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Increased interest and learning outcomes of vocational high school students through the use of CNC lathe simulators

Abstract

Student learning outcomes in the NC / CNC CAD-CAM XI TPM 1 Mechanical Engineering lesson at SMK Negeri 5 Padang are below standard because the learning media used is not varied enough. This research aims to increase interest and learning outcomes using CNC Lathe Simulator. This study used the Classroom Action Research method with 14 students in the XI TPM 1 subject, which was carried out in October-November 2022 with two cycles. The research instrument uses questionnaires and test questions. The results showed an increase from cycle 1 to cycle two by 4.21% and classical completeness of cycle 1 to cycle two by 7.14%. The results of this study show that the use of a CNC Lathe Simulator in NC / CNC CAD-CAM Machining Engineering lessons increases student interest and learning outcomes.

Keywords: CNC Lathe Simulator, Interests, Learning Outcomes, CAD-CAM

Introduction

According to (Sujana, 2019), education is the work to help the soul of students, both outwardly and mentally, from their nature toward a better human civilization. (Sirait, 2016), interest is a sense of liking and interest in a particular activity without coercion. According to (Chotimah & Fathurrohman, 2018), learning is a permanent change in behavior or behavioral potential due to reinforced experience or practice. The greater the interest in learning possessed by students, the greater the influence exerted on learning outcomes (Laras & Rifai, 2019). Several previous studies prove that interest influences the success of learning and learning outcomes (Jalinus et al., 2023; Prasetya et al., 2021).

NC/CNC CAD-CAM Mechanical Engineering The subject is the lesson learned in class XI in the first and second semesters. Even though the basic competency is learned, namely: in the first and second semester, even though the basic competency is learned, namely: (1) Understand understanding CNC machines, (2) Understanding CNC programming, (3) Understanding CNC coordinates, (4) Understanding the process in the work of CNC machines. To support learning at SMK Negeri 5, Padang has two units of CNC machines, alkaline, but the machine is damaged. With this, it is unlikely that it will meet the student's interest in understanding the experience of working with CNC machines. Medial training in learning is an excellent way to increase investment which can be done to improve results in learning interest. Lack of sales of technology in terms of failure in the form of video learning in process experience with CNC machines in educational activities.

Based on the experience and experience of the researchers when carrying out the practical educational experience carried out during the period July – December 2021 in class XI SMK Negeri 5 Padang, several practicals were discovered, especially in terms of learning the NC/CNC CAD-CAM Machining Techniques, due to the lack of optimal use of medial learning such as video learning, education is still too monotonous so that students are unable to learn it is difficult to understand the learning problems, students often fall asleep, and sometimes they are too lazy to go out and become saturated with

medial learning, medial learning video learning requires quite expensive costs, such as learning video online learning students. In the medial learning video learning process, not all students can follow the informality conveyed through the media learning video. This also impacts the interest in student learning outcomes, which should be understood as a standard applied by the school, namely the Minimum Completeness Criteria at SMK Negeri 5 Padang.

(Wijanarka, 2012), Learning objectives, especially CNC competence, will be challenging for those who study CNC without using media in CNC machines. This is because the CNC machine facilities at the school cannot operate. So students cannot carry out practicum activities to the fullest, and according to (A & Azis, 1998), The ideas behind these movements are difficult to convey orally; instead, it needs to be demonstrated or simulated through animation or machine movement simulation (machine simulator). Students often misunderstand concepts and misinterpret command codes because they get abstract explanations rather than media or facilities that demonstrate the operation of CNC machines. Through the use of CNC Simulator media, it is effectively applied as a learning medium (Ardianto et al., 2021). This CNC Lathe Simulator is a learning medium that optimizes existing components to make the learning appearance more varied, looks as if naturally using a CNC machine, and attracts student learning stimuli (Candra et al., 2019).

