International Journal of Social Sciences: Current and Future Research Trends

(IJSSCFRT)

ISSN (Print), ISSN (Online)

© International Scientific Research and Researchers Association

https://ijsscfrtjournal.isrra.org/index.php/Social Science Journal

Environmental Factors that Affect the Academic Performance of Senior High School Students during COVID-19 Pandemic

Eric Ragpala*

Don Mariano Marcos Memorial State University, Mid La Union Campus, College of Graduate Studies, City of San Fernando, La Union 2500, Philippines

Email: ragpalaeric@gmail.com

Abstract

The COVID-19 pandemic affected several countries' educational systems, particularly on platforms for teaching and learning. One of the countries that have shifted its educational environment to an online and modular learning modality is the Philippines. As a result, several researchers conducted a study into the various factors that have been linked to student academic performance. This study focused on the environmental factors that affected senior high school student's academic performance during the COVID-19 pandemic. Thematization was employed in this study that highlighted the qualitative approaches in the determination of the environmental factors faced by the senior high school students in their online classes and their coping mechanisms. In this study, online learning experience during the COVID-19 pandemic, quality of education amidst pandemic, environmental factors, academic performance, and coping mechanisms are the themes that were developed based on the respondent's answers. This study used purposive sampling in selecting the respondents that helped the researcher focus on the students' specific traits that are of interest. The environmental factors that were found out are noise, temperature, light, and air quality in respondents' study area. The researcher also found out other factors that affect the academic performance of the respondents aside from the environmental factors mentioned, such as family, peers, teachers, online games, social media, time, internet connection, health condition, and attitude towards learning.

Keywords:	environmental	factors;	COVID-19	Pandemic;	thematization;	purposive	sampling;	qualitative
approach.								

^{*} Corresponding author.

1. Introduction

1.1 Background of the Study

The COVID-19 had infected 94 million individuals and killed 2 million people in 191 countries and territories as of January 2021 [38]. The ongoing pandemic caused by coronavirus disease 2019 (COVID-19) has forced the closure of educational institutions of all levels, including high school and university students, and has urged educators and institutions to quickly adapt teaching strategies [54]. Online learning allows students to have innovative learning experiences by providing availability, network, adaptability, and the opportunity to enhance student partnerships [58]. And as the number of people using online learning grows, it is crucial to figure out how students may use learning procedures to achieve academic progress in an online setting [58]. The learning environment is one of the factors that influence academic performance [31]. A child's development and advancement are aided by a favorable environment, and children thrive in a calm and welcoming environment, however, it was noted that schools located near noisy urban streets are linked to poor mental focus and low student performance [55]. For quite some time, virtual learning, commonly known as online learning or remote learning, has been changing the face of education, and as a result of the COVID-19 pandemic, it is quickly becoming a fundamental part of, and a standard tool, in the broader realm of higher education [36]. Based on the statistics of UNESCO, the COVID-19 upsurge has affected around 1.3 billion school students at all levels from 186 countries as of April 28, 2020, and higher education has embraced technological change in all aspects, with universities around the world shifting to online platforms [69]. The best strategy to ensure the character of instruction and plan for its future has become a significant concern in basic and higher education [35]. A research study investigated the effects of COVID-19 confinement on the autonomous learning performance of students in higher education at the Universidad Autónoma de Madrid [32]. The research studies the impact of Coronavirus on student academic performance [32]. The study involved 458 students divided into two groups: the control group and the experiment group [32]. The students in the trial group who accepted online classes while in COVID-19 confinement had a significant positive impact on their academic performance, improving students' learning procedures to more continuous practice, enhancing their efficiency [32]. Administrative challenges, social contact, academic skills, technical skills, learner motivation, time and support for studies, technical problems, expense, and internet connection are all obstacles to online learning [53]. When students consider their learning environment to be positive and encouraging, they learn more effectively [16]. Environmental factors have been found in studies to have a significant impact on an individual's physical and psychological capacity [14]. The goal of this study is to find out the environmental factors that affect the academic performance of senior high school during the COVID-19 pandemic.

