

Students' Success Rate Enhancement in an Electrical Machines Subject Through a Hybrid Flipped Classroom–Socratic Method [†]

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Abstract

In this paper, a hybrid flipped classroom–Socratic method (HFC-SBM) is proposed as an active and effective method of teaching and learning to enhance the success rate in the subject of electrical machines. The proposed method was applied in the third year of a Bachelor of Engineering Technology program. Most students were new to the subject of electrical machines and did not have any prior knowledge of the principle of energy conversion in electrical machines. The traditional method (TRM), the flipped classroom method (FCM), and the Socratic-based method (SBM) were applied and then compared with the proposed HFC-SBM. The students were assessed each time they completed a specific teaching and learning method. The assessment results revealed that the proposed HFC-SBM improved the students' success rate tremendously by 300%, 160%, and 80% when compared to the TRM, FCM, and SBM, respectively. A single-factor Analysis of Variance (ANOVA) test has been carried out on the statistical data to assess the significance of the different teaching and learning methods on the students' success rate.

Keywords: active teaching and learning; flipped classroom method; electrical machines; hybrid flipped classroom–Socratic-based method; student success rate; traditional method



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1. Introduction

One of the most energy-conversion-intensive courses in the electrical engineering educational experience is the discipline of electrical machines. The conversion of mechanical energy into electrical energy is very prevalent in the generation of electricity. Conversely, the conversion of electrical energy into mechanical energy is the standard for driving mechanical loads to achieve a specific, well-defined duty cycle task. The principle of energy conversion in electrical machines is generally expressed through a differential equation that describes the energy transfer balance. Students enrolled for the first time in the subject of electrical machines usually find it challenging to master the concept of energy conversion. Different methods of teaching the subject of electrical machines have been employed to simplify this concept for students [1–3].

The traditional method (TRM) of teaching, referred to as the lecture-based approach, rewards passivity in students rather than active involvement, thus allowing students to be passive recipients of information, leaving the students with a lower chance of attaining a high-level cognitive ability [4]. Research suggests that methods that promote active learning increase student achievement through participation and engagement with content [4]. In interactive learning methods, students inevitably develop critical thinking while learning

about electrical machines, and students are more likely to learn and retain information if they engage personally [5]. When a professor introduces a new concept for the first time to students—such as how, for instance, mechanical energy is converted into electrical energy in a permanent magnet synchronous generator used for wind-power-generating systems—prior knowledge of basic principles of electro-mechanical conversion systems is a key determinant for a student to engage in active learning. The concept itself is not easy to understand when it comes to students hearing it for the first time. An attempt by the professor to engage the student in active learning becomes difficult. Different approaches have been suggested to enhance active learning in classrooms, including Concept Mapping (CM), the flipped classroom (FC), the project-based learning method (PBLM), and the Socratic-based method (SBM). The combination of the problem-based learning approach (PBLA), gamification approach (GA), and data-driven approach (DDA) has been recently suggested as an effective tool in engineering education to promote students' active engagement and to foster self-directed learning [6–9]. The PBLA enables students to apply theoretical knowledge to real-world problem-solving scenarios [6].

Conversely, the GA revolves around the application of game-design principles such as competitions, challenges, and rewards to enhance the student learning experience through attention, captivation, and motivation, with the purpose of promoting active participation in the learning process [10]. The integration of game-design principles into the PBLA contributes to an immersive and enjoyable experience in engineering education. The integration of GA and PBLA is spiced up by the DDA, which allows for personalized learning experiences, fostering individual growth, and addresses the diverse needs of engineering students. The CM approach to teaching and learning revolves around the presentation of information in a graphic format through the use of graphical tools known as concept maps to organize and represent knowledge and show relationships among them [11–14]. The CM approach facilitates active learning [15]; encourages student discovery while learning [16]; and reflects student experiences, beliefs, and biases in addition to an understanding of the topic [17]. The FC approach to teaching exposes students to learning materials outside of the classroom through notes, audio content, and video content [18,19]. Then, discussions and debates are carried out in the classroom. The PBLM approach to teaching and learning exposes students to problem-solving and design as a form of active participation in project-based courses in the engineering discipline [5,6]. The PBLA and PBLM offer the same outcome by promoting critical thinking to solve real-world engineering problems through the active participation of students.

