PERIÓDICO TCHÊ QUÍMICA
ARTIGO ORIGINAL

UM ESTUDO COMPARATIVO DOS EFEITOS DA OPINIÃO DOS PARES NA ANÁLISE DE SISTEMAS DINÂMICOS EM ESTUDANTES DE TECNOLOGIA DA ELETRICIDADE

A COMPARATIVE STUDY OF THE EFFECTS OF PEER FEEDBACK IN THE ANALYSIS OF DYNAMIC SYSTEMS ON STUDENTS OF ELECTRICAL TECHNOLOGY

UN ESTUDIO COMPARATIVO DE LOS EFECTOS DE LA RETROALIMENTACIÓN ENTRE PARES EN EL ANÁLISIS DE SISTEMAS DINÁMICOS DE ESTUDIANTES DE TECNOLOGÍA EN ELECTRICIDAD

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RESUMO

Introdução: O COVID-19 chegou de surpresa e, em pouco tempo, mudou os hábitos sociais. O ambiente educacional não ficou imune a essas mudanças e em pouco tempo teve que modificar sua estratégia de treinamento. Uma estratégia generalizada tem sido o treinamento a distância pela Internet. No entanto, em muitos casos, a sala de aula foi transferida para uma plataforma digital sem considerar sua eficácia. Um dos elos do treinamento é a avaliação. Um esquema de avaliação formativa em consonância com a educação a distância é a co-avaliação por pares. Esses esquemas permitem retroalimentar os processos a partir dos resultados, ao mesmo tempo que se modificam hábitos e se estimula a motivação. **Objetivos**: Este estudo tem como objetivo avaliar os efeitos da avaliação por pares como estratégia ativa no modelo transitório de educação a distância de alunos de graduação da Universidade Distrital Francisco José de Caldas. O objetivo é determinar sua utilidade e efeitos na formação dos alunos em dois espaços acadêmicos. **Métodos**: Estes cursos são ministrados nos últimos semestres do programa Tecnologia em Energia Elétrica. O estudo aborda um esquema quase experimental em que duas populações equivalentes são tomadas. A primeira turma é composta por 31 alunos do primeiro semestre de 2020, que atuaram como grupo controle, e a segunda turma é composta por 34 alunos do segundo semestre de 2020 que formaram o grupo de feedback de pares. Como instrumento, o estudo utilizou testes escritos clássicos. **Resultados e Discussão**: Os dados foram coletados por meio de inquéritos e analisados quantitativa e qualitativamente. As conclusões do estudo estabelecem que a técnica de avaliação pelos pares é útil para o reforço de alguns aspectos do processo de formação, nomeadamente para a consolidação de conceitos e motivação para o estudo autónomo. **Conclusões**: Os resultados comparativos indicam que a estratégia tem um impacto positivo ao nível do desempenho escolar, mas também apresenta algum nível de sobrecarga nos alunos, tema não explorado e que suscita necessidade de estudos mais aprofundados.

Palavras-chave: *Autonomia, avaliação pelos pares, desempenho acadêmico, avaliação formativa.*

ABSTRACT

Background: The COVID-19 arrived by surprise, and in a very short time, it has changed social habits. The educational environment has not been immune to these changes, and in a short time, it has had to modify its training strategy. A generalized strategy has been distance training through the Internet. However, in many cases, the classroom was moved to a digital platform without considering its effectiveness. One of the links of the training is the assessment. A scheme of formative evaluation in line with distance education is the co-evaluation by peers. These schemes allow feedbacking the processes from results, at the same time that habits are modified, and the motivation is stimulated. **Aims**: This study has the purpose of evaluating the effects of the evaluation by peers as an active strategy in the transitory model of distance education of undergraduate students in the Universidad Distrital Francisco José de Caldas. The objective is to determine its utility and effects in forming the students in two academic spaces. **Methods**: These courses are taught in the last semesters of the Technology in Electricity program. The study addresses a quasi-experimental scheme under which two equivalent populations are taken. The first group comprises 31 students from the first semester of 2020, who operated as a control group, and a second group is made up of 34 students from the second semester of 2020 who formed the peer feedback group.