1.2 Theoretical Framework of the Study

This study is predominantly focused on the environmental factors that affect the academic performance of senior high school students during the COVID-19 pandemic. From that given, this research used a theoretical construct devising three theories related to the topic:

a.) Albert Bandura's Social Cognitive Theory (1977)

In social cognitive theory, information is stored in the schema. As new information is internalized, it is compared with existing data and knowledge [4]. The schemas are then restructured to accommodate new information, and cognitive patterns are changed as a result [4]. Sensory input is stored for several seconds, and the information disappears unless it is deemed necessary [4]. If considered important, the information will be stored in short-term memory, and if the data continues to be necessary, it will be moved into long-term memory [4]. Observational learning, according to psychologists like Albert Bandura, allows a young infant to observe and replicate the activities of others, resulting in decision-making abilities and development [45]. The authors in [48] noted that this theory seeks to explain how students' learning and behavior are influenced by both environmental and cognitive variables [6].

b.) Behavioral Learning Theory by John Watson (1913)

The behavioral learning theory, sometimes known as behaviorism, is a popular notion that focuses on how students learn [78]. All behaviors are taught through interaction with the environment, as per behaviorism [78]. According to this learning theory, behaviors are acquired from their environment, and innate or inherited characteristics have very little influence on behavior [78]. The student does not operate freely in the environment; rather, environmental circumstances regulate the student's behavior, preventing the student from controlling his or her learning or the time it takes to attain it [39]. In addition, according to behaviorism, also known as behavioral psychology, all behaviors are taught by interaction with the environment through a process called conditioning, and as an outcome, behavior is reduced to a reaction to environmental stimuli [39]. Only observable stimulus-response behaviors are of interest to behaviorists, as they can be researched in a systematic and observable way [47].

c.) Coping Theory: Focus-oriented theory by Lazarus and Folkman (1984)

The authors in [42] came up with the term coping to describe a person's cognitive and behavioral efforts to manage stress, which may be divided into two categories: emotion-focused coping and problem-focused coping [29]. Coping, rather than being an individual attribute, is viewed as a process [61]. According to the author in [13], there are numerous approaches to dealing with difficult circumstances. The conscious and unconscious attempts we make to solve problems and minimize stress are referred to as coping [13]. It's the mind's built-in troubleshooting program, which seeks to get it back to its best working state [13]. The authors in [43] established the transactional model of stress and coping, which defined coping as a process including both cognitive and behavioral reactions that individuals utilize in an attempt to mitigate internal and/or external stressors that surpass their reserves [18].

1.3 Statement of the Problem

This study determined the environmental factors in the academic performance of senior high school students during the COVID-19 pandemic. Particularly, it aimed to address the following problems:

a. What are the environmental factors that affect the academic performance of senior high school students during the COVID-19 pandemic?

- b. How the environmental factors affect the academic performance of senior high school students?
- c. What are the coping mechanisms in the environmental factors that affect the academic performance of senior high school students during the COVID-19 pandemic?

2. Methods

Thematic analysis was used in the study. Thematic analysis is a versatile data analysis approach used by qualitative researchers to derive themes from interview data [67]. Since there is no specific research design linked with thematic analysis, it can be used for a variety of purposes, including case studies, phenomenology, general qualitative, and narrative inquiry, to mention a few [67]. Also, because procedures are simple to follow but rigorous enough to create relevant discoveries from the data, this data analysis approach is ideal for both novice and professional qualitative researchers [67]. The respondents for the study were grade 11 senior high school students in synchronous classes in a private school in the Province of La Union, Philippines. A letter of approval was sent to the school principal before the researcher began collecting the data. The total number of students chosen by the researcher was 30 senior high school students. The respondents were selected using the purposive sampling method to identify the environmental factors that affect senior high school student's academic performance during the COVID-19 pandemic. This method benefited in the selection of responders who matched the study's goals. This allowed for legitimate decision-making and the selection of qualified respondents for the study's prime purpose. According to the criteria, the researcher gathered the information needed for the study through a web-based questionnaire created with Google Forms. Following that, the respondents provided their responses to the study. All data collection strategies were carried out online via email, and the researcher used Facebook Messenger as a second option. All information was gathered in full confidentiality, and respondents were free to withdraw at any time. Aside from that, no personal data photographs or video clips were revealed and exposed. Following the interview, the researcher continued to analyze and interpret the data. Furthermore, the researcher identified the themes and subsequent names by providing a detailed explanation that aided him in defining them based on the data summary's content and significance. In the final stage, the researcher began to write a comprehensive report outlining the findings and interpretation of the data collected.

