Implementation of Contextual Teaching and Learning Strategy in Electronics Digital Course

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***Abstract*—the main issue of this action research is the lack of participation, comprehensiveness, motivation, and learning outcomes of students majoring Education Electronics Engineering in Electronics Digital course. This study aims to determine the implementation of Contextual Teaching and Learning (CTL) strategy in Electronics Digital course. This learning strategy allows students to be actively participated in learning process which eventually will increase the learning acquisition. This study is a classroom action research and involves 37 undergraduate students of the Education Electronics Engineering study program in Faculty of Engineering UNM who enrolled Electronics Digital course for the odd semester in 2020-2021. Data collection techniques employs observation checklist, closed questionnaire, interview, and open questionnaire. The results show that the CTL-based learning can increase students' motivation. It is indicated by the increasing number of students who actively ask questions during the lecture, from 5% to 87.03%. Furthermore, students' understanding of Electronics Digital teaching materials has also increased as seen from the students' ability to complete structured assignments without lecturers' assistance, ranging from 25% to 96% at the end of the third cycle. Students' grade, at the end of the third cycle, has also increased, 80% of students have improved to grade B. It is expected that students as respondents in this study will get an average grade of A-and higher by the end of semester.**

IndexTerms—contextual teaching and learning, electronics digital course

I. INTRODUCTION:

The quality of learning outcomes is determined by the application of the used learning strategies and the students' comprehension to the teaching materials. The Electronics Digital course is in the fifth semester with 3 credits and requires suitable learning strategies for strengthening skill competencies. Based on the results of prior study, Contextual Teaching and Learning (CTL) strategies can increase learning acquisition which are in accordance with the basic principles of learning digital electronics which are based on learning facts and practices that can be observed in the form of electric waves and electromagnetic signals. Therefore, determine the learning objectives and organizing the presentation of teaching materials are very important because they conveys students' readiness to learn about particular course [1][2][3].

In every lectures, students are expected to achieve maximum learning outcomes as the ability to solve problems numerically. Digital electronics is a course of how to solve complex mathematical equations. Digital electronics teaching materials include numerical and digital solutions such as: (1) Number System; decimal, binary, octal, hexadecimal, (2) Logic gates; Not,AND,OR,X-NOR,X-OR, (3) Gate characteristics; Inverter, Non-Inverter, (4) TTL Circuit, (5) Algebra Boolean, (6) ALU (Arithmetic Logical Unit), (7) Flip-Flop, (8) Finding the roots of equations, (9) solving linear algebraic equations, and (10) Optimization; Integration[4][5][6]. The scope of the teaching material that has been stated is not all taken, but is limited based on the analysis of the expected competency.

The learning strategy of Electronics Digital course employs theoretical and practical approach. Students must actively participated during lectures since it is not a conventional learning (lecturers explain and students listen), but also with individual assignments, group assignments, presentations, and discussions. The greatest weight of assessment is the mid-semester test scores and the final semester examination, therefore it is crucial for students to master how to solve questions on all topics since this is an essential competency strengthening course.

The prior observation shows that most of the students' are passive in Electronics Digital course. The students' attendance rate is high but little participation during learning process, some of the students rely their grades on their friends' in group assignment, confused with all symbols and concept of Electronics Digital, and students tend to feel bored with the less engaging teaching method. Therefore, it is crucial to improve the quality of teaching, especially in delivering teaching materials.

Contextual learning has seven components such as: (1) Constructivism, this concept requires students to build and incorporate new information into the schemas, (2) Questioning, in this concept question and answer activities are carried out by both teachers and students, 3) Inquiry is a cycle process in building knowledge or concepts that starts from observing, questioning, investigating, analyzing, then building theories or concepts, (4) Learning Community is functioned as communication forums to share experiences and ideas, (5) Modeling is an activity of demonstrating a performance so that students can imitate, learn or do something according to the given model, (6) Reflection is identify something that is already known and something that is not yet known so that an improvement can be taken, and (7) Authentic Assessment is a direct examination procedure that shows the real ability (knowledge, attitude, and skills) of students[7][8].

Learning progress is not merely measure the results but is also assessed the process in various ways. The interactions that are carried out by the teacher in the classroom and outside the classroom and positioning the relationship between the teacher and students or vice versa. This interaction process is a teaching and learning interaction process. Teachers, students and subject matter are the three main elements that are directly involved in this process so that learning objective is achieved. Thus teaching and learning interactions can be defined as a special approach to achieve learning objectives [9].