Using CNC Simulation Torch can help improve interaction, make learning more enjoyable and efficient, enhance the quality of education, and foster a positive attitude toward understanding (Suyetno et al., 2022). With medical learning support that supports such as the use of medical education "CNC Lathe Simulator," especially with CNC Lathe Simulator which influences interest in the result of learning alkaline students more by the calendar, researchers are interested in doing research with the title "Increasing Interest" It in Halsil Belaljar Students of Class XI Maltal Practicing NC/CNC CAD-CAM Machining Techniques Using the CNC Lathe Simulator at SMK Negeri 5 Padang" with Halalpaln and Dalpalt being one of the considerations in improving the quality of education, especially in terms of learning NC/CNC CAD-CAM Machining Techniques education becomes a significant factor in individual success (Emputri et al., 2019). Education is an activity that is deliberately done to form a good person (Putra et al., 2021). Good personal formation process through learning activities (Izzudin & Suharmanto, 2013). The implementation of education is closely related to learning (Hidayat et al., 2020). So education can be successful if the learning process is good or on target (Putu, 2019).

Methods
Types of Research

This research uses the Classroom Action Research (CALR) method, carried out in the context of ongoing learning. The research researchers consider learning components such as teaching media to create a solution following the class situation. (Laksono & Siswono, 2018) state that Classroom Action Research is defined as reflective research that carries out specific actions to increase or even reverse learning in a professional class and according to (Sanjaya, 2009). This research was carried out to improve the quality of experience in supporting the teaching and learning process of teachers, especially in a learning process.

Subject

The subjects of this study were students of class XI TPM 1 with a total of 14 students in the object of this study, namely the medial CNC Lalthe Simulator. This research was conducted at SMK Negeri 5 Padang Mechanical Engineering Department in Lolong Belanti, Padang City, West Sumatra. In this research, the time researchers need is usually one month after the issuance of the research permit letter, and the study will be carried out in the first semester of the 2022/2023 year.

Research Instruments

This research uses test sheet instruments and questionnaire sheets. Also, the technique of collecting data with the resources, on the other hand, of the students after the learning process is carried out.

Test instruments

The instrument test used validity, reliability, daily difference, and randomness analyses. Valid also lacks the correlation that was tested regarding the Corrected Item-Total Correlation for the test instrument and the Product Moment correlation for the questionnaire instrument. If an item is found that does not meet the requirements, it is unlikely that the thing will be investigated further. Based on the results of the test instrument test in the questionnaire, see the following table 1.

Table 1: Instrument Test Results

Instrument	Number of Items	Valid	Invalid
Test Questions	35	30	5
Questionnaire	24	20	4

Data Analysis Techniques

The learning interest indicator the student completes after the learning is completed is calculated in the data used to calculate the percentage of students' learning interest. To find out the percentage of students' learning interests, the following conditions are used:

$$P = \frac{F}{A} \, x \, 100\%$$

The test questions obtained after the completion of the research cycle were used to produce an assessment of student learning outcomes, with the KKM that had been set at 75 in a classical completeness level of 80% with a back-to-back category. Completeness of the individual as a result of this learning can be formulated as follows:

$$S = \frac{R}{N} x \, 100$$

The completeness of the classical result of this learning can be formulated as follows:

$$KK = \frac{ST}{N} \, x \, 100$$

Results and Discussion
Increased interest in learning students using CNC Lathe Simulator

It uses a valuable CNC Lathe Simulator medical experience in the learning process and the student's learning interest. Approximately 78.00% of students are interested in learning in cycle 1. Based on these results, it is concluded that they are not included in the category of success and are continued in the next cycle. The percentage of students' learning interest increased by 82.21% in cycle 2. From cycle 1 to cycle 2, students' learning interest increased by 4.21 percent. Observations show that students may be more interested in learning through cycles 1 and 2 of the CNC Lathe Simulator learning process. The following table shows the increase:

Table 2: Recapitulation increases students' learning interest in Cycle I and II

Student Learning Interests	Cycle I (%)	Cycle II (%)	Number of Increases
Feeling	76,00	84,57	8,57
Attention	80,86	81,71	0,86
Interest	75,14	80,86	5,71
Involvement	80,00	81,71	1,71
Average	78,00	82,21	4,21