3. Results

The researcher had sufficient information to proceed with the study after distributing the questionnaire and gathering information from the respondents. This chapter displays the data and information gathered from an online questionnaire administered, analyzed, and categorized by the researcher to answer the research questions.

3.1 Online Learning Experience during the COVID-19 Pandemic

The need for more flexible learning opportunities has expanded, and distance learning has emerged as the most viable alternative for the Philippines' education system to continue, and schools have changed to a remote learning method in which students can study at their own pace without having to attend lectures [50]. From the classroom to Zoom application, from personal to virtual, and from seminars to webinars, online learning has

become a pedagogical transition from traditional methods to current approaches to teaching-learning [12]. According to the author in [22], COVID-19 has markedly transformed the way global education is being delivered, with millions of students affected by educational institution closures because of the COVID-19 pandemic, resulting in the largest online shift in the history of education. The author also added that universities had to quickly transition to virtual and digital strategies as a result of the unexpected transition away from classrooms in many parts of the world, and many predict that the use of online distance learning will continue beyond the pandemic [22]. According to the respondents' experience with online classes during the COVID-19 pandemic, most of them said they managed to stay in their bedrooms and living rooms to conduct their classes online using their iPads, but the majority use mobile phones, laptops, and personal computers. In addition, they mentioned that unstable internet connections as the most significant challenge affecting their learning process through online classes even most of them have qualified internet providers like Converge and PLDT. Most of them share connections and data with family members, which is one of the reasons their connections are unstable. According to Asianet Broadband, when numerous devices are connected to the same internet link, internet bandwidth can be compromised, resulting in slow performance as each device receives a lesser bandwidth share [5]. Some of them have concerns regarding the bandwidth access and the quality of the device they use during synchronous classes that they think contribute to their lessons' understanding and comprehension level, affecting their academic performance. Based on the authors in [30], the degree to which students feel comfortable utilizing the internet and their overall experience with the online experience are related. Most of the respondents answered that conducting online classes is the most appropriate, accessible, and convenient method of delivering education during these pandemic times. They stated that using online classes as a formal education platform during the COVID-19 pandemic is a huge help to everyone, especially to students. In their personal view, it is an excellent idea for educational institutions to establish this online learning method for teachers to teach and impart their knowledge to their students even though they are in-home setups during the global crisis. Almost all institutions conducted and implemented online classes during the COVID 19 pandemic, using a variety of platforms such as Zoom, WhatsApp, and Google Classroom [1]. Moreover, some respondents said that they have difficulty catching up to every topic of their subjects since they cannot always attend Zoom meetings due to internet issues, but they still consider online classes to be an effective learning platform during a pandemic because they are more confident in their health safety. Under the current circumstances, the authors in [12] revealed that students perceived online education to be a feasible choice. According to the authors in [59], by extending educational options, changing student groups, and stimulating new pedagogical methods, online education can alter the educational system. Some respondents still prefer faceto-face classes and stated that online classes have been the most difficult for both students and teachers because they believe communications will be more effective and accessible in a classroom setting. As a result of the impacts caused by distance learning: less engagement with the school environment and classmates, and increased interaction with technology, students consider online courses ineffective [28].

