

The perception of Engineering students toward teaching performance on online learning during COVID-19 pandemic

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Article Info

Article history:

Received Jun 1, 2021

Revised Mar 17, 2022

Accepted Apr 23, 2022

Keywords:

Didactic strategies

Online teaching

Perception

Performance factor

Teaching performance

Topic factor

ABSTRACT

This study analyzed the perception of Mechanical Engineering and Systems Engineering students in the process of evaluating teacher performance in online teaching due to the COVID-19 pandemic. This was descriptive-correlational research. The results showed that the Systems Engineering students performed a better perception with the class session management factor and low qualification to the didactic strategies factor. Likewise, the Pearson correlation test indicated a significant relationship (0.000) between the specific factors on the overall performance factor. The topic factor has the greatest strength on the qualification of the overall performance factor, with a constant Pearson's correlation of 0.964. The Mechanical Engineering students showed a better perception with the class session planning factor and low qualification to the didactic strategies factor. Likewise, the Pearson correlation test indicated a significant relationship (0.000) between the specific factors on the overall performance factor. The didactic strategies factor being the one that has the greatest strength on the qualification of the overall performance factor, with a correlation constant Pearson's of 0.983.

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1. INTRODUCTION

The evaluation of teaching performance is one of the foundations on which the academic quality of public universities is based [1], [2]. The figure of the teacher has been referenced in multiple investigations,

as that central element in the search to improve educational quality and academic achievement of students [3]. Given this, the quality of university education systems has various theoretical-methodological debates, since there are many currents that can argue the different ways of measuring the quality and efficiency of education [4]. The evaluation of educational quality implies the evaluation of a wide range of activities demanded by the institution, the same one that to a large extent must be developed by the teacher [5]. However, teacher evaluation can be seen from different perspectives, those that are linked to the teaching-learning process are the most significant [6].

For a long time, universities have recognized the importance of increasing and improving the quality of teaching given to students, for which they have emphasized identifying the role that the evaluation of teacher performance plays, and who benefits. However, a single opinion has been reached that the ultimate purpose is to correct for the better [7], [8]. The evaluative process regarding teaching performance should privilege a deep reflection on the possibilities of improvement, as an essential weapon to enhance the transformative capacity that contributes to the solution and improvement of the quality of university education [9], [10].

The evaluation of university teaching work should be conceived as an exercise that seeks to achieve, protect and sustain the quality of the teaching function [11]. The reflective, evaluative and analytical process results in an articulated succession of actions, the same ones that seek to obtain findings for permanent improvement [12], [13]. The evaluation of teacher performance focuses on the so-called visible actions, that is to say, actions typical of those carried out in classrooms, which aim to achieve factors to improve, guaranteeing their continuous improvement in their performance [14], [15].

It should be noted that, reflection on the quality of education with a critical base, is vital for science and for society, the findings obtained from comparative analysis, particularly regarding teacher performance, are very important since it serves to forecasting the dynamics of change and making decisions [16], [17]. One of the difficulties that the teacher evaluation process presents is recognizing the multidimensionality of its work, however, the evaluation carried out from the student's perspective is necessary, since its evaluation largely concentrates the attitude shown by the teacher in other activities involved in the university [18], [19]. Thus, evaluating teacher performance is the process through which it is possible to issue an evaluative judgment on the fulfillment of responsibilities during the teaching-learning process, providing its students with objective, reliable and valid information [20], [21].

Now considering, the current context, the coronavirus disease (COVID-19) pandemic has caused an unprecedented crisis across the board. In the field of education, this emergency has led to the massive closure of face-to-face activities of educational institutions in more than 190 countries in order to prevent the spread of the virus and mitigate its impact. This has given rise to three main fields of action: i) The deployment of distance learning modalities, through the use of a variety of formats and digital platforms; ii) The support and mobilization of the educational staff and communities; and iii) The attention to the health and well-being of the students [22].

