blended learning approach uses the strengths of each to counter the weaknesses of the other.

Blended learning is an ease of learning that combines different delivery modes, teaching models, and learning styles, introducing a variety of media options for dialog between the facilitator and the learner. Blended learning is also a combination of face-to-face and online teaching, but more so as an element of social interaction. Blended learning is learning that is supported by an effective combination of different delivery, teaching, and learning styles and is founded on open communication between all parts involved with the training". As for the advantages of using blended learning as a combination of face-to-face and online teaching, but more so as an element of social interaction, they are:

1. There is interaction between teachers and students
2. Teaching can be online or face-to-face

The effectiveness of online and face to face learning on ESP (English for Specific Purposes), gives some conclusions as follows:

(i) blended learning model with video-based blog is an effective approach for students to learn English;
(ii) blogging helps 82% of students to improve their public speaking skills, such as speech, articulation, facial expression, attitude and gesture;
(iii) students are also taught how to use computer multimedia software and blog application through cooperative learning;
(iv) students can see and improve their weaknesses and learn from others' skills by watching videos on the blog quickly; and

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(v) by implementing the blended learning model for public speaking lessons, students benefit from self-autonomy and collaborative learning, peer feedback from videos, instructor feedback and self-reflection.

The wider implementation of blended learning model should be supported by various research, so that the percentage of each learning model can be known. Blended learning provides the best opportunity for learning from classroom to e-learning transition. Blended learning involves classroom (or face-to-face) and online learning. This method is very effective for adding efficiency to classroom instruction and allows for increased discussion or reviewing information outside of the classroom.

There are five keys to implementing blended learning, namely:

(i) Live Event, synchronous live or face-to-face learning at the same time and place or same time but different place.
(ii) Self-Paced Learning, which combines self-paced learning that allows participants to learn anytime, anywhere online.
(iii) Collaboration, combining collaboration, both teacher collaboration and collaboration between learners.
(iv) Assessment, the designer must be able to mix a combination of online and offline assessments, both test and offline. online and offline, both test and non-test.
(v) Performance Support Materials, make sure learning materials are prepared in digital form, accessible to learners both offline and online.

Six stages for designing and implementing optimal blended learning outcomes, including (1) determining the type and content of instructional materials, (2) establishing the used blended learning design, (3) specifying the online learning format, (4) conducting testing on the created design, (5) executing effective blended learning, and (6) preparing evaluation criteria for the implementation of blended learning.

First, determine the type and content of instructional materials. Educators must have a clear understanding of the relevant instructional materials to be applied in distance education, which is partially conducted through face-to-face and online or web-based learning.

Second, establish the design of the blended learning to be used. The learning design must be meticulously and seriously planned, involving e-learning experts to assist. This is to ensure that the created learning design is truly relevant and facilitates both face-to-face and distance learning systems, rather than complicating matters for students or other educational staff in organizing education. Aspects to consider in creating a blended learning design include: (a) how the instructional materials are presented, (b) which instructional materials are mandatory and which are supplementary to enrich knowledge, (c) how students can access both components of the learning, (d) what supporting factors are needed, such as which software is used, whether group work is necessary, or if individual work suffices.

Third, determine the online learning format. Whether teaching materials are available in PDF or video format, and what platform the teacher is using, whether Yahoo, Google, Facebook, or others.

Fourth, conducting testing on the created design. This test is carried out to determine whether the learning system is functioning well or not. Both effectiveness and efficiency are closely observed whether it inadvertently complicates matters for students and teachers or genuinely facilitates learning.

Fifth, executing blended learning effectively. Prior to this, there has been communication from teachers or professors regarding this system. This includes introducing the tasks of each educational component, explaining how to access instructional materials, and so on. In this

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context, teachers or professors serve as promotional agents, as participation in blended learning can come from the learners themselves or even external parties.

Sixth, preparing criteria for evaluation. Examples of evaluations conducted include: (a) Ease of navigation, (b) Content quality and substance, (c) Layout, format, and appearance, (d) Student interest, (e) Applicability, (f) Cost-effectiveness and value.

Please note that while I've provided translations, some of the terms and phrasings might vary based on the context and specific terminology used in the field of education and blended learning.

One of the intriguing aspects of implementing the blended learning model is the achievement of learning objectives efficiently and effectively, as both models have their respective advantages. The face-to-face learning model with conventional methods enables interactive learning through various approaches, strategies, and teaching methods. On the other hand, the online method allows for delivering materials online without limitations of space and time. Additionally, learners can obtain and process information from various sources, thereby enhancing the learning process. Various studies also indicate that blended learning is more effective compared to conventional learning with either face-to-face or fully online e-learning systems. The level of effectiveness is supported by the advantages of blended learning, as follows: (1) Learning content can be accessed anytime and anywhere using the internet network. (2) Learners have the flexibility to independently study materials or instructional content stored online. (3) Discussion activities can take place online/offline and outside class hours, involving interactions between learners and teachers, as well as among peers. (4) Instructors can manage and monitor students' learning activities outside class hours. (5) Instructors can assign pre-learning tasks to students before face-to-face sessions. (6) Targeted learning outcomes can be achieved as intended. (7) Learning becomes flexible and less rigid.