3.2 Quality of Education amidst Pandemic

The COVID-19 pandemic has demonstrated that the field of education is filled with innovative ideas that are striving to get out every day to reach their intended audience: parents, students, and teachers [60]. According to some respondents, they thought that taking classes online was a good idea since they can still see each other

through synchronous classes even they are in the middle of a pandemic, but as time went on, they realized that online classes were draining them. They have indicated that they have struggled greatly and are unmotivated to participate in school activities; their vision has become blurry, and suffer headaches since they stay almost 5 hours a day to attend their synchronous classes and another 3-5 hours to study, review, and finished the given activities posted in their Google Classroom. On the other hand, some respondents are enjoying online classes and are not experiencing any physical discomfort. For years, the American Academy of Pediatrics has recommended that children and teenagers have no more than two hours of screen time each day and there is no screen time for children under the age of two, however, these standards have been revised to match the reality of today's digital environment, as stated by the author in [51]. Moreover, few of the respondents have realized that online class is challenging; despite their teachers' best efforts, they are not learning nearly as much as they should. They said that online class is not appropriate or practicable, particularly for those strands that require actual or physical practices and activities within the school. Traditional and online education, according to the respondents, differ in terms of learning quality. They noticed that the activities they were provided in traditional education were more substantial than the ones they were given in online education. In addition, in a physical classroom versus a virtual one, teachers are more engaged in teaching, this could be because they have more freedom to talk and teach what they want, according to them. They also stated that their connections with their classmates and teachers are considerably better than in online education. They also observed that some students in online classes are only submitting activities to pass the class rather than learning for something. At the 0.05 level of significance, the author in [63] stated that there is a significant difference between the mean performance of students taught in an ideal learning environment and that of students taught in a dull learning setting. On the other hand, some respondents stated that their online activities are flexible and manageable and that their teachers are very considerate when it comes to the submission of their activities. They also mentioned that taking an online class is a good way for them to learn during the COVID-19 pandemic. The students' knowledge gain and performance as a result of e-learning were found to be similar to that of face-toface learning [80]. Goodwin University stated that a recent study shows that more than 75% of academic leaders believe that online education is on par with or better than on-campus education, and nearly 70% of chief academic officers agree that online learning is an important part of long-term instructional strategies [34]. In addition, approximately one out of every four students today believes that online classes help them study better, and this means that three out of four students believe they perform better in a traditional classroom [34]. The authors in [9] showed that in the context of the COVID-19 pandemic, the abrupt and forced transfer from traditional to online education had negative effects on university and high school student's readiness [17, 23]. The authors in [65] investigated students' experiences during the COVID-19 pandemic. In their findings, students valued the usage of online learning during the pandemic, on the other hand, half of them thought that traditional classroom instruction was more effective than using an online learning platform [65]. Students have mixed feelings about online learning according to the authors in [12].

3.3 Environmental Factors

The researchers in [8] noted that internal factors such as teacher performance have a significant impact on teaching and learning quality, as teachers can influence their students' achievements. Many researchers have suggested that teacher quality is an important factor in improving student performance, and high teacher

incentives are associated with better student performance and external factors, namely the environment factor [24]. It has an impact on student performance since most recent researches have found that the relationship between teacher knowledge and student learning has linear effects and that external factors are involved, according to the authors in [2]. The majority of the respondents stated that in traditional education, noise, temperature, and light can be controlled, resulting in better learning. However, in online education, particularly in their study room, some have stated that noise, insufficient light, inappropriate temperature, and bad air quality are all makeup and confounding factors in the disruption of their learning process. Environmental influence has received little or no attention in educational discourse and discussion, according to the author in [14], because it is not recognized as a component that affects academic performance in secondary schools. During the last decade, multiple studies have revealed a relationship between the environment and student academic performance [14]. Since enhancing academic performance is at the heart of the educational mission, and it is important to analyze the environmental factors that influence students' academic performance, as well as the measures that can assist them to improve and make recommendations[14]. According to some respondents, noise harms their learning process and academic performance. They procrastinate their outputs due to noises from vehicles, animals, neighbors, family members, and devices, and their concentration during synchronous classes is disrupted. They said that these noises interfere their communication with their teachers and classmates. Previous research has shown that noise has detrimental effects on children's performance at school, including reduced memory, motivation, and reading ability [64]. According to a study conducted by the authors in [19], students' performance in the low noise condition was much better than in the high noise condition. Classroom noise levels must be kept under precise limitations for effective education and instruction [68]. A field study was done at universities in the Netherlands to obtain further insight into the assessment of noise in an open-plan learning environment, and it was found out that noise bothered more than one-third of the students based on the result gathered by the authors in [7]. Furthermore, some respondents also considered light as one of the environmental factors that affect their academic performance. They said that the light in their study room is not enough to concentrate on their studies. The researchers in [71] included in their study that according to the authors in [56], room lighting is also an essential component for students' academic performance because light has a direct association with students' growth and also causes discomfort and poor academic performance if the light is poor. In addition, in the study conducted by the Heschong Mahone Group, students exposed to high amounts of natural light scored up to 18% higher on tests than students exposed to low levels of natural light [37]. The authors in [52] stated that lighting has a profound impact on many aspects of human function, including vision, circadian rhythms, mood, and cognition. They also added that its unspoken effects on learning and classroom achievement cannot be overlooked, and several studies have looked into how lighting quality and color can affect students' visual skills as well as academic performance [52]. And also, based on the findings of the author in [62], it is essential to increase lighting in learning environments to improve student's learning performance and stimulate them to learn more. The author also added that noise, light, color, and temperature are all basic physical factors in the learning environment that have an impact on learning [62]. Some respondents also said that their study room is not well ventilated. The temperature is also one environmental factor identified by the respondents. The researcher in [3] revealed that according to a study conducted by the authors in [33], higher air temperatures during the school year have been shown to significantly affect performance on the PSAT, an exam that primarily measures reading and math ability. The author in [57] stated

