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APPLICATION OF TECHNICAL AND VOCATIONAL EDUCATION TRAINING (TVET) IN THE LEARNING PROCESS OF PROGRAMMING LANGUAGE USING ONLINE COMPILER

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Abstrak

Advances in digital technology have influenced the transformation and growth of Technical and Vocational Education Training (TVET) globally. [1] The use of technology in the learning and training process for an educational institution has become a significant necessity in the competitive era of globalization. Many studies discussing the utilization of elearning in the teaching and learning process noted various challenges in the implementation in Indonesia. In this study the author wants to review the monitoring of the use of web-based compiler applications in the learning process of programming languages. The variables that will be used to measure the success of onlineGDB application utilization in the teaching and learning process include: The use of the GDB Online application, student understanding of programming languages, the final results in the learning process. The target respondents who were successfully collected were 146 people consisting of 141 students and 5 lecturers from various universities in North Sumatra-Indonesia. Data was collected by distributing questionnaires, observations and interviews. The results of this study indicate the use of the onlineGDB compiler application can improve the understanding of students in learning programming languages, this can be seen from the results of the compilation of questionnaires conducted for 3 months with 3 variables to measure the success of the programming language learning process, namely 1. The use of the GDB Online application, 2. Student understanding of programming languages, 3. The final results in the learning process.

Kata Kunci: OnlineGDB, TVET, Learning, Programming Language

1. Introduction

Digital-based learning today has developed with the availability of many web-based online applications, so that it greatly helps the teaching and learning process in lectures. The development of online learning that involves the use of digital technology such as Laptops, Tablets and Smartphones began to develop since the early 2010s and has grown greatly since the Covid-19 pandemic where all citizens are required to limit face-to-face activities.

Education as the main activity for a child, both from the most basic level to the highest level in pursuing their future. The development of the learning process utilizing digital technology continues to grow today with the emergence of several online platforms developed by the Indonesian government through the Ministry of Education, Culture, Research and Technology such as independent learning and other stackholders such as google class room, zoom meeting, google meeting, Online GDB, and others.

As one of the programming language learning platforms, Online GDB can be accessed free or paid by lecturers and students in a class formed by the lecturer, so that if the lecturer gives assignments to students, it can be directly accessed by all students in the class and students can immediately work on programming assignments given by the lecturer and send the assignment to the lecturer concerned.

Online GDB in addition to providing Classroom facilities also provides a learning process by providing editors and compilers of several programming languages such as C, C++, Python, Java, PHP, VB, HTML-JS-CSS, Ruby, Kotlin and others. This is very helpful for lecturers and students in the process of teaching and learning programming languages.

In the learning process in the classroom (offline) the limited learning time is often an obstacle for lecturers and students to be able to explore and understand the material provided by the lecturer so that additional time is needed for students to understand and explore the material that has been discussed in class meetings, therefore a medium is needed that can bridge lecturers and students.

This study aims to determine the effect of additional media based on online learning to improve the quality of student understanding of programming language learning. In this study, it is expected that by utilizing online-based compilers that are widely used today can improve the quality of learning in higher education.

The learning process in the 21st century today must fulfill four characteristics that distinguish it from the previous century, namely: Integrating digital communication into learning, collaboration, critical and creative thinking, and innovation. [2] In this study, the importance of using the GDB Online application in the learning process is something that can be discussed related to increasing student understanding in taking programming language courses.

Based on existing problems, to measure the success of students in understanding and mastering a programming language will be measured through several factors, both internal factors and external factors from students.

2. Theoretical Foundation

The teaching and learning process that has been known to be carried out face-to-face between lecturers and students according to several experts found by Morgan and friends learning is a relatively permanent change in behavior and occurs as a result of practice or experience. What is stated by Morgan and friends is in line with the statement put forward by other experts who state that learning is a process that can cause changes in behavior due to a reaction to a certain situation or due to a process that occurs internally within a person. These changes do not occur due to genetic inheritance, or natural responses, maturity, or temporary conditions of the organism, such as fatigue, the influence of drugs, fear, and so on. And can be a change in understanding, behavior, perception, motivation, or a combination of all. [3]

The purpose of learning is to help students to gain various experiences, and with that experience the intended behavior includes knowledge, skills, and values or norms that function as a controller of student attitudes and behavior. [4]

Programming is the process of writing, testing, fixing and maintaining the code that builds a computer program. This code is written using a specific programming language. There are many types of programming languages such as C#, C++, javascript, PHP, and others. The purpose of programming is to create a program that can perform a calculation or 'job' according to the wishes of the programmer. Programming requires skills in algorithms, logic, programming languages, and in many cases, other knowledge such as math. [5]