Conversely, the SBM is a form of dialogue between the professor and the students to encourage critical thinking using questions [20,21]. The purpose of the dialogue is to discuss a problem and find various solutions that promote independent learning [21]. There is a difference between dialogue and debate. The latter champions one's opinion, while a dialogue is a discussion that promotes knowledge sharing. Here, the key emphasis is on knowledge sharing, meaning the participants in the dialogue should have acquired some kind of prior knowledge of the topic at hand. One way of obtaining this knowledge beforehand is for the professor to provide students with some kind of self-study material. The challenge is that students may struggle to develop knowledge on a new topic because they cannot understand the engineering concept when they read it for the first time. In this case, employing the SBM in teaching and learning alone for new topics in science, technology, engineering, and mathematical courses—which, indeed, require high-level thinking skills—becomes more challenging for the students. To address this challenge, the use of online learning technology combined with SBM to improve higher-order thinking skills has been proposed [21–24]. In the latter, the dominant part of learning is in presenting a concept, while technology is used as a medium that helps to ensure the success of learning.

The presence of technology in the application of SBM has made it very easy for the teacher to monitor, respond to, and communicate any information to students.

Furthermore, the teacher and the students can interact without seeing each other. The students can be encouraged, stimulated, and motivated while learning with technology. This method, as presented in [21], is prominent in virtual classrooms where the teacher and student are in two different remote places. The use of a classroom communication system (CCM) to support the process of the SBM in interactive learning in large physical classrooms has been reported in [22]. The CCM enabled teachers to present questions, receive student responses, and provide immediate graphical feedback [22]. A computer and a data projector are used to present concept tests (questions); transmitter sets like TVs, video remote controls, and receivers allow students to signal their responses to the concept tests; and software allows class responses to be collated and immediately displayed by the data projector for students to see. This approach is practical as it provides teachers with the ability to identify from the computer display the names of students and the nature of their responses, and it enables teacher–student dialogue in large classrooms and allows the teacher to modify instruction in an ongoing way based on the overall class response. Although the employment of CCMs is looked upon as the simplest way of introducing active learning into a large physical classroom without splitting the class into smaller groups, which requires additional staff resources, it also presents a tremendous challenge in cases of limited resources. CCMs require a huge amount of capital and operational costs to acquire the necessary technology and regular equipment maintenance.

The use of the SBM in combination with traditional lectures and active learning exercises in electrical circuits and other engineering subjects has been reported in [25]. In that study, it is demonstrated that the approach improved student participation by helping them become actively involved and excited about their projects and the material being taught. The students were also motivated to master the course content better and to learn to think and reason more clearly, accurately, relevantly, logically, rationally, ethically, and responsibly. The work in [25] discusses how the SBM was used by integrating questioning and learning to stimulate, challenge, and assist the students in acquiring knowledge and developing intellectual skills, as well as other relevant abilities that are needed to think critically. The questions in [25] were formulated around the concept of a communication signal. This concept should be clearly understood by the participating student prior to engaging in any dialogue around it. For instance, questions formulated to discuss the size and strength of a communication signal cannot be answered by a student if the fundamental concept of a communication signal is not yet understood. From the work reported in [25], the students had prior knowledge pertaining to the fundamental concept of a communication signal before they were exposed to the SBM. The question is, how do you apply the SBM when introducing a new engineering topic or concept to students for the first time? The work presented in this paper has answered this question by employing the hybridization of the FC method and SBM to give students a new learning experience on a new topic in the subject of electrical machines, while also enhancing their success rate.

2. Materials and Methods

2.1. Materials

The proposed hybrid flipped classroom Socratic-based method (HFC-SBM) was implemented for the subject of electrical machines. This subject has 14.1 credits (141 h), which constitute theoretical and practical components. The assessments are continuously based, with 60% allocated to theoretical knowledge and 40% to practical knowledge. The subject's knowledge areas include engineering sciences, design, synthesis, computers, and information technologies. The syllabus is taught over a period of thirteen weeks, with

52 lecturing sessions, 26 practical sessions, and 13 tutorial sessions. The subject is presented and structured to provide students with practical working knowledge of electrical machines and their fundamentals, construction, principles of operation, performance, and applications. The subject also serves to equip the students with elementary knowledge, preparing them for an advanced electrical machines course. The students should be able to understand and demonstrate knowledge related to the fundamental concepts, principles of operation, and application of single- and three-phase transformers; direct current brush and brushless machines; and direct induction machines. They should also be able to demonstrate and understand the fundamental concepts, principles of operations, and stability of synchronous machines.