As an instrument, the study used classic written tests. **Results and Discussion**: The data was collected through surveys and were analyzed both quantitatively and qualitatively. The conclusions of the study establish that the technique of peer evaluation is useful for strengthening some aspects of the training process, particularly for consolidation of concepts and motivation towards autonomous study. **Conclusions**: The comparative results indicate that the strategy has a positive impact in terms of academic performance, but also shows some level of overload in students, a topic not explored, and that raises the need for further study.

Keywords: *Autonomy, peer assessment, academic performance, formative assessment.*

RESUMEN

Antecedentes: El COVID-19 llegó por sorpresa, y en muy poco tiempo, ha modificado las costumbres sociales. El entorno educativo no ha sido ajeno a estos cambios, y en poco tiempo ha tenido que modificar su estrategia de formación. Una estrategia generalizada ha sido la formación a distancia a través de internet. Sin embargo, en muchos casos, se trasladó la clase presencial a una plataforma digital sin considerar su eficacia. Uno de los eslabones de la formación es la evaluación. Un esquema de evaluación formativa acorde con la educación a distancia es la co-evaluación por pares. Estos esquemas permiten realimentar los procesos a partir de resultados, al tiempo que se modifican hábitos y se estimula la motivación. **Objetivos**: Este estudio tiene el propósito de evaluar los efectos de la evaluación por pares como estrategia activa en el modelo transitorio de educación a distancia de estudiantes de pregrado en la Universidad Distrital Francisco José de Caldas. El objetivo es determinar su utilidad y efectos en el proceso de formación de los estudiantes en dos espacios académicos. **Métodos**: Estos cursos se imparten en los últimos semestres del programa de Tecnología en Electricidad. El estudio aborda un esquema cuasi-experimental bajo el cual se toman dos poblaciones equivalentes. Un primer grupo está conformado por 31 estudiantes del primer semestre de 2020, los cuales operaron como grupo de control, y un segundo grupo conformado por 34 estudiantes del segundo semestre de 2020 los cuales conformaron el grupo de retroalimentación entre pares. Como instrumento, el estudio utilizó pruebas escritas clásicas. **Resultados y Discusión**: Los datos se recogieron mediante encuestas, y se analizaron cuantitativa y cualitativamente. Las conclusiones del estudio establecen que la técnica de evaluación por pares es útil para fortalecer algunos aspectos del proceso de formación, en particular con respecto a consolidación de conceptos y motivación hacia el estudio autónomo. **Conclusiones**: Los resultados comparativos indican que la estrategia tiene una incidencia positiva en cuanto a desempeño académico, pero evidencia también algún nivel de sobrecarga en los estudiantes, tópico no explorado y que platea la necesidad de un estudio más profundo.

Palabras clave: *Autonomía, co-evaluación por pares, desempeño académico, evaluación formativa.*

1. INTRODUCTION:

Engineering training is strongly conditioned by the demands of industrial, social, and technological development (De Araújo, Da Costa, Joseph, and Sánchez, 2020; Losada-Gutierrez, Espinosa, Santos-Perez, Marron-Romera, and Rodriguez-Ascariz, 2020; Oksana, Galstyan-Sargsyan, Amparo López-Jiménez, and Pérez-Sánchez, 2020; Oleksenko, 2020). The professional engineer must respond to the development that is intimately linked to the current and future potential of the country (Wang and Chiang, 2020). This implies that economic development depends on the quality of its professionals, which draws an enormous responsibility for higher education institutions (Camelo and González, 2004; Gómez-Llanos and Durán-Barroso, 2020). Within the field of electrical engineering, there are many critical areas for economic and social development, and it is possible to think of the electrical engineer as a cross-cutting professional for all types of industrial activity (Benešová and Tupa, 2017; Martínez, Montiel, and Martínez, 2018). One of these areas corresponds to the control and automation of processes, which goes hand in hand with skills in analyzing dynamic systems and the design of instrumentation and control systems (Martínez, Jacinto, and Montiel, 2019). These professional demands have led to the development of active training strategies that increase the performance in the training process of these future professionals (Tian and He, 2020). One of these strategies is peer assessment as a formative evaluation tool integrated into the professional training process that aims to stimulate critical thinking and the formation of a culture of self-learning (Bin Mubayrik, 2020; Cifrian, Andrés, Galán, and Viguri, 2020).