Considering what has been described, the university community had to abruptly adapt to the virtual modality of teaching [23], [24]. Therefore, we must be aware that to carry out the development of fully virtual courses, the ideal is to start planning well in advance, which involves training teachers and students in the use of technological tools, however, in many university institutions this was not done [25], [26]. Along with the COVID-19 pandemic, we are faced with a very particular scenario in which we must adopt a rapid change without neglecting the pedagogical principles that identify good teaching performance, in order to guarantee university academic quality [27], [28]. Even more so when large gaps have been identified in educational results, which are related to an unequal distribution of teachers, and of the best-qualified teachers, in particular, to the detriment of countries and regions with lower income and rural areas [22].

2. RESEARCH METHOD

2.1. Research level

The research design was non-experimental, since it is not intended to analyze the effect of an action plan or improvement plan on teachers, in such a way that it modifies their performance. On the contrary, it seeks to analyze the data in its natural state, as it was collected in the context of virtual learning implemented by the declaration of a health emergency due to the COVID-19 pandemic in Peru. Due to the fact that this virtual learning is forced (COVID-19), it is therefore necessary to pay attention to the virtual learning practice of engineering careers.

The research level was descriptive-correlational. It is descriptive since it is intended to use statistics to specify on average which factor presents a greater negative perception, in each professional school. Likewise, it is correlational, because it will identify the degree of relationship between the specific factors and the global factor. This in order to determine which of the factors has a greater weight or influence on the general qualification of teaching performance.

2.2. Population and sample

The population was made up of all the specialty teachers from the different professional schools. In order to specify the composition of the population under analysis, the following is detailed: the number of teachers in the professional school of Mechanical Engineering is 22 and in the professional school of Systems Engineering are 26. The sample will be equal to the population, due there was no difficulty in analyzing the performance evaluation of all the teachers that make up the population.

It should be noted that the evaluation of teaching performance is carried out from the perspective of the 172 students from the professional school of Mechanical Engineering and 149 students from the seventh to the tenth cycle of the 2020-A academic semester of the professional school of Systems Engineering. It has been established to survey students from the seventh to the tenth cycle because they are the ones who take specialty subjects.

2.3. Data collection technique

For this research, the data collection technique was the survey, which is composed of specific performance factors and a global performance factor. In the case of specific factors, it has as indicators: planning, didactic strategies, communication, class session management, and finally domain of the topic. It should be noted that the factors established in the survey were approved by resolution at the rector level of the State University of Peru, and the qualifications have been established within a range of 0 to 20.

2.4. Validation of the data collection instrument

Initially, the data collection instrument was validated using the SPSS V25 software. This analysis is made up of the validation of the content of the instrument and the data collected from it. When the test was carried out using Cronbach's alpha, the results showed a high reliability of 0.83 and 0.88, for the factors analyzed from the two professional schools of Mechanical Engineering and Systems Engineering [29].

3. RESULTS AND DISCUSSION

3.1. Perception of teaching performance by professional school

The research begun by determining which specific factor is the one that presents both the highest and the lowest average grade, according to the perception of Mechanical Engineering and Systems Engineering students. As detailed in the previous paragraphs, the instrument used in which the research variables intervene corresponds to a survey validated by a national university in Peru. Figure 1 shows the results of the evaluation of teacher performance during online learning, according to the perception of students of Systems Engineering and Mechanical Engineering.

As can be seen in Figure 1, in Systems Engineering school, the factor with the highest qualification is the class session management factor, which is related to the fulfillment of the scheduled activities during the academic semester, probably students perceive that this has been accomplished in a better way; while the one with the lowest qualification is the didactic strategies factor, which is related to the application of didactic methods, procedures and techniques appropriate to the development of the subject. Although the margin of difference is not significant, it can be said that by applying the administration factor of the class session, 69% of the teachers present a good performance and 23% present a regular performance, while applying didactic strategies the 50% of the teachers present a good performance, 42% present a regular performance, and 4% present a poor performance.