2.2. Approach

One of the aspects of the SBM of learning is to motivate students to think and build constructs upon learning something [20,21]. When students repeatedly think, it will indirectly mold them into having a high level of curiosity. The proposed HFC-SBM approach is illustrated in Figure 1. The process of learning starts with the flipped classroom, where, a week early, students are provided with the lectures' summarized notes (LSNs), the lectures' PowerPoint slides (LPPSs), prerecorded video- and audio-summarized lectures, and the extended literature from prescribed books (ELPB). The students go through the materials repeatedly to understand and demonstrate knowledge related to the fundamental concepts of a new topic regarding the principles of the operation and application of a specific electrical machine. In the classroom, at first, the lecturer formulates and puts forward a series of questions that require logical answers from the students, which stimulate critical thinking. Secondly, the students provide answers that yield a constructive argument in the form of a dialogue. Once the discussion reaches a point where students cannot respond and a non-satisfactory outcome is observed, the lecturer then helps by putting forward another set of questions that can open the students' minds to thinking. The process will continue until both the lecturer and the students observe a satisfactory outcome. Figure 2 elaborates on a typical dialogue between students and a lecturer using the SBM until a non-satisfactory outcome is observed. Conversely, Figure 3 elaborates on the dialogue from a non-satisfactory point to a satisfactory outcome. There were 93 students present who participated in the dialogue, and the topic was already introduced a week previously through the flipped classroom method. The students had prior knowledge of the concept of losses and efficiency in induction machines (IMs).

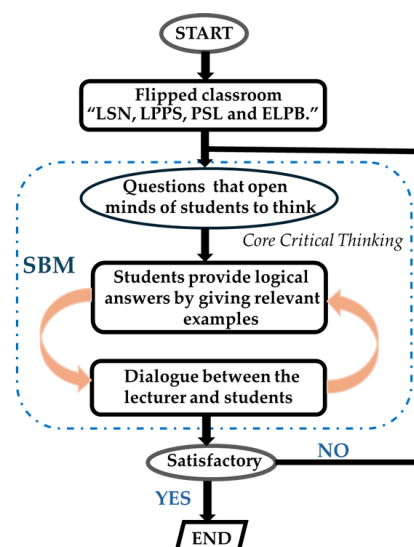


Figure 1. The approach of the hybrid flipped classroom–Socratic-based method of learning.