in his study that it has been proven that temperature has a significant impact on student performance, and it all starts with the mood. The effect of temperature on mood reduces memory and cognitive ability, which impairs learning ability [57]. In addition, students perform best in controlled conditions, according to data collected by the University of Scranton, with exam scores averaging in the 90th percentile, when it was too hot, scores were in the low 70s, and when it was too cold, they averaged in the mid-70s [57]. According to the author in [46], students perform best when the room temperature is 22 degrees Celsius. Temperature and several markers of learning outcomes were discovered to have a relationship [75]. Furthermore, some of the respondents believe that smoke from their home, neighborhood, road, or bad air quality condition, in general, is preventing them from finishing their school tasks and while attending synchronous classes, as they must wait for an hour to purify their study area. And this is one of the environmental factors mentioned by the respondents. According to some respondents, various contaminants such as smoke from cigarettes, vehicles, wood-burning stoves, and foul odors from wastes have an impact on the air quality in their study area. Pollution from outside sources is not the only problem; insufficient ventilation and air circulation inside classrooms also have an impact on learning [44]. When air is allowed to stagnate, carbon dioxide levels rise, and fumes from carpets and paint are unable to escape, affecting cognition directly [44]. Also, according to the authors in [71], temperature, lighting, and noise exert a significant direct influence on university students' academic performance and have an impact on the sustainability of university students as stated in their findings. The author in [11] stated that a suitable learning environment relieves students of physical distress, makes it easier for students to concentrate on schoolwork, and encourages students to think logically. Also, students in a good learning environment obtain greater achievement, while students in a poor learning environment have dull colors, inadequate lighting, noisy surroundings, and insufficient air ventilation [11]. Furthermore, students in poor learning environments face several physical challenges, and that only a small number of students with strong tenacity and self-discipline can conquer all of the challenges posed by such dangerous environments [11]. The author in [73] included in his study that B.F. Skinner and Albert Bandura made significant contributions to the environmentalist view of development. Environmentalists think that a child's environment influences his or her learning and behavior and that human behavior, development, and learning are all considered reactions to the environment [73]. In addition, this position is held by many families, schools, and educators, who believe that young children develop and gain new knowledge through reacting to their surroundings [73]. Some respondents, on the other hand, did not mention any environmental factors that influence their academic performance. Some respondents have also highlighted a few learning obstacles, such as environmental factors, but believe they can still perform and achieve better in their academics despite being in an online class. When a behavior is reinforced, it attracts attention, according to behavioral learning theory; classical conditioning provides stimulus control with caution, whereas operant conditioning necessitates significant stimulation [15]. Aside from environmental factors, practically almost all of the respondents have indicated a variety of learning factors or combinations of learning factors that are affecting their learning during the COVID-19 pandemic. The authors in [49] stated that students believe that online learning enabled them to complete their studies while the pandemic was occurring. Some researches included in this study support the relationship between environmental factors and students' academic performance. Based on the answers provided by the respondents, the environmental factors in their study area were determined to be noise, light, temperature, and air quality.