The education cannot be then to introduce concepts to the students. However, it must be oriented to a good performance of the future professional under any situation, including scenarios not contemplated in their formation process (Roca and Garcia-Valles, 2020). This implies that students become autonomous and aware of their training process (Suraratdecha and

Tayjasanant, 2020). Peer assessment is a strategy to self-reflect by students that can produce meaning in education (Ma, Yan, and Wang, 2020; To and Panadero, 2019). A meaningful learning process includes, in addition to cognitive change, the persistence over time of that change (Ospina and Galvis, 2017; Reynders, Lantz, Ruder, Stanford, and Cole, 2020). Since this permanence is linked to the prior knowledge of the student, it has been observed that the best strategies to develop these meaningful processes are those that invite learning through experience, i.e., active learning (Martínez, Montiel, and Jacinto, 2016; Moleko and Mosimege, 2020). Peer assessment is one of the key activities of active learning. In developing a peer assessment, the student has to analyze the material of his fellow student, synthesize the ideas of the student to understand his position and concepts and evaluate this information to produce an assessment of the process. Also, it is necessary to feedback to the student, an activity that strengthens the theoretical concepts evaluated and enhances the capacity for synthesis and apprehension. Studies have shown that peer assessment increases student motivation and commitment and encourages them to reflect on their training process (Verkade and Bryson-Richardson, 2013).

The student must learn to take ownership of his learning process. This means that he must take ownership of the learning process as an integral part of his development as a person, both socially and professionally. Learning is fundamental to development as an individual and has a strong impact on the development of society. However, an effective and meaningful learning process depends on the ability of the individual to awaken and maintain his or her motivation (Réka *et al*., 2015). The student must be able to orient his training process in such a way that a curious spirit is generated in him to question everything, investigate, read, write, speak with colleagues and experts, and in general develop any action that allows him to critically assimilate concepts (Lamon, Knowles, Hendy, Story, and Currey, 2020). These activities characterize active learning and learning by doing (Huang, Tseng, Jenq, and Ou, 2020). When developing these activities, the processes of analysis, synthesis, and evaluation of the information that is the basis of learning are motivated (Cardozo *et al*., 2020). On the other hand, passive learning is given when the student does not carry out these activities but remains the receiver of information provided by a teacher (Bell, 2020). This type of passive learning does not encourage critical thinking or analysis, which is why the process is less significant and has little impact on the development of the individual.

A self-directed student is one who can successfully control his learning process. This control involves defining what he wants to learn, how he will do this learning, and when. Developing these skills is not easy and implies the existence of a set of motivators. Research and experiences in educational processes have shown that the best motivators are born from the student himself (Forestier, Portelas, Mollard, and Oudeyer, 2020). This intrinsic motivation allows the student to develop self-projection skills, self-study, self-exploration, and in general, to answer the questions of what to learn, how, and when to do it (Réka *et al*., 2015). It is possible to identify some particular characteristics of a self-directed student, for example, his ability to define learning objectives. This is a consequence of his desire to improve and his capacity to evaluate his current state, the resources he has, and the resources he requires. It is also characterized by knowing his capacity to study, which methodology is the most appropriate for his process, and which people could help him to achieve his objectives.

2. MATERIALS AND METHODS:

To apply the study to the students, in addition to the data collection instrument (survey), a research protocol was designed with all the details of the study and an informed consent form that was shared with all the participants in the study and accepted by each of them before the application of the instrument. The Bioethics Committee approved these documents and the study of the Universidad Distrital Francisco José de Caldas (CIDC-0041-2021).

The study participants were selected from the last semesters of the program of Technology in Electricity of the Universidad Distrital Francisco José de Caldas. This academic program is developed over six semesters (three years), students belong to the fifth and sixth academic semester. 99% of the Technological Faculty students correspond to young people who recently graduated from their secondary education and come from locations close to the impact area of the technological campus (Villate and Jirón, 2004). This means that more than 85% of these young students come from the lowest social strata (Clavijo, 2018). The ages of the students in the study ranged from 18 to 22 years old, with 83.3% of males and 16.7% of females (Herrera, Jerez, and Vargas, 2013). The students develop the

courses of Dynamic Systems Analysis and Digital Circuits, which is why the area of dynamic systems was selected to evaluate the impact of the strategy. These courses correspond to a representative sample, so it is hoped that the results of the study can be extended to the entire campus community.