Several studies suggest that Contextual Teaching and Learning (CTL) can improve students' learning outcomes [10][11] where the learning activities is students centered, hence there is learning experience and active participation by students. The CTL is a learning strategy that emphasizes the process of full student involvement to construct the material being studied and connect it in the application of life. Furthermore, CTL is a strategy that links teaching materials with real-world situations and motivates students to connect their knowledge with everyday life[12][13][14].

Based on the background of this study, several problems can be formulated as follows: (1) How should the application of the CTL-based learning in Electronics Digital course be? (2) Does the application of the CTL-based learning increase students' motivation towards Electronics Digital course? (3) Does the application of the CTL-based learning improve students' understanding of Electronics Digital course? and (4) Does the application of the CTL-based learning in Electronics Digital course can improve the students' grade?

II. Method

WhereverThis classroom action research implements the Contextual Teaching and Learning strategy and involves 37 students who enrolled in Electronics Digital course as the respondents, a partner lecturer who assists the observation, and the researcher who designed the learning process and conducting learning observations based on the stages in classroom action research starting from identifying and formulating problems, developing learning methods, carrying out each stage of research, and compiling reports as shown in Fig. 1. The stages of action research can be described as follows [15].

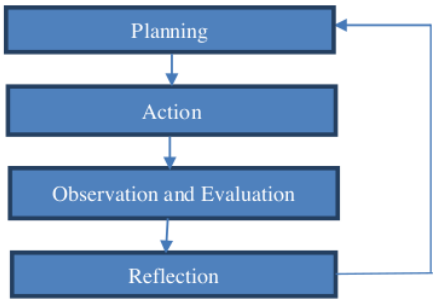

Figure 1. Stages of Classroom Action Research

The activity indicators used in this study are shown in Table 1 below. The success of the action in this study was assessed from the suitability of learning activities with the action plan, students' motivation in Electronics Digital course, students' understanding of analog electronics teaching materials, and the percentage of students who got score above A-.

Table 1. Indicators of Actions

Activity	Initial Result	Final Result
Action plan according to learning process	Incompatible	Compatible
Attention and learning motivation to take the course	Average	Very good
Presentation of learning objectives	Poor	Inconsistent
Arrangement of teaching material	Incoherent	Disorganized
Participation and understanding of teaching materials	Poor	High
Percentage of acquisition learning grades	On average 67 (B)	On average 82 (A-)

III. Results and Discussion:

The result of compatibility of action plan and learning process in the first cycle is presented in Table 2. The scoring system is based on the following criteria: 1 when only 25% of the activity is implemented (poor), 2 when only 50% of the activity is implemented (average), 3 when 75% of the activity is implemented (very good), and 4 when 100 % of the activity is implemented (excellent). The learning outcomes scores and categories are: A (>92-100), A- (>83-92), B+ (>75-83), B (>67-75), and B- (54-66).

Tabel 2. The Compatibility of Learning Process and Action Plan in Cycle I

Indicators	Score	Results
Preparation of teaching tools (Lesson Plan, Lab Sheet, Assessment)	2	Systematic improvements were made on the materials delivery, lab sheet and instruments based on the learning objectives
Presentation of lab equipment	3	Identify with tools and materials needed according to the job sheet
Introduction to lecture	3	Often forgotten
Deliver learning objectives	2	Often forgotten
Organize teaching materials	1	Not implemented
Present teaching materials sequentially	3	Implemented structurally
Give reinforcement and motivation	3	Implemented
Use Learning Media	3	Well implemented
Variation in lectures	3	Implemented and need improvement
Provide experimental practice guidance and problem solving assistance	3	Implemented and need improvement
Class and Lab Management	4	Well implemented
Demonstrate questioning skills	2	Need assistance
Evaluate learning outcome	2	Implemented with limited time
Reinforcement in learning	3	Implemented with limited time
Reinforcement in students' participation	2	Implemented but students are still passive
Close the lecture: Conclusion and feedback	2	Implemented

Data obtained in the first cycle show that labsheet preparation was in the poor category because after the labsheet was used it was found that there were errors in the value of the resistance value, labsheet, and typos, so the implementation of the practicum was not effective. Learning media has been used well because the media has been installed in the room and all learning media have been installed on the computer. Practical guidance has also been carried out very well because teaching materials, practice questions and case discussions are always carried out, either directly or through e-learning. The other aspects of learning process compatibility with action plan are categorized as well implemented and still need improvement. Data on the compatibility of learning process with action plan is shown in Table 3 and Table 4.

