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Academic performance in virtual learning environments post COVID-19 pandemic in higher education

Rendimiento académico en ambientes virtuales del aprendizaje en la pandemia COVID-19 en educación superior

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Abstract

The aim of this study is to analyze academic performance in virtual learning environments during the Covid 19 pandemic for Institutions Incorporated into the University located in the State of Mexico. For this, a review of scientific literature was carried out, which is based on current references in specialized databases. A quantitative design of this study based on an experimental study with a sample of 15 institutions, 1200 professors who taught at distance or virtually in the academic period, also 700 students were applied instruments during scholar period of year 2020- 2021, 2022. Data collection used different surveys. The information analysis is described narrative and presented by graphic, tables, and diagrams. The results of these surveys shown that, 80% learnt at distance, nevertheless 20% decided to quit the classes. The most used platform was Google classroom, the main communication plataforms used were Facebook, Zoom and WhatsApp. The 70% of the contents of the programs were completed. The 90% consider that academic performance is subjective. The 90% of theachers require developing digital competences 95% consider that access to technology is an oportunity to achieve learning.

Academic performance, Virtual learning, environments, Higher education

Resumen

El propósito de este documento es analizar el rendimiento académico en ambientes virtuales de aprendizaje en la pandemia COVID-19 para las Instituciones Incorporadas a la Universidad ubicada en el Estado de México. Ello tuvo un sustento en la revisión de literatura científica que se apoya en autores vigentes. El diseño metodológico tiene un enfoque de corte cuantitativo con diseño experimental con una muestra de 15 instituciones de educación superior (IES), 1200 profesores que dictaron clase en el periodo académico, con 700 estudiantes a quienes se les aplicaron los instrumentos durante el año 2020-2021. En seguida, la recolección de datos se hizo a través de instrumentos denominados cuestionarios en la aplicación google forms. El análisis de la información se describe y muestra mediante tablas, gráficas y diagramas de frecuencia. Los resultados de las encuestas muestran que, en educación superior, el 80% realizó trabajo a distancia, y también se demuestra que hubo un alto índice de deserciones 20%. La plataforma más utilizada fue Google classroom, el principal medio de comunicación fue Facebook, Zoom y WhatsApp. Se cumplió con el 70% de los contenidos de los programas. El 70% de los encuestados consideró que el rendimiento académico es medio y el resto bajo. El 90% de los docentes requiere desarrollar competencias digitales. El 95% considera que el acceso a la tecnología es una oportunidad para lograr el aprendizaje.

Rendimiento académico, Ambientes virtuales, Educación superior

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Introduction

Academic performance in virtual learning environments (VLE) is a construct that given the nature of the current dynamics called Pandemic COVID-19. This phenomenon requires its measurement in education, especially in higher education. It is a fact that virtual or distance learning raises many doubts about its efficiency or effectiveness. However, teaching and learning in virtual environments must be measured or evaluated to substantiate its performance with facts. Ross, Morrison and Lowther (2010) point out that there are theories that support Information and Communication Technologies (ICT), such as the connectivist theory of Simmens, who promotes their use as a trigger for new learning. This fact cannot be lost sight of in this new dynamic. Salinas (1996) suggests mixing technology, relying on synchronous and asynchronous media to achieve better communication as a starting point. It is recognised, as Bello (2005) rightly cites, that virtual education is entirely dependent on the functioning of the Internet. Consequently, virtual or distance education relies on electronic networks, and not necessarily on the construction of learning from a scaffolding of reality in the classroom. It is for this reason that it is necessary to see how academic performance in the COVID-19 pandemic was in VPAs.

To achieve the research objective, first, the background was described, based on scientific evidence to understand the emergence of the problem. Secondly, a comprehensive review of the current state of knowledge was made, supported by some current authors. Third, an experimental design was proposed to show the results of an instrument applied to the Institutions Incorporated to the Universidad Autónoma del Estado de México (UAEM) in Mexico.