This online learning system is a learning system that is carried out using the internet and presents it in various types of learning correlations. By conducting a learning system through online, it is hoped that it can become a benchmark for education in utilizing technology and information such as using devices on computers or gadgets to connect with each other, so that the use of this educational technology makes the teaching and learning process more effective. [6]

Since it was launched by the minister of education and culture, the independent learning curriculum aims to provide flexibility for students to better understand concepts and strengthen self-competence. The application of Technical and Vocational Education Training (TVET) can be one of the concepts to further improve the concept of learning programming languages. [7]

With the rapid development of technology, learning and teaching techniques have changed a lot. The old techniques are considered too ordinary and tend to be boring. Both for students and teachers [4]. Therefore, this journal will discuss the techniques and tools used in learning and teaching programming based on the research that has been done.

3. Methodology

This research uses qualitative methods on lecturers and students of STMIK Methodist Binjai with the target population of lecturers and students who take programming language courses. The population that was successfully collected was 5 lecturers and 141 students with different genders..

Table 1. Target

No	Population	Quantity
1	Lecturer	5
2	1st Semester Students	54
3	3rd Semester Students	49
4	5th Semester Students	38
Total		146

The data to be used in this study were obtained through opinion polls by distributing questionnaires to lecturers and students. The variables used in this study are grouped into 3 groups, namely:

Table 2. Variables and number of questions

No.	Variables	Total
1.	Use of the GDB Online application	6
2.	Students' understanding of programming languages	8
3.	End results in the learning process	4

For the component Use of the GDB Online application there are 6 elements that will be asked in this questionnaire, as for the elements that will be asked, namely:

1. Whether the GDB Online application system can be accessed easily.
2. Does the GDB online application allow interaction between lecturers and students.
3. I like using the GDB online application to learn programming languages.
4. Does the GDB online application provide information / material / questions that are easy to understand.
5. I intend to use the GDB online application until some time in the future.
6. With the GDB online application allows you to study anytime and anywhere.

For the variable student understanding of programming languages consists of 8 elements, among others:

1. You don't experience much difficulty when learning computer programming.
2. You do not find it difficult when writing code / syntax in programming
3. Algorithms confuse you in learning programming.
4. Do you agree that an algorithm is really a sequence of steps to solve a problem?
5. You feel that learning programming does not train you to solve problems systematically.
6. You feel that mathematical problems can be helped by programming languages.
7. You feel that with a good program all work can be done more easily and quickly.
8. You feel that a student who understands programming languages will find it easier to find a job.

Meanwhile, to measure the final result variable in the learning process consists of 4 elements, among others:

1. You feel that the questions given, both practice questions and exam questions, are not too difficult.
2. Do you agree that practice questions are not needed in learning programming languages.
3. You did not have much difficulty understanding the questions given in the exam.
4. You feel that the exam time provided to complete the computer program is not enough.

4. Results

Standard deviation, which is usually called standard deviation, is one of the most widely used statistical models in determining. In this study, the authors used the standard deviation calculation method to determine the distribution of the data from the questionnaire by calculating the average or mean. One of the functions of the standard deviation formula is to provide an overview of the distribution of data against the average.

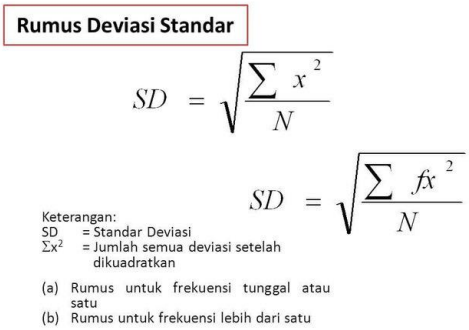

Figure 1. Standard deviation formula

In the variable Use of the Online GDB application, the author uses 6 elements to determine the extent of use of the OnlineGDB application by students and lecturers. From the results of these calculations, an average result (mean) of 2.375 and a standard deviation of 1.1535 was obtained, because the standard value is lower than the mean, so it can be concluded that the majority of lecturers and students who study programming languages can be said to know the OnlineGDB application well. Table 3 shows the calculation results of the use of the GDB Online application on campuses that study programming languages.