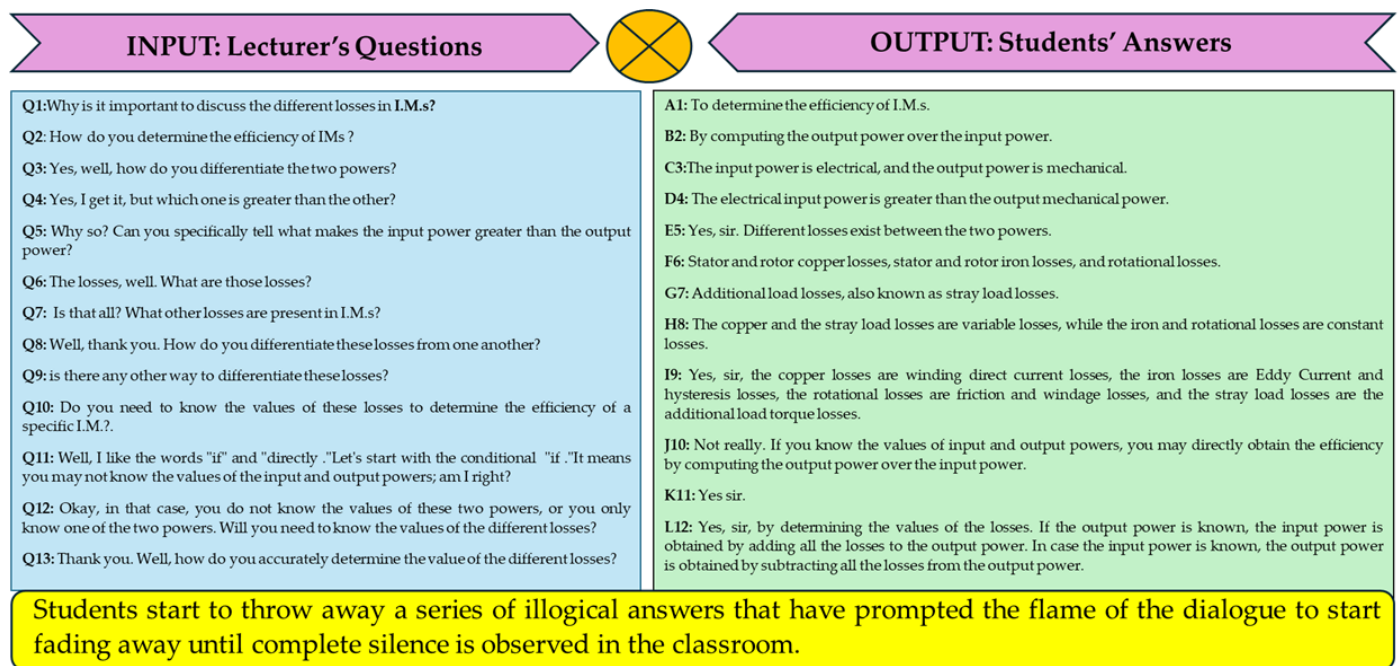


Figure 2. Implementation of Socratic-based method of learning through a dialogue: Part 1: Dialogue until the students cannot logically engage with the lecture.

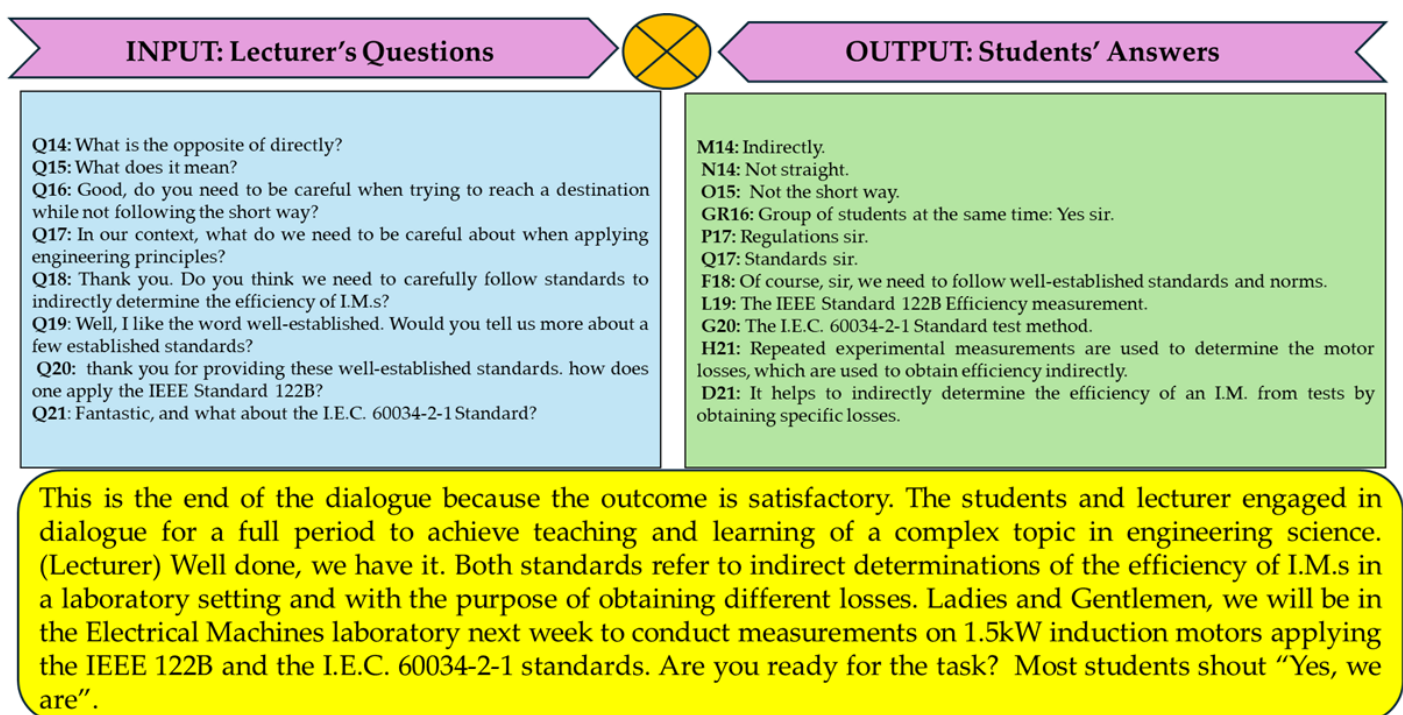


Figure 3. Implementation of Socratic-based method of learning through a dialogue: part 2: Dialogue until a satisfactory outcome between the lecturer and the students.