To achieve this purpose, several databases such as EBSCO, Redalyc, ECORFAN, Web of Science, among others, were used to show evidence of the problem. Then, recent studies on VPA in higher education were identified to support the relevance of the study, and the gaps. In this research, with a quantitative experimental design approach, the quality criteria to be considered were certain elements shown to achieve reliability and validity. Reliability in this case is given by the degree of repeated application of the measurement instrument, as the same results were produced in different subjects. Whereas validity was indicated by the degree to which the instrument actually measured the variable academic performance (Hernández et al., 2010).

In this, internal validity detected the degree to which valid conclusions were drawn about the causal effects of the variables. While external validity generalised the results to the conditions or areas of interest (Ross, Morrison and Lowther, 2010). In this sense, we sought to replicate the study, but analysed from another context. To achieve this, instruments were used to provide reliability in the collection of information. Consequently, data obtained from the information is presented. Finally, some of the ideas were contrasted.

Background

Open distance learning (ODL), e-learning and e-learning on the Internet, has its historical antecedents in the last century, but it is only in the 1990s that it has taken off. It has evolved slowly in various parts of the world. Sometimes with uncertainty, sometimes without credibility. Nonetheless, some universities have developed the distance mode, or blended learning, as an alternative for educational coverage.

Nowadays, Distance Education and ICTs enable social spaces for human interaction in a virtual way. It is a fact that the environment gives rise to new teaching-learning processes. The transmission of knowledge through electronic communication networks must become a consistent reality. There is no going back, the search for a type of virtual education where the student is involved, participates and is the generator of his own knowledge is the challenge. They must also participate in multidisciplinary projects, learning to function in an environment of collaboration and cooperative development. In other words, paradigms must be broken. It is true that the Covid-19 global dynamics accelerated the process or positioned the method. It is necessary to understand that this phenomenon will not end in this century, the trend is different, and that it is better to be prepared for other adverse scenarios.

Evolutionary theorists confirm that more pandemics will come, all caused by overpopulation. For this reason, Higher Education Institutions (HEIs) are obliged to restructure their curricula not only to offer traditional face-to-face or blended classes, but also to make room for the introduction of virtual classes.

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Theoretical Approach

This review of the literature notes the relevance of VPAs in various academic circles. Therefore, some of the gaps in the literature are shown to give rise to this study. It is noted that the discussions deal with studies developed for different contexts, systems or nations. For this reason, the research that has been done is validated, as it is designed in a context that has not yet been explored. Hence, the research presented has diverse approaches and characteristics, but none yet under this complex scenario.

Virtual Learning Environments

Authors such as Gonzáles and Flores (2000) define a VLE as a space where people converge who intend to learn a subject based on theory, technique and practice with the use of media or tools that contribute to their own generation of knowledge.

Meanwhile, a VLE, in the words of Herrera (2006) is an environment that is supported by technological means for learning in a synchronous or asynchronous manner. Cabero, et al (2000) consider that there are a series of characteristics that support the VLE: software and hardware, and even something that he calls orgware or structures that support systems that help the teaching-learning process.

Contreras-Colmenares and Garcés-Díaz (2019) in their research called Ambientes Virtuales de Aprendizaje: dificultades de uso en los estudiantes de cuarto grado de primaria, conclude that VLEs are training spaces that require a commitment from the teacher. In this case, still limited by the training and development of technological skills. Perhaps for these last reasons it can be inferred that, although the evolution of VLE has been moderate, the current dynamics demand its use in an accelerated manner, but supported by technology and media. It is recognised that other questions arise about its efficiency or effectiveness, but it must be understood that it is the only alternative available to counteract the issue of education in times of pandemic crisis.

Another paper by Suárez, Flores and Peláez (2019) on Teachers' digital competences and their importance in virtual learning environments, agrees that it is necessary to make the teaching community digitally literate. The researchers agree that virtual education is booming. Furthermore, they identify a number of opportunities to achieve the digital competences required.

For this reason, it can be argued that the efficiency of VLE also depends on the use of other technological tools in addition to the development of teaching competences. However, the article leaves a gap on academic performance.