Improved student learning outcomes using CNC Lathe Simulator

Learning with the CNC Simulator can improve student learning outcomes in the cognitive field and mental knowledge of NC/CNC CAID-CAIM learning, according to the study's findings. The instrument used to measure the learning results is a double-choice test at the end of a cycle of 30 questions. The actual increase can see in results of learning pathways from cycle 1 to cycle 2. Dalpalt can be seen from the physical table in the following picture:

Table 3: Recapitulation of increased student learning outcomes in cycle I and II

Student Learning Outcomes	Cycle I (%)	Cycle II (%)	Number of Increases
Top Rated	80,00	86,67	6,67
Lowest Value	60,00	73,33	13,33
Average	74,52	78,33	3,81
Number of Students Complete	11	12	1
Classical Completeness	79	86	7,14

It can be seen from the results of the visuals in the total numbers of students in the totality of the overall classics that there is an increase in the numbers in cycle 1, obtaining 79% in cycle 2, obtaining 86% with an increase in achieving 7.14%. Judging from the results of this study, there has been an increase in student interest and learning outcomes which shows the similarity of results or suitability of research results with previous research by (Candra et al., 2019), with the results of the t-test calculation of 1.675 which is smaller than the t-count of 5.118 which states that there is a significant difference between learning outcomes through the use of the CNC Simulator compared to conventional media which states that the effectiveness of using the CNC Lathe Simulator on high school students and research by (Ardianto et al., 2021), with the results of the N-Gain study of 57.8% which means that through the use of the CNC Simulator, it is effectively applied as a learning medium.

Conclusion

Using the Simulator CNC to place the alps that students learn in class XI TPM 1 regarding the NC/CNC CalD-CAIM Machining Techniques in increasing their interest in the metalized material is evident in the practice that is carried out throughout the research. In cycle 1, 78% of students show interest in learning. In cycle 2, the percentage increases to 82%. Learning the NC/CNC CAID-CAIM Machining Techniques in class, XI TPM 1 can be practiced with the help of a CNC Simulator, which can improve student learning outcomes. This can be seen in the practice carried out during the research. In the first cycle of students' learning achievement, the student's learning achievement percentage was 79 percent. In contrast, in the second cycle, the student's learning achievement had an 86 percent percentage of classical learning completion.

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Declaration
Author's Contribution

Angger Prayogi is a researcher and data collection, Febri Prasetya is the one who directs the method and process of making, Yufrizal is the one who evaluates the results of the research data, and Bulkia Rahim is the one who considers the research.

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Conflict interest

The authors declare no conflict of interest.

References

A, Y., & Azis, A. (1998). *Dasar Teknologi Mesin NC/CNC*. Jurusan Pendidikan Teknik Mesin FPTK IKIP Padang.
Ardianto, D., Helmi, N., Indrawan, E., Mesin, J. T., & Tawar, K. A. (2021b). *Efektivitas Penggunaan Cnc Simulator Untuk Meningkatkan Hasil Belajar Pada Pembelajaran Teknik Pemesinan Nc / Cnc Dan Cam Kelas Xii Smk Negeri 1 Bukittinggi Effectiveness of Using a Cnc Simulator To Increase Learning Outcomes in Learning Nc / Cnc Machiner*. *3*(4), 62–67.

Candra, Y. E., A, Y., Irzal, I., & Prasetya, F. (2019). Pengaruh Media Simulator Cnc 2 Axis Terhadap Hasil Belajar Mata Diklat Cnc Dasar Siswa Di Smk Negeri 5 Padang. *Jurnal Vokasi Mekanika (VoMek)*, *1*(1), 15–19. https://doi.org/10.24036/vomek.v1i1.19

Chotimah, C., & Fathurrohman, M. (2018). Paradigma Baru Sistem Pembelajaran Dari Teori, Metode, Model, Media, Hingga Evaluasi Pembelajaran. In *Yogyakarta: AR-RUZZ MEDIA* (pp. 99–102).