Of the total number of participating students, 31 were linked to the study during the first semester of 2020, and this first group was labeled as a control group. These students worked a distance training model without the use of peer evaluation and with a strategy that consisted of adapting the traditional academic processes to the distance video conferencing platform (Gómez, Montiel, and Martínez, 2020). The second group formed by 34 students joined the study during the second semester of 2020, and they maintained a strategy of distance training very similar to the one of the first control group, except that they implemented the peer evaluation approach. This second group was labeled a peer-assessment group. All students (from both the first and second groups) were organized into small groups of two to develop all academic activities (Bustami, Syafruddin, and Afriani, 2018).

The instruments used in this study were:

1. **Thematic oral presentation**. During five sessions with the students by videoconference, the professor presented the criteria for the analysis of dynamic systems, both at a continuous and discrete level. During these sessions, the material provided to the students included a list of the basic tools used in the modeling of different physical systems, details of their use, and a wide range of design examples developed step by step in synchrony with the students. Also, the students were made aware of how to verify these behaviors by simulation, and in the case of digital systems, ways to implement certain combinational circuits were established in Verilog. A video recording of these sessions was made and kept available to students throughout the academic semester.
2. **Peer-fed labs**. Each pair of students must present their results to their classmates through video conferencing every week to develop practical laboratory activity. These laboratory practices include mostly implementing and evaluating specific circuits but sometimes contain simulations, analysis of physical models, or performance analysis. During each presentation, the group receives feedback from both the teacher and the other students. The criteria for development and presentation are similar to all groups, which is why all students have strong criteria for delivering concepts from the work of their peers. At the end of each presentation, the strengths and weaknesses of each group are highlighted.
3. **Written evaluation**. The written evaluation is the classic instrument used in the courses to determine the academic performance of the students. However, the evaluation applied to students had variations that made it more appropriate to the content, methodology, and purpose of the study. For both groups (control and peer assessment), the assessment included items that examined the conceptual interpretation of the students and items that tested their abilities to analyze a given problem situation. In both cases, the work was developed by the pairs of students with the full freedom of action (without supervision) but with restricted development time. The difference in the application of the instrument was that for the control group, the assessment was carried out only by the teacher. In contrast, in the peer assessment group, the peer assessment was conducted by the peer groups under the supervision of the teacher. In the latter case, all students were provided with an evaluation guide instrument with the evaluation criteria and a guide to performing the peer feedback.
4. **Personalized external advice**. For the groups that considered it necessary, additional advisories were made available, requested at the students' discretion. The students clarified specific doubts related to the course and the strategy of peer evaluation. This instrument was used by 12% of the students in the study.

Participants in the peer assessment group were provided with an instrument with the minimum assessment criteria, indicating when an answer is correct, when it is incorrect, why certain answers are incorrect, and how to weigh the development of their peers (Jian-Wei, Chia-Wen, Chu-Ching, and Lung-Chun, 2017). This instrument also contained instructions on how to provide feedback to their peers, emphasizing that this feedback was always mandatory. Students were also instructed that the peer assessment activity was as important as the assessment developed, i.e., that it was part of the course performance grade. Each pair of students assessed the written test of two groups of

students, and two other groups assessed each group of students. The teacher-reviewed the evaluations of the students before giving them feedback, including his evaluation of the work developed by the students, both evaluated and evaluators. These documents were fed back to the students during a videoconference session, during which all the results were socialized. The control group students took a similar written test, but the evaluation and feedback were done only by the teacher. This activity was also developed during a videoconference session.

At the end of each semester, an individual test of overall student performance was conducted. This test was evaluated only by the teacher and was intended to measure the level of proficiency of the two groups and to identify the actual impact of the peer evaluation strategy (Gerald, 2018). The tests applied to both groups were similar in design and structure. They contemplated both conceptual elements of the dynamic systems and specific skills in the analysis and design of control schemes. Again, the test was designed and applied so that the student could use any resource at his or her disposal, with only restrictions on time and number of students (the test was the only individual tool applied in the course). A survey of the peer review group was also developed individually to determine the students' position on the use of this tool.