Certainly, learning with a blended approach has its advantages as listed above, but it also has some drawbacks, including: (1) Instructors need skills to conduct e-learning. (2) Instructors need to allocate time to develop and manage e-learning, such as creating materials, preparing assessments, conducting evaluations, and participating in online forums with students. (3) Instructors need to provide digital references for students and integrate them into face-to-face learning. (4) Uneven distribution of supporting facilities and infrastructure and low technological understanding. (5) Instructors need effective teaching strategies to maximize the potential of blended learning.

The potential for implementing blended learning is highly feasible, especially with the advancement of information and communication technology. The proliferation of supporting applications, along with broader technology utilization within society, can overcome the limitations with strong willingness and commitment from educators.

The elements of blended learning as a teaching method also possess their own characteristics, which are as follows: (1) Learning that integrates various methods of delivery, teaching models, learning styles, and diverse technology-based media. (2) A combination of face-to-face instruction, self-directed learning, and independent online learning. (3) Learning is supported by an effective combination of instructional methods, teaching approaches, and learning styles. (4) Teachers and parents of learners play equally important roles; teachers serve as facilitators, and parents act as supporters.

3. Methods

Based on the theory mentioned above, the primary activity in the field of education is teaching and learning. The success or failure of educational objectives to be achieved later depends on how the students experience the learning process. Learning outcomes serve as

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benchmarks that students must achieve during their learning journey, thus teachers must make efforts to ensure that students reach the set benchmarks. Not all students can attain the predetermined learning outcomes. Students who successfully achieve the set learning outcomes are viewed by teachers and other students as having high abilities and efforts. Conversely, students who fail to achieve the set outcomes might be seen as having lower abilities and efforts. School learning success is influenced by various factors, both internal and external. One factor influencing learning outcomes is the teaching strategy. In this regard, there is a need for a teaching model that can assist learners in developing their competencies.

One way to address the challenges is to develop and implement the Blended Learning model, which integrates both face-to-face and online learning. This research aims to develop and implement the Blended Learning model through several stages, including planning the learning process, implementing the learning, and assessing the effectiveness of the Blended Learning model. The planning stage involves creating learning materials such as syllabi and lesson plans. The resulting learning plans are then tested for feasibility and used as guidelines for the implementation stage of the Blended Learning model. The implementation stage involves conducting experiments with the Blended Learning model in the teaching of Basic Computer and Networking.

This implementation involves a group of students and follows the learning steps designed during the planning stage. These steps include orientation, organization, investigation, presentation, analysis, and evaluation. The impact of the Blended Learning model is evaluated based on learning outcomes, specifically the students' performance in daily assessments. The assessment considers the students' post-implementation performance. Conclusions are drawn based on the students' learning outcomes to determine the impact of the Blended Learning model. The conceptual framework of this research and the development of the Blended Learning model is illustrated in **Figure 1**.

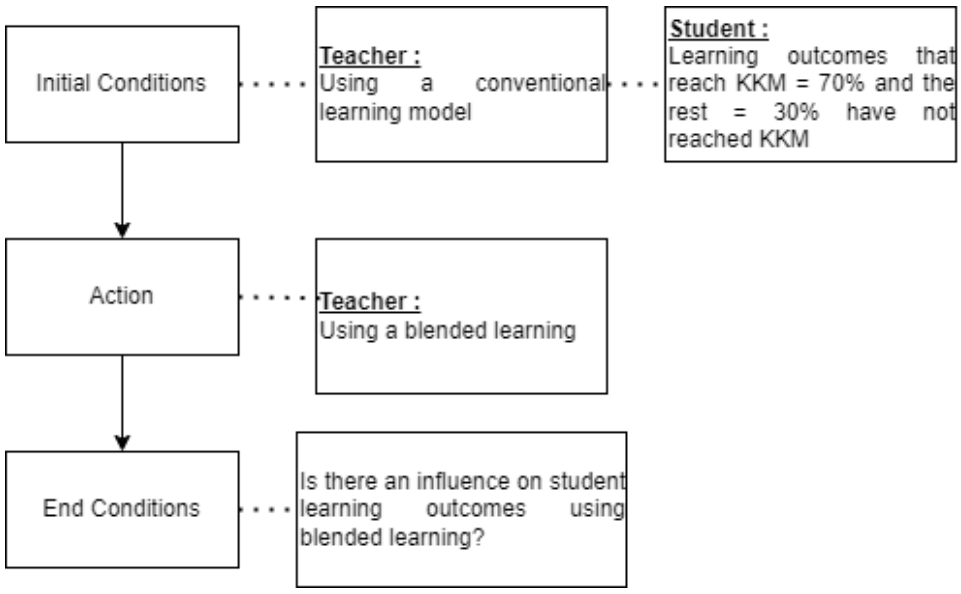

Figure 1. Research and development of blended learning model.