Tabel 3. The Compatibility of Learning Process and Action Plan in Cycle II

Indicators	Score	Results
Preparation of teaching tools (Lesson Plan, Lab Sheet, Assessment)	2	Systematic improvements were made on the materials delivery, labsheet and instruments based on the learning objectives
Presentation of lab equipment	3	Identify with tools and materials needed according to the jobsheet
Introduction to lecture	4	Implemented
Deliver learning objectives	2	Rarely implemented
Organize teaching materials	1	Not implemented
Present teaching materials sequentially	3	Implemented structurally
Give reinforcement and motivation	3	Implemented
Use Learning Media	3	Well Implemented
Variation in lectures	3	Implemented and need improvement
Provide experimental practice guidance and problem solving assistance	3	Implemented and need improvement
Class and Lab Management	4	Well implemented
Demonstrate questioning skills		Need assistance
Evaluate learning outcome	2	Implemented with limited time
Reinforcement in learning	3	Implemented with limited time
Reinforcement in students' participation	2	Implemented but students are still passive
Close the lecture: Conclusion and feedback	3	Implemented

Tabel 4. The Compatibility of Learning Process and Action Plan in Cycle III

Indicators	Score	Results
Preparation of teaching tools (Lesson Plan, Lab Sheet, Assessment)	4	Systematically implemented with the materials, labsheet steps and instruments based on the learning objectives
Presentation of lab equipment	4	Identify with tools and materials needed according to the jobsheet
Introduction to lecture	4	Implemented
Deliver learning objectives	4	Implemented
Organize teaching materials	4	Not implemented
Present teaching materials sequentially	3	Implemented structurally
Give reinforcement and motivation	3	Implemented
Use Learning Media	3	Well implemented
Variation in lectures	3	Implemented and need improvement
Provide experimental practice guidance and problem solving assistance	3	Implemented and need improvement
Class and Lab Management	4	Well implemented
Demonstrate questioning skills	2	Need assistance
Evaluate learning outcome	3	Implemented with limited time
Reinforcement in learning	3	Implemented with limited time
Reinforcement in students' participation	3	Implemented but students are still passive
Close the lecture: Conclusion and feedback	4	Implemented

The result of action plan from cycle I to cycle III has increased. However, there are still some aspects that cannot reach the maximum score, such as deliver teaching materials, providing reinforcement, making learning variations, and class and lab management. These findings made the researcher aware that in the future, practical learning of Computing Engineering needs to be improved by increasing the explanation of teaching materials, providing reinforcement, making variations in learning, and managing the class.

For three cycles, the motivation of students to take Digital Electronics course is shown in Fig. 3. It shows that the number of students who arrive on time and the number of students who ask questions are increase. The number of students who arrive on time at the end of the cycle reach 90%. These results can be interpreted that students are increasingly motivated to enter class immediately, as not to miss the class. Meanwhile, the number of students who ask questions can only reach 60%. More questions means that more students are interested in exploring the subject further, even though not all students ask questions.

The number of students discussing assignments with friends and the number of students who did not immediately leave the class or lab when time ran out increased from cycle I to cycle III. At the end of the third cycle, the number of students discussing assignments with friends is 25%, while the number of students who did not immediately leave the class or lab when time ran out was 10%. This can be interpreted as a decrease in motivation, but it can also be interpreted that an increase in motivation causes students to master the material faster, so they can do assignments with confidence and most of them can complete assignments on time.

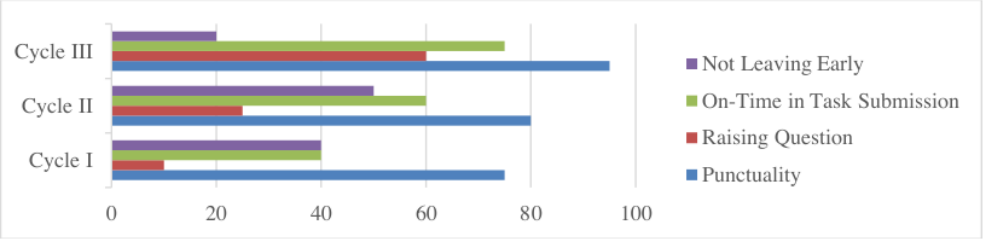

Figure 3. The Development of Students' Motivation in Three Cycles

The results of students' understanding of the teaching materials obtained from observations are shown in Table 5 below.