3.4 Academic Performance

The University of Otago stated that assessment is intended to help students improve their learning and academic performance, and assessment in which students' performance is rated and marks are added together to determine a paper's final grade and another component of the students' course [70]. They also added that formative assessment test is one crucial part to consider in measuring the performance of the students [70]. According to the authors in [79], academic achievement is measured with grades and the general percentage average. Few of the respondents have said that their assessment scores in their subjects have been affected by the said environmental factors they faced during their online classes. They also added that students are suffering now and cannot wait for the pandemic to go back to normal life and go to school to learn properly. Furthermore, they stated that they cannot afford to adjust to these environmental factors. They also said that most students would be more focused and involved in learning if they were in a classroom setting, and advocate the face-toface option since it encourages students to be more involved, active in the classroom, and to learn rather than merely comply. They also pointed out that spending hours online is the equivalent of spending hours in school, however, when it comes to grades, especially good academic performance, they prefer face-to-face learning since, in their opinion, it determines how well they grasped the teachings and allows teachers to see how hard they worked in their studies. On the other hand, some respondents claimed that even when confronted with environmental factors, they still want online learning because there is no other way to learn in a pandemic. They also added that being exposed to different learning factors does not affect their academic performance at all. Overall, according to respondents' answers, they are motivated and others are not when it comes to learning online during the COVID-19 pandemic. The author in [66] stated that social learning theory suggests that motivation might come from being rewarded or punished because when we are in a similar scenario, we will mimic or avoid the conduct depending on our previous experience. Motivation is such a key part of academic learning and achievement [21]. According to the author in [41], the social cognitive theory addresses the unique methods in which people acquire and sustain behavior, as well as the social setting in which they perform it, and it looks at a person's past experiences to predict whether they would engage in specific behaviors. In addition, those past experiences have an impact on reinforcing, expectations, and expectancies, all of which influence whether or not a person would engage in a certain behavior and why they do so [41]. Lastly, according to the author in [27], the social cognitive theory has been utilized in education to better understand classroom learning, student motivation, and the academic performance of the students.

3.5 Coping Mechanisms

The authors in [10] revealed that coping mechanisms are the behaviors, cognitive functions, or emotional reactions that one employs when confronted with a stressful situation [42]. Going to the beach, riding a bike, and performing their hobbies are some of the respondents' coping mechanisms. Others described their coping mechanisms as watching dramas and movies on television, sleeping, viewing on various social media sites such as Facebook and YouTube, and doing chores. This is to relieve their tension and negativity caused by environmental factors that, according to them, are affecting their academic performance. To avoid anxiety and other mental health difficulties, some respondents prefer to practice time management. They are also preparing themselves to become accustomed to the aforementioned environmental factors. Furthermore, they are

attempting to reduce "negative vibes" by ensuring that their study area is free from noise, odor, poor lighting, and ventilation through room organization and cleaning. According to the author in [74], research suggests that a student's physical environment can have such an impact on them that it can impair their academic progress by up to 25%. She added that color, classroom structure, cleanliness, adequate resources, and bright lights can help students study more effectively and obtain higher grades [74]. The author also noted that, in contrast, overcrowding and a high student-to-teacher ratio often result in decreased student performance and a negative attitude [74]. The author also stated that students need 2-4 feet of private space to feel comfortable and get the most out of their educational environment [74]. Furthermore, the author mentioned that students who participate in the design of their surroundings via artwork, configuration, or participation in the physical dynamics of the classroom, feel empowered and part of a community, which can help them feel more motivated overall [74]. The authors in [25] stated in their study that coping strategies' situational uniqueness is demonstrated by the fact that they are defined as responses to a specific issue. This has led to the adoption of a flexible coping approach in recent years, based on the assumption that a single individual may integrate different coping mechanisms, utilizing one or the other depending on the specific situation they are facing [20, 40]. The focus-oriented state and trait theories of coping, according to Lazarus and Folkman's Coping Theory, highlight a person's internal resources and mental capacities for determining how efficiently he can change to a situation [13]. Lazarus and Folkman also added that stress coping entails a more precise process of cognitive evaluation to establish whether an individual believes he or she can properly adapt to the demands of a stressor or change [72]. Lastly, It was discovered that learning is most effective when the body, soul, and spirit are all in sync; otherwise, learning is ineffective [26].