From that moment, the dialogue reached a non-satisfactory outcome, and the lecturer reformulated another set of questions that opened the minds of the students to rethink logically. The dialogue that follows the non-satisfactory outcome is illustrated in Figure 3. From the moment Student M used the word "directly" when answering questions related to the determination of efficiency, the lecturer unblocked the student's mind through a grammatical approach.

3. Results and Discussion

3.1. Analysis of Results

Continuous assessment is employed to refine the student's skills over time effectively. Students are continuously and comprehensively assessed regarding a specific component of the course. Consistent feedback on the assessment is provided to students, which helps them to identify any learning gaps they might have. There is a required mark that meets the minimum compliance. Any student with a score below the minimum mark will be assessed for the second time on the same component of the course. This process will continue until the student complies with the minimum requirements. The results in Figure 4 were processed and analyzed using MATLAB R2023a.

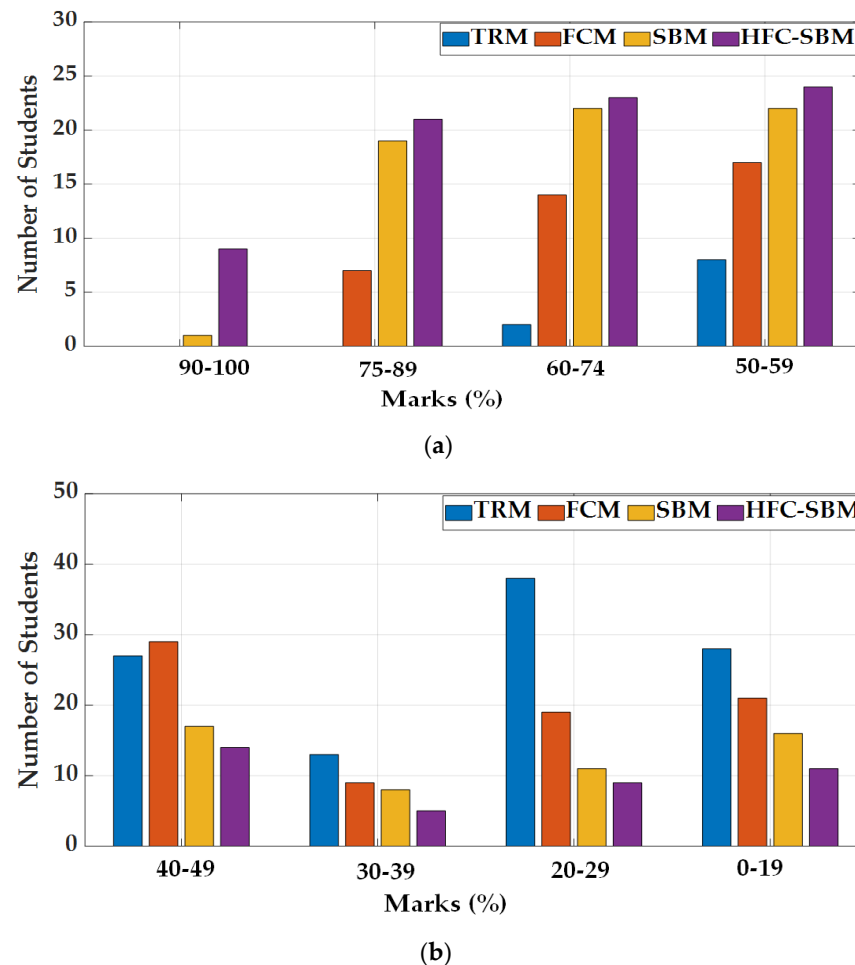


Figure 4. Comparison of teaching and learning methods: (a) marks ranging from 50% to 100% and (b) marks ranging from 0% to 49%.