Table 5. Students' Understanding in Cycle I, II, and III

Indicators	Frequency C1	% C1	Frequency C2	% C2	Frequency C3	% C3
Students work on assignments correctly	6	16.22	16	43.24	9	24.32
Students work on and submit assignments on time	14	37.84	23	62.16	17	45.94
Students work on assignments with additional activities	5	13.51	2	5.41	23	62.16
Students who can do assignments without assistance and peers	19	51.40	7	18.92	6	16.22
Students work on assignments according to the labsheet	31	83.78	4	10.81	35	94.59
Students work on assignments based on the references studied	26	70.27	5	13.51	3	8.11

Based on the data in Table 5, there is a saturation of student activities during lectures in the third cycle. It shows that the learning process must consider the level of saturation, especially in delivering teaching materials that requires mathematical equations and solutions.

The development of students' understanding on Electronics Digital course for three cycles is presented in Fig. 4. There are 6 indicators (1) students who do assignments correctly, (2) students who work on and submit assignments on time, (3) number of students who do assignments with additional activities, (4) students who can do assignments without assistance and peers, (5) Students work on assignments according to the labsheet, (6) Students work on assignments based on the references studied.

The number of students working on assignments with additional activities is at a low percentage during all cycles. This could be due to the fact that students are still too worried about failing the experiments if there are too many study materials. For students, the most important thing is to follow the instructions in the labsheet so that the power amplifier circuit that is arranged can run properly. The number of respondents who can do assignments without the help of a lecturer is at the highest percentage. At the end of the third cycle this indicator can reach up to 100%. This shows that students feel they have understood the materials being taught and do the tasks on their own.

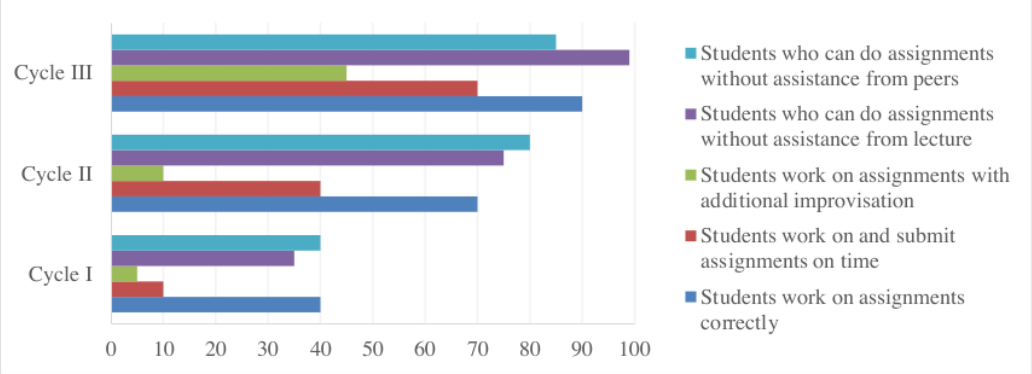

Figure 4. The Development of Students' Understanding of Teaching Materials

Considering that the research report must be completed before the current semester is over, the score of student learning outcomes is taken from the provisional score obtained in the 8th week. The distribution of the score in the second cycle and the third cycle can be seen in the following table.

Table 6. Score Distribution of Digital Electronics Learning Outcomes in the Cycle I and II

Grade	Cycle I		Cycle II		Category
	Frequency (%)	Cumulative Percentage	Frequency (%)	Cumulative Percentage	
A	4 (16.21)	4 (16.21)	7 (21.62)	7 (21.62)	Excellent
A-	8 (10.81)	12 (32.43)	21 (56.76)	28 (75.67)	Good
B+	10 (27.03)	22 (59.46)	5 (10.81)	33 (89.19)	Average

B	8 (21.62)	30 (81.08)	3 (8.11)	36 (97.29)	Poor
B-	7 (21.62)	37 (100)	1 (2.70)	37 (100)	Very Poor

In the cycle II, the learning outcome shows only 59.46% of the students got B+ (average). However, taking into account the tendency in the cycle III that 75.67% of the students got A- (good), it is expected by the end of the semester numbers of students who got A- will increase. The table also shows that students get the opportunity to get better grades in the third cycle compared to current scores.