Finally, Taborda and López (2020) comment in their article Critical thinking: an emergence in virtual learning environments that, although the strengths of the VLE modality are recognised, there are also implications that do not support the teaching-learning process. The latter refers to the possibility that one consequence is a lack of socialisation. This can be discussed in another study. The authors argue that the configuration of digital systems in synchronous and asynchronous processes are not dynamic, in the case of students and teachers, they feel intimidated, so they do not participate or do not turn on their digital cameras in the synchronous system, otherwise it is detected when they question themselves about learning or competences, given the world of information that exists. It is not clear whether there was a learning moment or whether the technology did not provide the expected dynamics. This is perhaps the main reason why academic performance is subjective in this type of VPA.

Academic Performance

Lucena, et al (2019), define academic performance (AR) as a student's maximum outcome from the learning process. It is understood that AR has different connotations. According to Martínez and Otero, in García (2019), they state that AR is the product obtained by students from learning centres and that it is regularly shown in academic grades. Pizarro (1985) in García (2019), incorporates the term ability measure that expresses an estimate of what a person has learned.

However, recent data show that AR depends on a number of factors. González and Guadalupe (2017) call them variables. Mostly determined by knowledge, subjects, learning ability, socio-cultural level, expectations, both of the teacher and parents. However, the discussion for this case focuses on the fact that there are other factors that are determinants of learning such as technology. In this context, VPAs are supported by ICT, yet there are learning methods that reinforce traditional models, although the discussion focuses on the fact that technology is a means to support learning. It is argued that everyone learns at their own pace and in their own way. In this case, it is up to HEIs to provide the necessary technological tools to equip this Virtual Learning Environment.

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When we refer to equipping, we must consider equipment, media, Internet, applications and spaces or electronic classrooms. However, it is not only about equipping the "virtual classroom" but also about equipping the teacher and the student, through computer equipment, Internet cards and software. Everything is an investment, the most important one, in education.

In Practice

In a study called Influencia del aula invertida en el rendimiento académico: Una revisión sistemática (Hinojo, et al., 2019) they show that this method (Flipped classroom) allowed to increase students' grades significantly, in a first period, and later it was demonstrated that there are conditioning factors that do not allow learning to be absolute. Although the results support that the flipped classroom method is more efficient versus the traditional method (Hinojo, et al, 2019), some data show that there are some issues or "factors" that influence AR to depend on other variables to achieve efficiency.

Suárez, Flores and Peláez (2019), in a paper on AR in VPA, state that the success of the tool depends largely on the support of ICT. The authors also recognise that teachers and students are required to have a series of digital competences (DC). However, while there are studies such as Rivera, et al (2021) that argue that the starting point towards virtualisation is the development of DCs to avoid improvisation in teaching, there are also studies such as Rivera, et al (2021) that argue that the starting point towards virtualisation is the development of DCs to avoid improvisation in teaching.

At the present time, many HEIs are declaring an end to virtualisation and a return to the traditional, which is incorrect. It must be acknowledged that the CDs add, to a large extent, to the AR of the students in this virtual modality. It is time to pass on good practices in order to replicate the studies.

For all of the above, Calvo, et al (2020), Prata, et al (2020), Ramírez-Hernández (2020), Peña (2020), Ospina, et al (2013), among others, agree that VPAs are supported by methods, models, infrastructure, competences, systems, for the achievement of the AR of students in HEIs. Under these circumstances, the following research question arises: What was the academic performance of higher-level students in virtual learning environments of the Institutions Incorporated to the UAEM in times of the COVID-19 pandemic?

Research Method

This study is based on a quantitative design with an experimental design, a case study with a single measurement, which will allow the application of instruments for data collection based on a series of items that guide the variables to be identified, therefore, as is well cited, this type of methodological design is the appropriate one for the research (Hernández, Fernández-Collado, and Baptista, 2008).

Method

Campbell and Stanley (1966) in Hernández et al (2008), argue that there are three types: pre-experiments, pure experiments and quasi-experiments. In this case, the pre-experiment was used. That is, a stimulus was administered to some groups, after applying the measurement of the academic performance variable to observe the level of the group. It is simply a matter of explaining some facts coming from the academic reality. This type of research aims to measure, collect group or individual information on variables according to the study (Hernández, Fernández-Collado, & Baptista, 2008).