Figure 4 compares the different teaching and learning methods and the students' assessment performance. There were 110 students who were assessed each time regarding a distinct component of the syllabus, including performance characteristics and the applications of three-phase induction machines, brush direct current machines, electrical transformers, and synchronous machines, including stator armature winding design. The learning material assessed for each component of the course constitutes 25% of the theoretical syllabus. The traditional method (TRM) of teaching and learning was employed for brush–direct current machines, and students were assessed for the first time in a sitting environment. The flipped classroom method (FCM) was used for electrical transformers. The SBM was used for synchronous machines, and the hybrid flipped classroom–Socratic-based method was used for induction machines.

In Figure 4a, it can be observed that none of the assessed students scored a mark of 75% when the TRM was used as a method of teaching and learning. The majority of those who participated in the TRM scored between 20 and 29%. Of the 110 students who participated in the TRM, only 10 students managed to score a mark between 50 and 74%. The rest of the students were given a second opportunity to improve their scores. A different picture can be observed when the FCM was employed. The number of students who scored a minimum of 75% increased from zero students for the TRM to seven students for the FCM. To draw a complete picture between the TRM and the FCM, one should look closer at the number of students with a mark above 50%. There have been huge improvements, from 10 students to 38 students. The SBM has provided a different picture. For the first time, there is a student with a mark above 90% and 19 students with a mark between 75% and 89%. This is a tremendous improvement from the marks the students obtained under the TRM and FCM. The proposed HFC-SBM has performed much better than the TRM, FCM, and SBM. Of the 116 students who participated in the HFC-SBM, 9 students scored a mark between 90 and 100%, 21 students scored a mark between 75% and 89%, 23 students scored a mark between 60% and 74%, and 24 students scored a mark between 50% and 59%. In total, 39, 53, 78, and 106 students were given second opportunities for the HFC-SBM, SBM, FCM, and TRM, respectively.

3.2. Analysis of Variance Experimental Test

To confirm the validity of the above results and to present the qualitative information regarding the different teaching and learning methods with respect to the students' success rate, the significant differences between the achievement averages of the four teaching and learning methods must be critically determined by using a multiple comparison test. In this paper, a single-factor Analysis of Variance (ANOVA) test provides a definitive assessment of the significance of the different teaching methods in the students' success rate. Essentially, single-factor ANOVA is used in experimental tests to determine what factors affect a specific response variable [26]. ANOVA is used to test equality among several means by comparing the variance between groups relative to the variance within groups [27]. The ANOVA test imposes no restriction on the number of means [28]; more than two population means are compared for equality, and the test statistic, known as the F-statistic, is used for computation [29]. The single-factor ANOVA experimental test is summarized in Table 1.

Table 1. Summary of single-factor ANOVA model.

Scheme.	SS	df	MS	F	p-Value
Between Groups	SSB	$dfB = g - 1$	(SSB/dfB)	(MSB/MSW)	$P(F > F-crit)$
Within Groups	SSW	$dfW = N - g$	(SSW/dfW)	MSW	
Total	SST	$dfT = N - 1$			

In Table 1, SS denotes the sum of squares; df is the degrees of freedom; MS is the mean squares; F denotes the ratio of between- and within-group variance; the p-value is the probability of obtaining; and $F-crit$ is the critical value of the F-distribution. The sources of variance between and within groups are expressed in (1) and (2), respectively.

$$SSB = \sum_{i=1}^g n_i (\bar{x}_i - \bar{x})^2 \quad (1)$$

$$SSW = \sum_{i=1}^g \sum_{j=1}^{n_i} (\bar{x}_{ij} - \bar{x})^2 \quad (2)$$

where g is the number of groups, n_i is the number of observations in group i , $\bar{x}$ is the overall average across all groups, and $x_{ij} = j^{th}$ is the observation in group i .

The main steps are carried out in the assessment of the effect of the teaching and learning method on the response variable. The different teaching and learning methods serve as different treatment levels for the ANOVA model. There are four treatments, including the traditional method (TRM), the flipped classroom method (FCM), the Socratic-based method (SBM), and the hybrid flipped classroom–Socratic-based method (HFC-SCM). Each of the four teaching and learning methods is simulated with eight different ranges of students' marks for a balanced ANOVA test. For replication purposes, a subroutine was implemented to randomly vary the mark range by 5% to mimic the randomness that is inherently achieved under typical experimental conditions. The response of the students' success rate is determined for each replication of the different treatment levels. ANOVA is then performed on these data using a significance level of 0.05, corresponding to a 95% confidence interval. Table 2 summarizes the results of the ANOVA with the student success rate response.