In the final stage of the study, the researchers performed a micro-analysis of the data collected during the year of the study. This micro-analysis was centered on the individual final tests developed by the students of the two groups. The results were carefully reviewed to identify recurrent errors in each group of students. These errors included misapplication and inconsistencies of concepts, erroneous analysis of certain dynamic models, and inadequate use of code structures in Verilog, regardless of their proper final functioning. The group of researchers developed specific rubrics to weigh the performance in these aspects. These rubrics, normalized in the range of zero to 100, were statistically processed by calculating mean values and applying the Student *t*-test (Alzaid, 2017). For the qualitative analysis, the survey results applied to the students of the peer evaluation group were used.

3. RESULTS AND DISCUSSION:

To observe the impact of the peer evaluation on student performance, we calculated descriptive statistics of the results collected from the final tests applied to the two groups (control group and peer evaluation group, Table 1). From these statistics, it can be concluded that all the characteristics evaluated in the final performance of the students showed a significant increase.

Table 2 shows the result of paired samples *t*-test on the features (Bogdanova, Sherstinova, Blinova, and Martynenko, 2017). For the first feature, a significant difference ($P = 0.044 < 0.05$) was obtained between the data of the two groups. This means that the results did not occur by chance and that the peer review strategy led to an improvement in the performance of the students in applying the concepts. In the other three characteristics, a similar result was obtained, the *P* values were low. Therefore the increase in performance concerning the inconsistency of concepts, analysis of dynamic systems, and adequate coding occurred due to the peer evaluation strategy used in the G2 group (peer assessment group). According to the results, our study confirms that there is a significant positive effect on student performance due to the use of peer assessment as part of student learning strategies.

From the analysis of the data, it is observed that the peer assessment group in this study had a positive effect on student performance attributable to the peer assessment strategy, particularly about the analysis and understanding of central concepts of dynamic systems analysis, which led the students in this group to improve their average evaluation by 21% with respect the control group. In terms of dynamic analysis and coding strategies, significant performance increases were also detected as a direct consequence of the strategy.

It was detected that during peer evaluation, students become more sensitive to their weaknesses and strengths, which leads to a critical self-analysis of their performance and a more significant learning process along with the development of the feedback from their peers. The student autonomously identifies the competencies he should strengthen and those in which he is highly competent and transfers this analysis to his peers.

In terms of qualitative analysis, a survey examined the student perceptions of the strategy's usefulness in improving their learning strategy, the contribution of feedback to their training

processes, the contribution to their motivational levels, the degree of satisfaction with the strategy, and considerations regarding the additional burden implied by the strategy. Figures 1 to 6 show the results of some of the most representative questions.

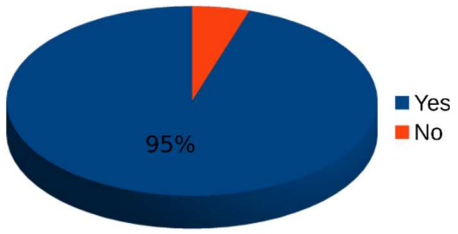

Figure 1. Question: Is the workload adequate to achieve the learning outcomes? Yes or No

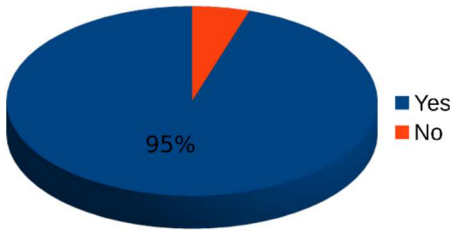

Figure 2. Question: Does the quality of teaching help the student achieve learning outcomes? Yes or No