IV. CONCLUSION:

The Contextual Teaching and Learning strategy in Electronics Digital course is implemented by providing reinforcement and encouragement for students to participate actively in learning, such as asking questions and developing practical assignments. As to support the research result, a set of labsheet has been developed that supports the implementation of contextual learning process. The Contextual Teaching and Learning strategy in Electronics Digital course can improve students' motivation to attend lectures as indicated by the increasing number students who actively ask questions during the learning process (up to 69.5%). It also improves students' understanding as indicated by the increasing number of students who can do assignments without the help of lecturer (up to 94.25% at the end of the third cycle). Although the final grades have not been released, because the course is still on-going until the end of this semester so it is still possible for students' final grades to increase, but from the temporary final grades it can be seen that 80% of students have obtained B+ and higher. Apart from the results of the third cycle, student scores tend to increase, so it can be expected that at the end of the semester, all students can get an A- or higher.

REFERENCES:

[1] Suparman, A. 2012. *DesainInstruksional Modern. Panduan Para PengajardanInovatorPendidikan*. Jakarta: Erlangga.

[2] Jordana, J., &Rober, FJ. 2015. A Course on Digital Electronics Based on Solving DesignOriented Exercises by Means of a PBL Strategy. *International Journal of Engineering Education, 31*(1).

[3] Bhuyan, M. H., Azmiri Khan, S. S., & Rahman, M. Z. 2018. Teaching digital electronics course for electrical engineering students in cognitive domain. *International Journal of Learning and Teaching, 10*(1).doi: 10.18844/ijlt.v10i1.3140.

[4] Herlandi, B. 2009. *Elektronika Digital* [Online]. Available at http://bambangherlandi.web.id/. Accessed 16 September 2021.

[5] Chapra, S. C. 2010. *Numerical Methods for Engineers Sixth Ed*. New York: McGraw-Hill.

[6] Triatmaja, A.K., &Khairudin, M. 2018. Study on Skill Improvement of Digital Electronics Using Virtual Laboratory With Mobile Virtual Reality. *J. Phys.: Conf. Ser. 1140 012021*. doi:10.1088/1742-6596/1140/1/012021.

[7] Jhonson, B. E. 2006. *Contextual Teaching and Learning*. Mizan Learning Center. Bandung.

[8] Johnson, E. B. 2010. *Contextual Teaching & Learning: MenjadikanKegiatanBelajar-MengajarMengasyikkandanBermakna*. Bandung: Kaifa.

[9] Depdiknas. 2003. *InteraksiBelajarMengajar*. Jakarta: Depdiknas.

[10] Nurhadi. 2002. *PendekatanKontekstual (Contextual Teaching and Learning (CTL)*. Jakarta: Depdiknas, DitjenPendidikanDasardanMenengah, DirektoratPendidikanLanjutanPertama.

[11] Sanjaya, W. 2009. *StrategiPembelajaranBerorientasiStandar Proses Pendidikan*. Jakarta: PenerbitKencana.

[12] Haryanto, P.C., Arty, I.S. 2019. The Application of Contextual Teaching and Learning in Natural Science to Improve Student's HOTS and Self-efficacy. *J. Phys.: Conf. Ser1233 012106*. doi:10.1088/1742-6596/1233/1/012106.

[13] Kristidhika, D.C.,Cendana, W., Felix-Otuorimuo, I., Müller, C. 2020. Contextual Teaching and Learning to Improve Conceptual Understanding of Primary Students. *Teacher in Educational Research, 2*(2). doi: 10.33292/ter. v2i2.84.

[14] Fadhilah., Effendi, Z. M., Ridwan . 2021. Development of Contextual Teaching and Learning (CTL) Models in Applied Physics Courses. *International Journal of Multicultural and Multireligious Understanding, 8*(3). doi: 10.18415/ijmmu.v8i3.2425.

[15] Elliot, J. 1991. *Action Research for Educational Change*. Bristol, PA: Open University Press.

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