In this case, the level of research, according to criteria and modality, requires explaining facts to measure the variable Academic Performance in Virtual Environments that have occurred in the context after the COVID-19 pandemic in the Institutions Incorporated to the UAEM. The data were collected electronically from the original scenario, without making inferences or manipulations (Creswell, 2009). It should be noted that the study had two points in time for measurement: it was carried out at the end of the 2020-2021 period, and the beginning of the 2021-2022 period, all to understand how the transition and use of technology was in VPA.

Participants

The sample used was approximately 700 students. All of them come from a higher education level, from different institutions, all of them incorporated to the UAEM.

The students were of both sexes and those who were interested participated. The ages ranged from 19 to 23 years old. Therefore, the sample represents an important value in this study. No exclusion criteria were established and anyone who wanted to participate and received the electronic link to fill out the form was allowed to do so.

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Instrument

An instrument was designed to obtain the information using the google forms platform. The instrument was a questionnaire of approximately ten questions, some of which were open-ended, and others closed-ended, with the intention of obtaining truthful and reliable information. No value scales were established as the information obtained was quantitative.

Procedure

To achieve the purpose and answer the research question, the following activities were carried out in the order specified. The steps to obtain the information are as follows:

1. Questionnaire was designed in Google forms platform.
2. An email was sent to all the institutions to invite them to participate in filling out the survey.
3. A time frame of 15 days was given.
4. The platform was permanently monitored to see the degree of response from the participants.
5. Once the time period was over, the platform was closed, and the information was collected.
6. The results are presented in the form of discussion and graphic displays.

Results

This section collects the data on What was the academic performance of higher-level students in virtual learning environments of the Institutions Incorporated to the UAEM in times of the Covid-19 pandemic?

For this reason, the results are broken down in detail:

Question 1: Is there a plan of academic activities in your institution that includes objectives, activities, timelines, etc.?

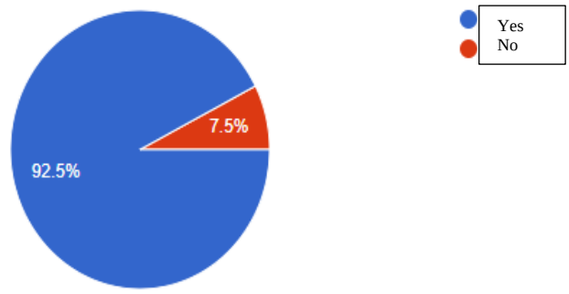


Figure 1 Results of the activity plan
Note. Directorate of Incorporated Institutions Admon. 2019-2021

In particular, the following results were generated:

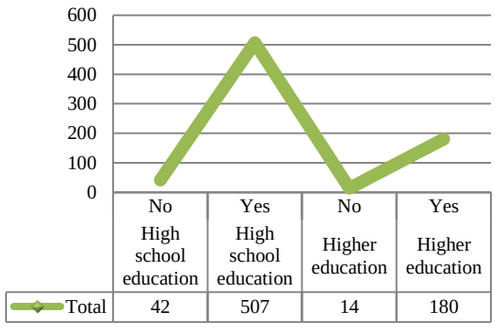


Table 1 Results of the activity plan
Note. Directorate of Incorporated Institutions Admon. 2019-2021

Question 2: What platforms have been used in your institution? Online and distance learning.

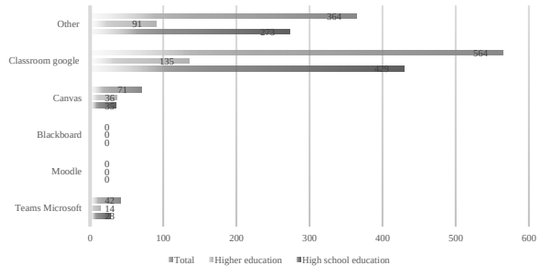


Figure 2 Most used platforms
Note. Directorate of Incorporated Institutions Admon. 2019-2021

Question 3: What videoconferencing tools have been used in your institution?