On the other hand, Figure 1 shows that in the Mechanical Engineering school, the factor that presents a higher qualification is the planning factor. It is related to the ability and effort of the teacher in preparing and achieving the course during the academic semester. Students probably perceive that this factor has been fulfilled in a better way and the teacher has clearly and precisely communicated the objectives and activities to the development of each class. While the factor that presents a lower qualification is the didactic strategies factor. This could respond to the fact that Mechanical Engineering students do not feel that they are acquiring the knowledge, skills and attitudes relevant to their professional development. It should be taken into account that it is a career with a high practical development, which was carried out according to the perception of the students in a better way in face-to-face teaching. Similarly, although the margin of the factors is not significant, it showed that applying the planning factor, 32% of the teachers present a very good performance. While applying didactic strategies, only 23% of the teachers present a very good performance and 5% present poor performance.

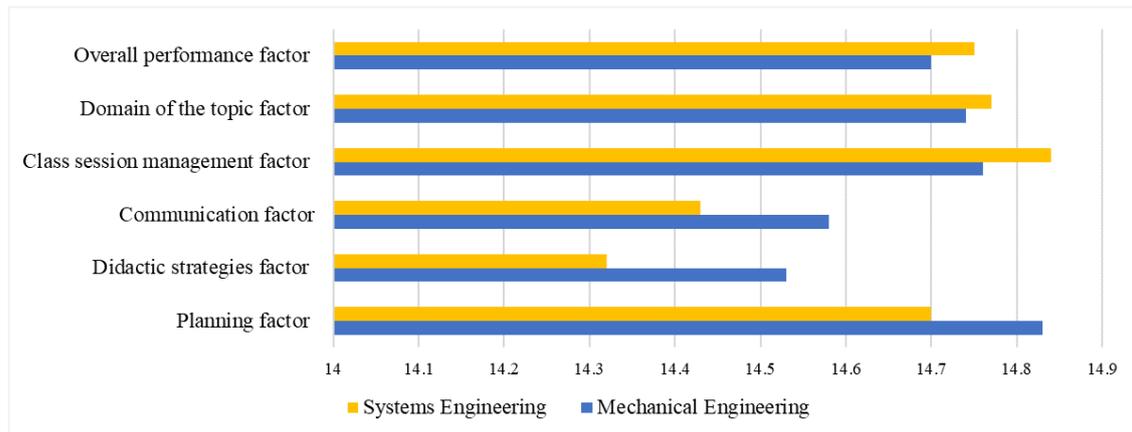


Figure 1. Teaching performance by professional school

Regarding the planning factor, the degree of autonomy positively correlated (sig. 0.000) with the need to perceive the correct commitment on the part of the teacher. Furthermore, the score obtained from the “autonomy” indicator is a predictor of the degree of satisfaction that they report in virtual courses. Both autonomy and commitment indicators interact as variables that explain student satisfaction, since when both are given together, their effect is greater than that of each factor separately [30].

As can be seen in both professional schools, they give a low rating to the teacher's application of didactic strategies. Under this new context generated by the COVID-19 pandemic, the use of technologies is no longer an option but a necessity. Therefore, it is important that teachers and students are integrated into the digital environment [31]. As various investigations, students satisfactorily evaluate teaching performance, when they perceive that their knowledge is increasing and they feel prepared for the new challenge of labor insertion. Therefore, the use of digital tools becomes a necessary resource to use. Even more so considering that engineering careers go hand in hand with research and the creation of cutting-edge technological solutions, committed to social needs and sustainability [32], [33].

Regarding the overall performance factor, which includes the general perception of the students, Figure 1 shows that minimally the professional school of Systems Engineering presents a better perception towards teachers and the way in which they apply the five factors in analysis. Mostly, this indicator is the one that is usually taken into account by the authorities when making an improvement plan. Figure 2 presents the results obtained from the variation in perception regarding the change in the teaching modality.