Based on the theoretical description that has been stated above, the research hypothesis proposed in this study is that there is an application of the blended learning model to improve the online-based learning activities of basic computers and networks of class X TKI 4 SMKN 2 Bandung students.

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The type of research to be carried out is Classroom Action Research. This research is expected to produce effective learning that can improve student learning outcomes of Basic Computers and Networks by using the Blended Learning model. This research has several stages in the form of cycles. The research procedure consists of two cycles, each cycle is adjusted to the changes to be achieved.

4. RESULTS AND DISCUSSION

At the initial meeting, before conducting Blended Learning instruction, students were administered a pre-test aimed at assessing their initial competency in computer assembly. The test format used was multiple-choice, comprising of ten questions. Upon distributing the test, the teacher provided instructions to the students on how to answer the questions and asked them to write their names and class. Subsequently, the students proceeded to work on the test. The students' pre-test results can be observed in the **Table 1**.

Table 1. Scores obtained by students during the initial test.

No	Name	List Ask										Score	Value
		1	2	3	4	5	6	7	8	9	10		
1	Student 1	1	0	0	1	0	1	0	0	0	0	3	0.67
2	Student 2	0	1	1	1	0	0	0	0	1	0	4	2.00
3	Student 3	0	0	1	1	0	1	0	0	1	0	4	2.00
4	Student 4	0	0	0	1	0	1	0	0	1	0	3	0.67
5	Student 5	0	0	0	1	0	1	0	0	1	1	4	2.00
6	Student 6	1	1	1	1	0	1	0	1	0	1	7	6.00
7	Student 7	0	0	1	0	0	1	0	0	0	1	3	0.67
8	Student 8	1	0	0	0	1	0	0	1	0	1	4	2.00
9	Student 9	0	1	1	0	1	0	1	1	1	1	7	6.00
10	Student 10	1	1	0	0	1	0	1	0	1	1	6	4.67
11	Student 11	0	1	0	0	1	0	0	1	0	0	3	0.67
12	Student 12	1	0	1	0	0	0	1	1	0	1	5	3.34
13	Student 13	1	0	0	0	0	0	1	1	0	0	3	0.67
14	Student 14	1	1	0	1	1	0	1	1	1	1	8	7.34
15	Student 15	1	1	1	0	0	0	0	0	1	0	4	6.00
16	Student 16	1	1	0	1	0	1	1	0	0	0	5	3.34
17	Student 17	0	1	1	1	1	0	1	0	1	1	7	6.00
18	Student 18	1	1	0	0	0	0	0	1	0	1	4	2.00
19	Student 19	0	0	1	0	1	0	0	0	0	1	3	0.67
20	Student 20	0	0	1	1	0	0	0	1	1	1	5	3.34
21	Student 21	0	1	1	0	0	1	0	1	1	0	5	3.34
22	Student 22	0	1	1	1	1	0	1	1	1	0	7	6.00
23	Student 23	0	1	1	0	1	1	0	0	0	0	4	2.00
24	Student 24	0	1	1	0	1	1	0	0	0	0	4	2.00
25	Student 25	1	1	1	0	0	1	0	0	1	1	6	4.67
26	Student 26	1	1	0	1	1	0	1	1	1	1	8	7.34
27	Student 27	1	0	1	0	1	0	1	0	1	0	5	3.34
28	Student 28	1	1	1	0	0	1	0	0	1	1	6	4.67
29	Student 29	0	0	1	0	1	1	0	0	1	0	4	2.00
Total												**91.42**	
Average												**3.15**	
Completeness												**6.89%**	

From the data of student learning outcomes in Table 4.1 above. it can be observed that the learning outcomes of students in class X TKI 4 are still relatively low. This is evident from the

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average score of students being 3.15. The distribution of scores among 37 students is as follows:

(i) Those who scored 0.67. a total of 6 students with a percentage of 20.68%.
(ii) Those who scored 2. a total of 9 students with a percentage of 31.03%.
(iii) Those who scored 3.34. a total of 5 students with a percentage of 17.24%.
(iv) Those who scored 4.67. a total of 3 students with a percentage of 10.34%.
(v) Those who scored 6. a total of 4 students with a percentage of 13.79%.
(vi) Those who scored 7.34. a total of 2 students with a percentage of 6.89%

Based on the results of the initial test. it can be inferred that the students still face difficulties in solving problems and have a limited understanding of computer assembly material. These difficulties arise from:

(i) Students' inadequate understanding of the subject matter.
(ii) A significant number of students were not seriously engaged when answering the given questions.