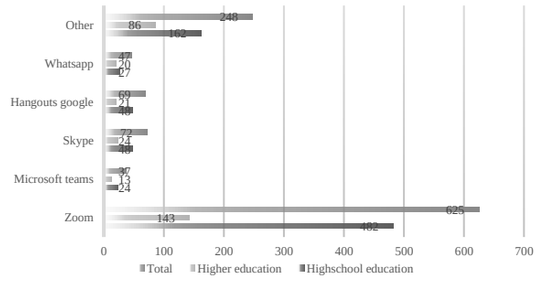


Figure 3 Videoconferencing tools
Note: Directorate of Incorporated Institutions Admon. 2019-2021

Question 4: What proctoring tools have been used in your institution?

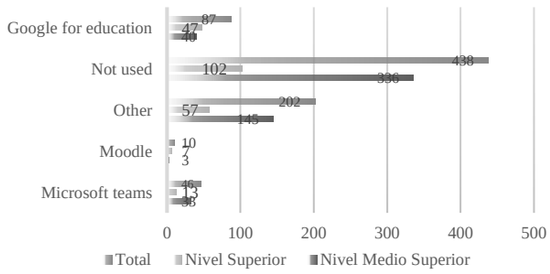


Figure 4 Proctoring tools
Note: Directorate of Incorporated Institutions Admon. 2019-2021

Question 5: What is your institution's primary means of communication during the COVID-19 health contingency?

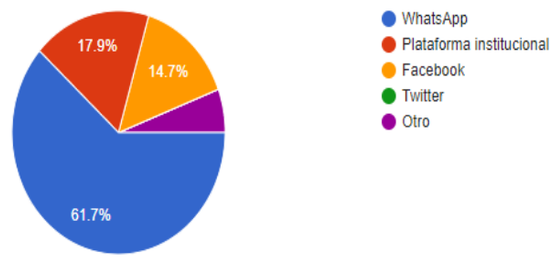


Figure 5 Proctoring tools
Note. Directorate of Incorporated Institutions Admon. 2019-2021

Question 6: Please assign a percentage to the challenges your institution has faced during the COVID-19 health contingency?

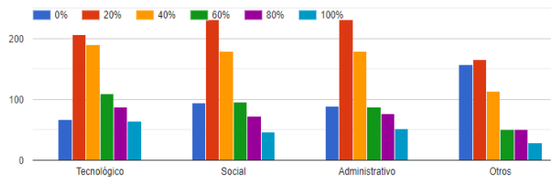


Figure 6 Proctoring tools
Note: Directorate of Incorporated Institutions Admon. 2019-2021

Question 7: Which staff has been most involved during the contingency? (where 1 is minor and 5 is major).

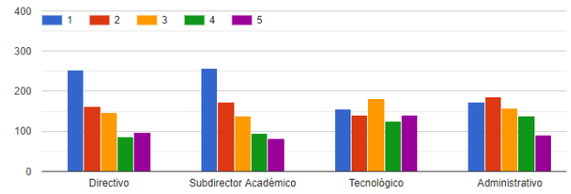
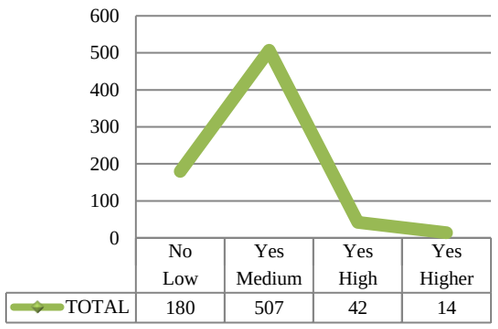


Figure 7 Proctoring tools
Note. Directorate of Incorporated Institutions Admon. 2019-2021

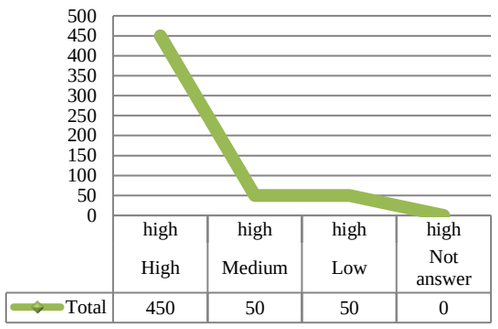
Question 8: How do you consider your academic performance was during this COVID 19 pandemic?