In general, Figure 2 shows that the professional mechanics school has experienced a positive variation when moving to the online teaching modality. While the Systems Engineering career presents a negative variation when this new teaching-learning modality. The negative variation in the professional school of Systems Engineering may be related to the abrupt adaptation of virtual classes, which has not allowed a rapid acquisition by the student of digital resources such as personal computer (PC). This added to the economic crisis of the country, many of them failed to acquire these devices that are the primary means for the development of specialty subjects. For this reason, they have expressed their dissatisfaction regarding the adaptation of virtual teaching, this dissatisfaction has been mainly reflected in the way in which they have been evaluated. This new context undoubtedly means that the educational model must be restructured, as a consequence, student dissatisfaction and the importance of technological tools can be perceived, even more so if many students do not have the resources to access education online education optimally [34], [35].

Otherwise, the positive variation of Mechanical Engineering students may be related to the positive perception towards the fulfillment of the objectives that intervene in their professional training, during the academic semester. It also related to the skill and the teacher's effort in preparing the activities, despite being dissatisfied with the application of technological tools. As indicated in previous study, the results of the Anova test showed $F_a=54.929 > 3.933$. It means that there is an effect of the application of learning models on the learning results and student satisfaction [36].

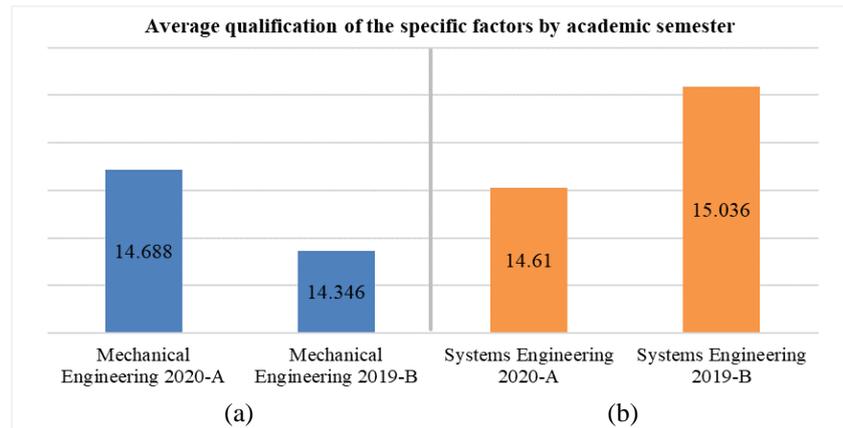


Figure 2. Comparative analysis by professional school between (a) Mechanical Engineering academic semester 2020-A and 2019-B; (b) Systems Engineering academic semester 2020-A and 2019-B

3.2. Analysis of the relationship of the specific factors with the overall performance factor

When taking a corrective action, the authorities of the higher educational institution tend to focus mostly on the results of the overall performance indicator. Since it reflects how satisfied students are with the teacher's performance. Although this is an important factor, it should be taken into account how closely related the application of the specific factors by the teacher is with the students' perception of the overall factor. These results allow a better overview of each specific factor to be obtained. In this way, the authorities are able to focus in a timely and specific way when making improvement changes.

The objective of this analysis, for its development the Pearson correlation test was applied by means of the SPSS software. It indicated if there is a significant relationship and the degree or level of this relationship or association [37]. It is necessary to indicate that this test carried out for both professional schools; since they are totally different natures, this is supported by the results obtained. Initially, the analysis carried out for the professional school of Mechanical Engineering as the result is presented in Table 1. The table shows that didactic strategies factor has greater strength with the perception of Mechanical Engineering students towards the overall performance of the teacher. It should be noted that when Pearson's correlation coefficient is closer to the value 1, the relationship will have greater strength or consistency [38].