Consequently, it can be stated that the initial competency of students in class X TKI 4 is relatively low in understanding computer assembly material. To find out the presentation level of classical completeness. the teacher describes it in **Table 2.**

Table 2. Presentation Rate of Classical Completion.

No	Score	Number of Student	Percentage
1	0.67	6	20.68%
2	2.00	9	31.03%
3	3.34	5	17.24%
4	4.67	3	10.34%
5	6.00	4	13.79%
6	7.34	2	6.89%
	Total	37	100%

From the results of student answers in the initial test. it shows that students still have difficulty in solving the problems of branching structure material according to the algebraic principle have difficulty in solving branching structure material questions according to the algorithm principle. for this reason, it is necessary to continue to cycle I.

Based on the teacher's findings that have been described. the implementation of learning on assembling observation computers using the Blended Learning method in the learning process creates an active atmosphere for students. The Blended Learning method is carried out using moodle so that students can be more independent by having a freedom in accessing the lesson on their own, focused on the task at their hand and be more excited in learning because learning using computer has not been done often before.

The implementation of learning by using the Blender Learning method in the learning process has been carried out optimally. It is said to be optimal because the steps of applying the Blender Learning method have been fully implemented at the action stage. The student learning outcomes has increased from pre-test (initial test), post-test I and post-test II. This can be seen from the table and diagram of the class average value and the increase in the percentage of students experiencing learning completeness in **Table 3**.

Table 3. Scores obtained by students during the initial test.

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Name of Student	Pre-Test Score	Post Test I Score	Pos Test II Score
Student 1	0.67	4.67	7.34
Student 2	2.00	4.67	6.00
Student 3	2.00	3.34	7.34
Student 4	0.67	4.67	6.00
Student 5	2.00	6.00	7.34
Student 6	6.00	8.67	10.0
Student 7	0.67	4.67	7.34
Student 8	2.00	4.67	7.34
Student 9	6.00	7.34	8.67
Student 10	4.67	6.00	8.67
Student 11	0.67	3.34	6.00
Student 12	3.34	7.34	10.0
Student 13	0.67	4.67	6.00
Student 14	7.34	7.34	10.0
Student 15	2.00	6.00	8.67
Student 16	3.34	6.00	7.34
Student 17	6.00	7.34	7.34
Student 18	2.00	4.67	7.34
Student 19	0.67	3.34	7.34
Student 20	3.34	8.67	10.0
Student 21	3.34	4.67	7.34
Student 22	6.00	7.34	10.0
Student 23	2.00	3.34	6.00
Student 24	2.00	7.34	10.0
Student 25	4.67	7.34	10.0
Student 26	7.34	7.34	7.34
Student 27	3.34	6.00	4.67
Student 28	4.67	7.34	4.67
Student 29	2.00	8.67	7.34
Total	**91.415**	**172.79**	**223.43**
Average	**3.15**	**5.95**	**7.70**
Completeness	**6.89%**	**41.37%**	**75.86%**

From the observation of the actions taken by using the Blended Learning method in learning on the material of assembling computers carried out is optimal. There is an increase in learning outcomes compared to the learning outcomes in the pre-test and post-test cycles. where in cycle II the average score obtained by students reached 7.54 (26 students) said to have been completed in learning. Thus. in cycle II this has reached optimal completeness. so, there is no need to carry out learning actions to the next cycle in **Table 4**.

Table 4. Scores obtained by students during the initial test.

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Aspect	Number of Students	Average Score	Completion
Pre-Test	2	3.15	6.89%
Pos-Test Cycle I	12	5.75	41.37%
Pos-Test Cycle II	22	7.70	75.86%

Based on the research results as described in **Table 4** above from the pre-test, post-test I and post-test II in learning on the material of assembling computers based on the elements carried out is optimal. The implementation using the Blended Learning method has been carried out well.

5. CONCLUSION

Based on the discussion that has been presented in chapter IV, it can be concluded that by applying the Blended Learning method to the material of assembling computers in Class X TKI 4 SMK Negeri 2 Bandung can improve student learning outcomes. Starting from the pre-test to the second cycle post-test. In the initial test as many as 2 students (6.89%) has completed their learning with an average of 3.15. In cycle II as many as 37 students (75.86%) has completed their learning with an average of 7.70. The Blended Learning method links the subject matter with the students' surrounding environment to encourage students to make a connection between the knowledge they have and its application in their daily lives. Students learns by not just memorizing or remembering facts, but also to apply what they have learn to their daily lives.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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