	No Low	Yes Medium	Yes High	Yes Higher
TOTAL	180	507	42	14

Table 2 Academic performance in the COVID-19 pandemic
Note. Directorate of Incorporated Institutions Admon. 2019-2021

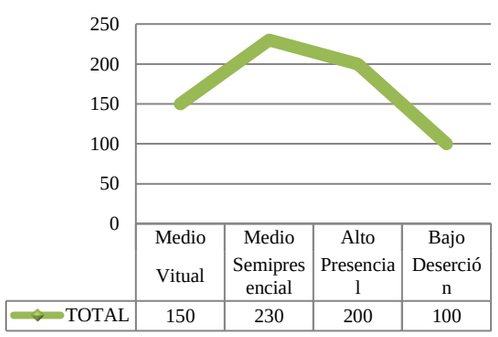
Question 9. Do you consider that academic performance in virtual education depends on the technological tools provided by your HEI?



	high High	high Medium	high Low	high Not answer
Total	450	50	50	0

Table 3 Academic performance versus technology
Note. Directorate of Incorporated Institutions Admon. 2019-2021

Question 10. Would you be willing to take classes in virtual learning environments regardless of the pandemic?



	Medio Vitual	Medio Semipresencial	Alto Presencial	Bajo Deserción
TOTAL	150	230	200	100

Table 4 Virtual versus face-to-face teaching
Note. Directorate of Incorporated Institutions Admon. 2019-2021

Discussion

In summary, analysing the academic performance (AR) in virtual learning environments (VLE) in the COVID-19 pandemic for the Institutions Incorporated to a University located in the State of Mexico, was achieved by means of a referential framework contemplating various sections: problem, literature review, methodology and results.

For all of the above, it was found that there is sufficient evidence to say that academic performance in virtual learning environments for the Incorporated Institutions (II) was maintained with a considerable standard of qualifications and without learning problems.

According to the results of question 1, the Incorporated Institutions (II) had a plan for the operation of online education. The IIs, immediately the pandemic situation was declared, worked on adapting the educational model using the technology at their disposal. This means that the student community detected that the institution made decisions based on a plan of action.

Regarding question 2, it was found that the Google classroom platform was the most used application for the instructional design of the learning units (LUs). The result shows that no major modifications had to be made to the contents of the AUs, but simply the transition from a face-to-face system to a virtual one. It is clarified that this does not mean that the transition was efficient, but quite the opposite: there is clear evidence that it is not an exemplary mechanism, but given the circumstances, it was what helped to solve the crisis at that time.

On question 3, the video tools that were used were those that were available and free of charge. However, it was clear that the IIs, with a few exceptions, have not made investments in educational technology, especially in what has to do with video conferencing in synchronous and asynchronous systems. It was found that the shares of platforms such as Zoom and WhatsApp increased by 70% of their stock price on the New York Stock Exchange (Forbes Staff, 2020). As a result, many educational institutions used less expensive and more efficient platforms.

On the issue of proctoring referred to in question 4, it was confirmed that there are platforms that have been used permanently, as many IIs have moved towards a virtual and distance education model. However, it is shown that many students in the IIs do not know how to operate such platforms and therefore it is urged to develop digital competence courses.

On the subject of communication, question 5, the results show that the most used medium is WhatsApp. This represents an advantage for the community, however, it is also a serious problem, as most HEIs have invested in using institutional e-mails, which are official means of communication, but most HEIs use WhatsApp groups as a communication mechanism. Many questions arise in this regard, which the HEIs themselves will have to address and resolve as soon as possible.