Table 3. Variables for using the GDB online application

Pertanyaan	SS	S	N	TS	STS	Mean	Std. Deviation
Apakah Sistem aplikasi Online GDB dapat diakses dengan mudah.	35,6	22,6	25,3	10,3	6,2	2,29	1,226
Apakah Aplikasi online GDB memungkinkan adanya interaksi antara Dosen dan mahasiswa	32,9	23,3	28,1	7,5	8,2	2,35	1,241
Saya suka menggunakan aplikasi online GDB untuk belajar bahasa pemrograman	24,7	28,1	30,1	11,0	6,2	2,46	1,157
Apakah Aplikasi online GDB memberikan informasi/materi/soal yang mudah dipahami.	21,9	30,1	30,1	9,6	8,2	2,52	1,176
Saya berniat untuk menggunakan aplikasi online GDB hingga beberapa waktu kedepan	26,0	25,3	29,5	11,6	7,5	2,49	1,211
Dengan adanya Aplikasi online GDB memungkinkan anda untuk belajar kapan saja dan dimana saja.	29,5	32,2	32,9	5,5	0,0	2,14	0,910
Rata-rata						**2,375**	**1,1535**

To determine students' understanding of programming languages, the author also provides variables to measure students' understanding while taking programming language courses. Based on the results obtained while students were taking this course using the OnlineGDB application, there was an increase in students' ability to master the programming languages discussed. This can be seen from the results of the questionnaire on the variable student understanding of programming languages where the average result obtained was 2.42 and the average standard deviation result obtained was 1.19. The results of calculating the student understanding variable about programming languages can be seen in table 4.

Table 4. Variables Student understanding of programming languages

Pertanyaan	SS	S	N	TS	STS	Mean	Std. Deviation
Anda tidak begitu banyak mengalami kesulitan saat belajar pemrograman komputer	30,1	27,4	26,7	9,6	6,2	2,34	1,183
Anda tidak merasa kesulitan ketika menuliskan kode/sintaks dalam pemrograman	29,5	28,1	26,0	7,5	8,9	2,38	1,233
Algoritma membingungkan anda dalam mempelajari pemrograman	24,0	29,5	29,5	11,0	6,2	2,46	1,151
Setujukan anda bila algoritma benar-benar merupakan urutan langkah-langkah untuk memecahkan masalah	24,0	28,1	30,1	9,6	8,2	2,50	1,193
Anda merasa belajar pemrograman tidak melatih anda memecahkan persoalan secara sistematis	20,5	25,3	33,6	13,0	7,5	2,62	1,170
Anda merasa permasalahan matematis dapat dibantu dengan adanya bahasa pemrograman.	28,1	34,9	24,0	6,2	6,8	2,29	1,144
Anda merasa dengan adanya program yang baik semua pekerjaan dapat dilakukan dengan lebih mudah dan cepat	34,2	21,9	27,4	10,3	6,2	2,32	1,220
Anda merasa seorang mahasiswa yang memahami bahasa pemrograman akan lebih mudah dalam mencari pekerjaan.	28,8	25,3	29,5	8,2	8,2	2,42	1,219
Rata-rata						2,42	1,19

The last variable measured is the final result in the learning process which aims to see the results obtained by students during the programming language course lecture process, where the results obtained show better results with a mean value of 2.52 and the standard deviation results show a value of 1.23. the results of this questionnaire can be seen in table 5 below.

Table 5. Variable End results in the learning process

Pertanyaan	SS	S	N	TS	STS	Mean	Std. Deviation
Anda merasa soal-soal yang diberikan baik soal latihan maupun soal ujian tidak terlalu sulit	21,9	28,1	30,1	13,0	6,8	2,55	1,169
Setujukan anda soal-soal latihan tidak diperlukan dalam belajar bahasa pemrograman.	22,6	29,5	28,8	9,6	9,6	2,54	1,216
Anda tidak begitu mengalami kesulitan memahami soal-soal yang diberikan dalam ujian	28,1	22,6	25,3	12,3	11,6	2,57	1,328
Anda merasa waktu ujian yang disediakan untuk menyelesaikan program komputer tidak cukup.	28,1	28,1	28,1	6,8	8,9	2,40	1,218
Rata-rata						2,52	1,23

5. Conclusion

Based on the results of this study, several conclusions can be drawn that by utilizing the OnlineGDB application in the teaching and learning process for programming language courses can help students to better understand programming languages, besides that with the use of the onlineGDB application lecturers can provide Assignments, correct and provide comments on the results of assignments done by students. In this study, from the measurement results of the 3 variables proposed, including the use of onlineGDB, student understanding and final results, the total average mean value of each variable is 2.375, 2.42 and 2.52 and the average value of the standard deviation of each variable is 1.1535, 1.19 and 1.23, from the results obtained it can be concluded that the use of this OnlineGDB application will greatly help students and lecturers, so that the use of this OnlineGDB application can be used as an additional tool in the learning process on existing campuses.

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