Table 1. Pearson correlation analysis in the professional school of Mechanical Engineering

Specific factor	Overall performance factor	
Planning factor	Pearson correlation	.977
	Sig. (bilateral)	.000
	N	22
Didactic strategies factor	Pearson correlation	.983
	Sig. (bilateral)	.000
	N	22
Communication factor	Pearson correlation	.976
	Sig. (bilateral)	.000
	N	22
Class session management factor	Pearson correlation	.972
	Sig. (bilateral)	.000
	N	22
Domain of the topic factor	Pearson correlation	.977
	Sig. (bilateral)	.000
	N	22

In this sense, the results indicated that there is a very high strength of 0.983 between the qualification of the Mechanical Engineering student of the overall performance factor and the perception of the teacher's application of didactic strategies (the application of didactic methods, procedures and techniques, appropriate to the development of the subject). For this reason, the qualification towards overall performance factor will change positively or negatively. It occurs if the perception about the knowledge, skills or development that students are acquiring varies in a satisfactory or unsatisfactory way, respectively.

Mechanical Engineering school integrates science, electronics and automation of processes to improve the goods and services produced by companies. In this view, the use of new virtual channels is required. Even more, if the benefit obtained from having virtual resources on different internet platforms is knowledgeable in order to address issues that were previously very difficult to explain and understand. It is natural that Mechanical Engineering students, due to their profile, feel that they need to feed on didactic strategies to adapt to the innovation of current technologies and management of emerging ones. Since this allows them to maximize their professional training. Therefore, previous study revealed a high positive level of significance between the dimensions of student satisfaction towards teaching performance with the teaching strategies of the teacher towards the student [39].

Continuing with the same method, the analysis carried out for the professional school of Systems Engineering. Table 2 shows the results from the Pearson correlation test, which indicated that Domain of the topic factor has greatest strength with the perception of Systems Engineering students towards the overall performance of the teacher. Likewise, previous study indicated that the performance of the teachers generates satisfaction in the students. So, there is a very strong relationship between the actions and demonstrations of mastery, motivation, and commitment of the teachers towards the achievement of the learning of the student. This is indicated by the value of the path coefficient $P2, r_{X2X5}=0.239 > r(\alpha=0.01)=0.137$ [40].

In this sense, the results indicated that there is a very high strength of 0.964 between the qualification of the Systems Engineering student of the global factor and the perception they have towards the solid domain of the topic by the teacher. That is, in the perception if the teacher pours their academic and professional experiences into the development of the subjects. Also, if the knowledge they share is related to the professional practice that they feel that Systems Engineering students should acquire. These results in line with previous study that pointed out the domain demonstrated by both professional and personal teachers have a high level of relationship of 0.982, with the satisfaction of the student towards the teacher [39]. In addition, the evaluation of the work performance of teachers by the student is significantly related to their skill and abilities in the teaching process. This is reflected in the value of the coefficient of $R^2=0.071$ and the significant value is 0.000 [41].

Table 2. Pearson correlation analysis in the professional school of Systems Engineering

Specific factor		Overall performance factor
Planning factor	Pearson correlation	.915
	Sig. (bilateral)	.000
	N	26
Didactic strategies factor	Pearson correlation	.958
	Sig. (bilateral)	.000
	N	26
Communication factor	Pearson correlation	.954
	Sig. (bilateral)	.000
	N	26
Class session management factor	Pearson correlation	.870
	Sig. (bilateral)	.000
	N	26
Domain of the topic factor	Pearson correlation	.964
	Sig. (bilateral)	.000
	N	26

4. CONCLUSION

The study exposed the deficiencies that exist regarding technologies and digital pedagogical resources used by teachers in the online teaching process, due to the global COVID-19 pandemic. The abrupt change to virtual reality reveals the precariousness in the design of policies for the digital age. It occurred due to the lack of digital devices and connectivity, less knowledge about the use of digital technology, as well as lack of training for teachers and students. The proper use of technological resources in the teaching-learning process generates autonomy, criticality and participatory learning in students; especially if they are aligned to careers with a practical and technological nature.

It is suggested to establish a system to train and motivate the teaching staff in the use of the virtual environment. Likewise, the institution should provide an infrastructure in accordance with the new pedagogical model of the institution that guarantees quality teaching-learning. In addition, a learning self-assessment instrument should be implemented for the students of the virtual courses. A platform where the student can express their opinion about their learning should be implemented. In this way, the activities of the virtual courses need to be redesigned.

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