Now, on question 6, regarding challenges, the data show that there are two issues of concern: technology and socialisation. The issue of technology is likely to be a challenge for students as certain skills are required for the operation of systems. However, today's generations are adept at handling different equipment, so operating a platform should not be a problem. Perhaps the most complex issue is that of socialisation. This may be an issue that has an impact on learning, but studies are underway to identify what the consequences of a lack of socialisation are for students.

Question 7, on the level of involvement of the authorities, shows that it is still the top and middle management who make the most important decisions in this new dynamic. However, the graphs show that the decision must be agreed with the different sectors of an institution, i.e., administrative staff, technologists, academics and mainly the student community must be involved.

On the issue of academic performance, which is framed in question 8, the results show that 70% of the respondents considered their academic performance to be average. A quarter of the respondents did not learn, the rest of the respondents considered their learning to be optimal.

In question 9, it is observed that academic performance in virtual learning environments depends on the technological tools provided by their HEI. 80% of the respondents fully agree that it is the institution that is responsible for providing the necessary tools to take advantage of virtual learning environments. If investment in such technology is simply not possible, then there is another factor that conditions the success of the tools and that is access to the Internet.

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In the last question 10, would you be willing to take classes in virtual learning environments regardless of the COVID-19 pandemic, the results are divided; however, perhaps what is worrying is the dropout rate, which would be another variable to measure in another study, in this case it is presented as a possibility that 20% would drop out. In addition, 40% of those surveyed considered that they would continue to take virtual classes, as long as there is equipment, means and technology. There is another segment, 40%, who do not consider it, preferring blended or face-to-face classes.

Conclusions

Finally, it is emphasised that this health emergency generated by COVID-19 has had a series of implications for the whole of humanity. One of them, in education; there is no doubt that learning models modernise in accordance with social circumstances. The connectivist model, based on virtuality, is a modality that must continue to be developed in all academic institutions.

Therefore, remembering that the objective was to analyse academic performance in virtual teaching environments, a case study of the Institutions Incorporated to the Autonomous University of the State of Mexico. It could be seen from the results that the academic performance was perhaps the expected, not the ideal.

The research problem was shown in an adequate context to develop the research. It was possible to validate that the academic performance of higher-level students in the institutions incorporated to the UAEM was more or less adequate, it was considered that there are other factors that influence this AR. Some stated that it was due to access to technology, media, Internet and equipment. It is noted that the question of this research was resolved from the application of the instruments in a transparent and adequate manner without tendencies.

In relation to the literature review, the studies presented have a currency, so that the state of the art of the topic is relevant in its study. In addition, it was achieved by the dynamics of the information obtained, always under the magnifying glass of investigating primary sources and references that supported the problem in other contexts, but perhaps with similar characteristics, so that the scientific rigour of the publications is verified.

As for the quantitative methodological design, pre-experiment: case study with a single measurement, it can be determined that it was useful because the group control was minimal and helped to have a first approach to the phenomenon. However, it can be suggested for other research that the result is generalisable, i.e., the research could be carried out at other levels such as primary, secondary or upper secondary.

The results, although they show that academic performance in the Institutions Incorporated to the Autonomous University of the State of Mexico did not have a negative impact on learning, it probably did cause other personal, social, communication and technological problems. The following particular results were found: 80% did distance work, and there was a high rate of dropouts 20%. The most used platform was Google classroom. The main means of communication was Facebook, Zoom and WhatsApp. 70% of the respondents considered academic performance to be average and the rest low. 90% of the teachers need to develop digital competences. 95% see access to technology as an opportunity to achieve learning.

The originality of this study does not remain unsaid because to date, not much has been published on the subject. Therefore, it is a research with an innovative contribution, it followed criteria of objectivity, it tried to be rigorous at the empirical level, it respected methodological procedures and it followed the steps of the scientific method. Also, one quality is that, on the basis of the method used, the results obtained are considered to have a degree of validity and reliability.

A recommendation that emerges from this study is that, although there are many issues that need to be studied further, two are identified at the moment: on the one hand, the digital skills gap between teachers at different levels of education. On the other, the effect of socialisation in virtual learning environments.

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