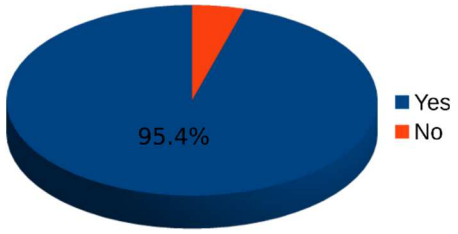

Figure 3. Question: Am I motivated to achieve learning outcomes? Yes or No

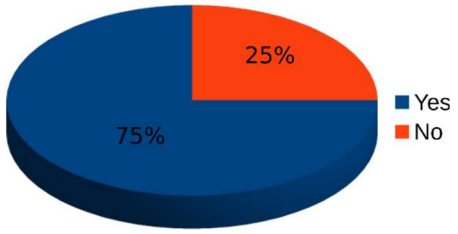

Figure 4. Question: Feedback from my peers improved my learning? Yes or No

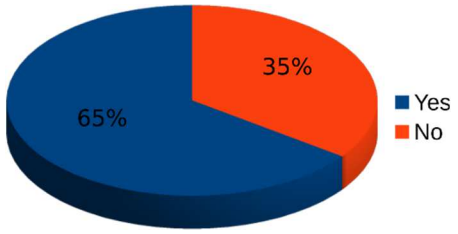

Figure 5. Question: Do you consider that you require additional feedback from the teacher as part of the evaluation and feedback process? Yes or No

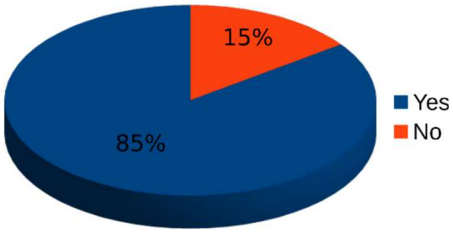

Figure 6. Question: Was the information you received in the peer assessment useful to the course? Yes or No

From these results, it is evident that the peer assessment group students managed to develop some awareness and self-criticism regarding the strategy. While it was observed that students are aware of the increased work involved in developing the peer assessment, there is greater acceptance that the strategy brings many benefits in the sense that it allows strengthening specific weaknesses while at the same time socializing and enhancing strengths. This increased student work translates into more careful attention to concepts and strategies that improved academic performance, strengthened analytical and critical skills, and enhanced motivation in studying the course.

The analysis of the responses of the students shows that the peer evaluation strategy allowed the students to be more critical and responsible for their training process. The answers to the questions show a high degree of awareness of their capabilities and weaknesses, which they identified thanks to the contributions of their peers. The degree of responsibility placed on them by the teacher may make students concentrate more on their performance and the analysis and feedback they provide to their peers. This strengthens their academic capacity and their self-critical level of their professional training (they learn to control their academic progress). While it is true that a more in-depth study is needed to account for the level of additional dedication of the strategy hand in hand with the design of academic credits for a given academic course, it is valid to state at this point that the integrated design of a curriculum with the adoption of these techniques is presented as a promising strategy under an academic environment strongly impacted by social restrictions and isolation.

Another point that requires further study is related to the role of the teacher throughout the

peer evaluation process. Previous research has shown that although the evaluation developed by students in this model tends to be of a good level, the truth is that it is never as accurate and complete as the one developed by the teacher (Salehi, and Daryabar, 2014). This means that the teacher is a fundamental part of the strategy, and must be involved at every stage of the process. This means a greater degree of dedication, something that should also be considered in the design of the curriculum. Also, students should not feel that they are alone in the process (something that can be detected in the responses of the students), on the contrary, they should continuously feel the support of the teacher.

4. CONCLUSIONS:

This article presents a study applied to young undergraduate students in electrical engineering that sought to determine the effects of peer evaluation and feedback within the transitional model of distance learning. It aimed to identify the possible effects on specific parameters of training in the area of dynamic systems, and these parameters included the correct and consistent application of concepts of analysis of dynamic systems, the correct analysis of dynamics, and proper coding in Verilog. The student population under test was mainly male (a little more than 80%), between 18 and 22 years old, and belonging to the lowest social strata of the city. These characteristics are generalized in the Universidad Distrital Francisco José de Caldas student population, located in the city of Bogotá (Colombia). A total of 65 students participated, separated into two groups. A first control group developed a distance learning process characterized by adapting the face-to-face classes to a video conferencing platform. The second group used the same training strategy but added the technique of peer evaluation and feedback as part of the process. Both groups handled the same content and depth levels, developed during the same time frame (six months). There was no contact between the two groups, and pairs of students organized all academic work. The final performance of each group was weighted with the same tool to determine the difference in performance between the two groups. The analysis of these tests showed that in all the parameters analyzed, there was an increase in performance completely attributable to the strategy. In some cases, it was even weighted above 20%. It was also possible to identify a favorable acceptance of the strategy by the students, even though they consider that substantial additional work is required. Further studies should determine the true degree of incidence of the strategy on the time required by students to propose changes in the curriculum. It was also observed that there is a need to increase the training of students in the techniques of peer evaluation.