Table 2. Summary of ANOVA for different teaching and learning Methods with students' success rate response.

Source of Variance	SS	df	MS	F	p-Value	F-crit
Between Groups	12,642.671	3	4,214.224	0.62	0.91	1.75
Within Groups	29,427.092	106	277.614	-	-	-
Total	42,069.763	109	-	-	-	-

The p -value is above the significance level, with F -values greater than F -crit. This confirms the hypothesis that the specific methods of teaching and learning for the electrical machines subject under study in this paper have a significant effect on the response variable, which is the student success rate.

4. Conclusions

This paper has proposed a new learning experience based on the hybridization of the flipped classroom and Socratic methods to enhance student success rates in the subject of electrical machines. The proposed method has revitalized enthusiasm for the students and improved participation during the process of teaching and learning. The results evidence that the proposed method has tremendously increased the students' success rates by 300%, 160%, and 80% when compared to the traditional, flipped classroom, and Socratic-based methods. The ANOVA experimental test results confirmed the hypothesis that the effect of different teaching and learning methods for electrical machines on the students' success rates and marks range is significant. Although active participation and students' success rates were tremendously enhanced, there were still a good number of students who chose to observe rather than participate. A gamification method may be explored as a part of future work to encourage more students' active participation.

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References

1. Mehmet Akbaba, M. Teaching transient behavior of electrical machines with personal computers. *Comput. Educ.* **1997**, *28*, 155–164. [[CrossRef](#)]
2. Bjekic, M.; Ricic, M.; Sucurovic, M. GeoGebra Tool: Development of Applications for Electrical Machines and Drives Teaching. *Int. J. Eng. Educ.* **2024**, *40*, 23–27.
3. Bjekic, M.; Ricic, M.; Sucurovic, D. The Efficacy of GeoGebra Tool in Enhancing Electrical Machines and Drives Instruction. *Int. J. Eng. Educ.* **2024**, *40*, 38–42.
4. Marmah, A.A. Students' Perception About The Lecture As A Method Of Teaching In Tertiary Institutions. Views Of Students From College Of Technology Education, Kumasi (Coltek). *Int. J. Educ. Res.* **2014**, *2*, 601–612.
5. Ambiyar, A.; Afifah, N. The Effect of Project Based Learning Towards Student Achievement in Electrical Machines and Energy Conversion Subject. *J. Phys. Conf. Ser.* **2019**, *1387*, 012087. [[CrossRef](#)]
6. Čubela, D.; Rossner, A.; Neis, P. Using Problem-Based Learning and Gamification as a Catalyst for Student Engagement in Data-Driven Engineering Education: A Report. *Educ. Sci.* **2023**, *13*, 1223. [[CrossRef](#)]
7. Kabilan, M.K.; Annamalai, N.; Chuah, K.-M. Practices, Purposes and Challenges in Integrating Gamification Using Technology: A Mixed-Methods Study on University Academics. *Educ. Inf. Technol.* **2023**, *28*, 14249–14281. [[CrossRef](#)] [[PubMed](#)]
8. Sukackè, V.; Guerra, A.O.P.D.C.; Ellinger, D.; Carlos, V.; Petronienė, S.; Gaižiūnienė, L.; Blanch, S.; Marbà-Tallada, A.; Brose, A. Towards Active Evidence-Based Learning in Engineering Education: A Systematic Literature Review of P.B.L., P.J.B.L., and C.B.L. *Sustainability* **2022**, *14*, 13955. [[CrossRef](#)]
9. Zare, J.; Aqajani Delavar, K. Enhancing English Learning Materials with Data-Driven Learning: A Mixed-Methods Study of Task Motivation. *J. Multiling. Multicult. Dev.* **2024**, *45*, 4011–4027. [[CrossRef](#)]