Emputri, Y., Ambiyar, & K, A. (2019). Penerapan Model Pembelajaran Project Based Learning Untuk Meningkatkan Aktivitas Dan Hasil Belajar Gambar Teknik Siswa Smk Negeri 1 Pariaman. *Jurnal Vokasi Mekanika (VoMek)*, *1*(1), 8–14.

Hidayat, W., Jahari, J., & Nurul Shyfa, C. (2020). Manajemen Kelas Dalam Meningkatkan Proses Pembelajaran Di Madrasah. *Jurnal Pendidikan UNIGA*, *14*(1), 308. https://doi.org/10.52434/jp.v14i1.913

Izzudin, A. M., & Suharmanto, A. (2013). Efektivitas Penggunaan Media Pembelajaran Video Interaktif Untuk Meningkatkan Hasil Belajar Praktik Service Engine Dan Komponen-Komponennya. *Journal Unnes*, *2*(2), 1–8.

Jalinus, N., Syahril, Haq, S., & Kassymova, G. K. (2023). Work-based learning for the engineering field in vocational education: Understanding concepts, principles and best practices. *Journal of Engineering Researcher and Lecturer*, *2*(1), 9–17. https://doi.org/10.58712/jerel.v2i1.22

Laksono, K., & Siswono, tatag yuli eko. (2018). *Penelitian Tindakan Kelas* (P. Latifah, Ed.; Cetakan pe). Bandung : Remaja Rosdakarya, 2018.

Laras, S. A., & Rifai, A. (2019). Pengaruh Minat dan Motivasi Belajar Terhadap Hasil Belajar Peserta Didik di BBPLK Semarang. *Jurnal Eksistensi Pendidikan Luar Sekolah (E-Plus)*, *4*(2), 121–130.

Prasetya, F., Syahri, B., Fajri, B. R., Ranuharja, F., Fortuna, A., & Ramadhan, A. (2021). Improved learning outcomes of CNC programming through Augmented Reality job sheet learning media. *Jurnal Inovasi Vokasional Dan Teknologi*, *21*(3), 221–233.

Putra, W. D., Ambiyar, Helmi, N., & Nabawi, R. A. (2021). *Strategi Pembelajaan Sistem Blok Masa Pandemi Covid-19 menurut Pandangang Siswa Kelas XI Jurusan Teknik Pemesinan SMK Negeri 1 Sumatera Barat*. *3*(1), 45–51.

Putu, yulia. (2019). Hubungan Gaya Komunikasi Guru Terhadap Tingkat Keefektifan Proses Pembelajaran. *Jurnal Agama Dan Budaya*, *3*(2), 71–78.

Sanjaya, W. (2009). *Penelitian Tindakan Kelas*. Jakarta: PRENADAMEDIAGROUP.

Sirait, E. D. (2016). Pengaruh Minat Belajar Terhadap Prestasi Belajar Matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *6*(1), 35–43. https://doi.org/10.30998/formatif.v6i1.750

Sujana, I. W. C. (2019). Fungsi Dan Tujuan Pendidikan Indonesia. *Adi Widya: Jurnal Pendidikan Dasar*, *4*(1), 29. https://doi.org/10.25078/aw.v4i1.927

Suyetno, A., Qolik, A., Sudjono, I., & Fauzy, F. A. (2022). *Pengaruh Penggunaan Simulator CNC Terhadap Hasil Belajar Mata Kuliah CNC Selama Masa Pandemi Covid-19 Di Jurusan Teknik Mesin Universitas Negeri Malang*. *5*, 7–16.

Wijanarka, B. S. (2012). *PENGEMBANGAN MODUL DAN PEMBELAJARAN KOMPETENSI KEJURUAN TEKNIK PEMESINAN CNC SMK*. UNIVERSITAS NEGERI YOGYAKARTA.