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Table 1. Descriptive statistics of the performance of the two groups (control group and peer assessment group) at the end of the academic training processes

	Mean		StDev		Min		Max	
Misapplication of concepts	G1 57.6	G2 90.1	G1 18.3	G2 5.3	G1 36.7	G2 73.6	G1 81.2	G2 95.7
Inconsistencies in the concepts	G1 83.4	G2 92.6	G1 10.8	G2 10.1	G1 74.3	G2 79.6	G1 95.8	G2 97.1
Wrong dynamic analysis	G1 71.2	G2 92.4	G1 15.9	G2 3.5	G1 54.4	G2 82.9	G1 88.9	G2 99.6
Inadequate coding	G1 92.5	G2 98.3	G1 2.52	G2 0.9	G1 89.2	G2 97.3	G1 93.7	100

G1 = Control group
G2 = Peer-assessment group

Table 2. *T*-test of paired samples from the two groups

	T Value	Degrees of Freedom	P Value
Misapplication of concepts	2.831	63	0.044
Inconsistencies in the concepts	8.791	63	0.008
Wrong dynamic analysis	4.703	63	0.007
Inadequate coding	5.672	63	0.001

APPENDIX

Survey form used with the students.

1. Course name:

2. Professor:

3. Level of effort you have put into the course

	Deficient	Average	Satisfactory	Very Good	Excellent

4. Knowledge acquired

	Deficient	Average	Satisfactory	Very Good	Excellent
Level of skills or knowledge at the beginning of the course					
Level of skills or knowledge at the end of the course					
Level of skills or knowledge required to complete the course					
To what extent has the course contributed to improving your skills or knowledge?					

5. Professor's skills and dedication

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The professor was an effective trainer					
The explanations were clear and well structured					
The professor stimulated the interest of the students					
The professor made good use of the teaching time					
The professor					

was attentive and helpful					
The grades were published early and contained valuable commentary					

6. The learning outcomes in the unit are clearly identified Yes NO
7. The learning experiences in the unit helped me achieve the course objectives Yes NO
8. The learning resources in this unit helped me achieve the course objectives Yes NO
9. The assessment tasks in this unit fairly assess my achievement of the learning outcomes Yes NO
10. Feedback on my work in this unit helped me to achieve the unit outcomes Yes NO
11. The workload for this unit is adequate to achieve the learning outcomes Yes NO
12. The quality of teaching in this unit helps me achieve the learning outcomes Yes NO
13. I am motivated to achieve the learning outcomes in this unit Yes NO
14. I make the most of the learning experiences in this unit Yes NO
15. The feedback from my peers enhanced my learning in this unit Yes NO
16. Overall, I am satisfied with the co-evaluation process developed by my peers Yes NO
17. Overall, I am satisfied with the co-evaluation process I developed Yes NO
18. I consider that the professor's distance lecture activity was effective in my learning process Yes NO
19. I consider that the laboratory activities through simulations were effective in my learning process Yes NO
20. I consider that the asynchronous video activity was effective in my learning process Yes NO
21. I consider that the co-evaluation activity was effective in my learning process Yes NO
22. During the co-evaluation of my peers I solved doubts related to the course contents Yes NO
23. If you have participated in the remote sessions (or listened to the recordings), did you find the content of the lectures useful? Yes NO

24. Did you find that the use of live presentations (student presenting their academic work online) during the sessions was good for the student presenting their work? Yes NO
25. Did you find that the use of live presentations (the student presents his/her academic work online) during the sessions was good for the other students in the course? Yes NO
26. Have you found this co-assessment format to be effective in helping you meet the learning outcomes? Yes NO
27. Would you recommend this co-evaluation approach? Yes NO
28. Did the professor provide useful information for the co-assessment process? Yes NO
29. Considers that it requires additional feedback from the professor as part of the assessment and feedback process Yes NO
30. Did you find the co-assessment based sessions to be a challenge that developed additional skills related to the

course? Yes NO
31. The information you provided in the co-assessment was useful for the course Yes NO
32. The information you received in the co-assessment was useful for the course Yes NO
33. The co-assessment activity meant unnecessary work, it did not add to the learning work already developed for the written test Yes NO