10. Dicheva, D.; Dichev, C.; Agre, G.; Angelova, G. Gamification in Education: A Systematic Mapping Study. *J. Educ. Technol. Soc.* **2015**, *18*, 75–88.
11. Novak, J.D.; Canas, A.J. *The Theory Underlining Concept Maps and How to Construct and Use Them*; Institute for Human and Machine Cognition: Pensacola, FL, USA, 2008.
12. Vanides, J.; Yin, Y.; Tomiat, M.; Ruiz-Primo, M.A. Using concept maps in the Science Classroom. *Sci. Scope* **2005**, *28*, 27–31.
13. Novak, J.D.; Gowin, D.B. *Learning How to Learn*; Cambridge University Press: New York, NY, USA, 1984.
14. Alshatti, S.A.; Watters, J.J.; Kidman, G. Enhancing the teaching of family and consumer sciences: The role of graphic organizers. *J. Fam. Consum. Sci. Educ.* **2012**, *28*, 14–35.
15. Wilgis, M.; McConnell, J. Concept mapping: An educational strategy to improve graduate nurses 'critical thinking skills during a hospital orientation program. *J. Contin. Educ. Nurs.* **2008**, *39*, 119–126. [[CrossRef](#)] [[PubMed](#)]
16. Caputi, L.; Blash, D. *Teaching Nursing: Using Concept Maps*; College of DuPage Press: Glen Ellyn, IL, USA, 2008.
17. Halford, G.S. *Children's Understanding: The Development of Mental Models*; Lawrence Erlbaum: Hillsdale, NJ, USA, 1993.
18. Sarpparaje, M.; Jeyasala, V.R.; Rathiga, K.; Sasirekha, K. Flipped Classroom Approach to make the Best Utilization of E.S.L. Classes at Mepco Schlenk Engineering College-A Try Out. *Asian ESP J.* **2018**, *14*, 209–228.
19. Khan, S.M. Facilitating Aural-oral skills of Engineering Students through the Flipped Classroom. *TEST Eng. Manag.* **2020**, *82*, 154–167.
20. Delić, H.; Bećirović, S. Socratic Method as an Approach to Teaching. *Eur. Res. Ser. A* **2016**, *10*, 511–517.
21. Boyle, J.; Nicol, D.; Bobby Hamilton, B.; Dempster, B. Experience with Classroom Feedback Systems to Enable Socratic Dialogue In Large Engineering Classes. In Proceedings of the IEE Engineering Education 2002: Professional Engineering Scenarios, London, UK, 3–4 January 2002. [[CrossRef](#)]
22. Suhadi, S.M.; Zaid, N.M.; Mohamed, H.; Abdullah, Z.; Aris, B. Online learning" potential in Socratic learning methods to empower Higher Level Thinking. In Proceedings of the 2014 IEEE 6th Conference on Engineering Education (I.C.E.E.D.), Kuala Lumpur, Malaysia, 9–10 December 2014; pp. 145–150. [[CrossRef](#)]
23. Suhadi, S.M.; Mohamed, H.; Zaid, N.M.; Abdullah, Z.; Aris, B.; Sanmugam, M. Implementation of Socratic Method in online learning to enhance creative thinking: Analysis review. In Proceedings of the 2016 4th International Conference on Information and Communication Technology (ICoICT), Bandung, Indonesia, 25–27 May 2016; pp. 1–4. [[CrossRef](#)]
24. Chang, E.Y. Prompting Large Language Models with the Socratic Method. In Proceedings of the 2023 IEEE 13th Annual Computing and Communication Workshop and Conference (CCWC), Las Vegas, NV, USA, 8–11 March 2023; pp. 351–360. [[CrossRef](#)]
25. Golanbari, M.; Garlikov, R. Employing Socratic Pedagogy to Improve Engineering Students' Critical Reasoning Skills: Teaching by Asking Instead of by Telling. *Am. Soc. Eng. Educ.* **2008**, 544.
26. Montgomery, D.C. *Design and Analysis of Experiments*, 8th ed.; John Wiley & Sons: Hoboken, NJ, USA, 2013.
27. Larson, M.G. Analysis of Variance. *Circulation* **2008**, *117*, 115–121. [[CrossRef](#)] [[PubMed](#)]

28. Howell, D.C. *Statistical Methods for Psychology*, 7th ed.; Cengage Learning: Wadsworth, IL, USA, 2010.
29. Wegner, T. *Applied Business Statistics Methods and Excel-Based Applications*, 4th ed.; Juta and Company Ltd.: Cape Town, South Africa, 2016.

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