4. Limitations and future research

Since the respondents answered online, it is not clear whether the answers given by the respondents are from their own experiences or just copied from the internet. The face-to-face interview was not conducted due to the threat of COVID-19. Given the situation, online is the most effective place to ensure the health of the respondents. The respondents were given about a week to provide their answers to the questionnaire sent by the researcher, this is to give them enough time to determine the environmental factors present in their study area. The respondents are all grade 11 senior high school students that were from different strands and sections. Of the collected answers, the researcher has no idea on the appearance and what was present in the study area of the respondents. Finally, as this study only included 30 respondents from Grade 11 senior high students, some of the results may not apply to other Grades 11 and 12 senior high school students. Therefore, further research with a qualitative approach is needed to determine whether these results will generalize to students' academic performance during the COVID-19 pandemic. This could contribute to additional in-depth analysis, results and accentuate the dynamic and comprehensive aspects of the environmental factors that affect the students' academic performance.

5. Conclusions and Implications

This study determined the environmental factors that affect academic performance and the coping mechanisms of senior high school students during the COVID-19 pandemic. The conclusions were drawn based on the

answers provided by the respondents. Depending on their home layout, connectivity, and the people around them, students are vulnerable to a variety of environmental distractions, which can be physical or emotional. The researcher found out that the student's academic performance is affected by the environmental factors that students faced in their online classes during the COVID-19 pandemic. The environmental factors that were determined are noise, light, temperature, and air quality in respondents' study area. The students' coping mechanisms vary from person to person and are dependent on their circumstances. As the implications of the study, based on the results, it is essential to consider that student behavior is a significant predictor of the learning environment. Teachers will be more aware that their student's learning environment and attitudes toward online learning can have an impact on their academic performance. Consequently, teachers will be guided to seek out more appropriate and effective teaching-learning ways for themselves and their students. This research will also inspire parents to provide holistic guidance and a favorable learning environment for their children while they are learning online. Finally, school curriculum developers can gain additional insights into how to improve online classes by considering the students' learning environment, which will reduce negative and increase positive emotions toward learning, resulting in improved academic performance of the students.

Acknowledgments

The researcher wishes to thank his professors who made this research work possible. They instructed him well on how to conduct this study and convey the findings as plainly as possible. The researcher would also like to express his gratitude to his family for their patience, love, and support throughout his life. Also, he would like to thank God, for letting him through all the difficulties. Finally, he expresses gratitude to everyone who has helped him complete this research study, whether directly or indirectly.

References

- [1] M. Adnan. (2020, Jun.). "Online Learning amid the COVID-19 Pandemic: Students' Perspectives." Journal of Pedagogical Sociology and Psychology. [Online]. Vol 1, pp. 45–51. Available: https://eric.ed.gov/?id=ED606496. [Mar. 20, 2021].
- [2] S. A. Agathangelou, C. Y. Charalambous, and M. Koutselini. (2016, Jul.). "Reconsidering the contribution of teacher knowledge to student learning: Linear or curvilinear effects.," Teaching and Teacher Education. [Online]. Volume 57 ,Pages 125-138. Available: https://www.sciencedirect.com/science/article/abs/pii/S0742051X16300452. [Apr. 3, 2021].
- [3] Sigurd Lerkerød Alnes. "Higher temperatures impact our ability to learn." Airthings. Internet: https://www.airthings.com/resources/higher-temperatures-impact-ability-learn, Jun. 5, 2018. [May. 5, 2021].
- [4] Angelo State University. "1.3 Theories of Learning and the Online Environment". Internet: https://www.angelo.edu/faculty-and-staff/instructional-design/online-teaching/section_13.php, 2021 [Mar. 11, 2021].

- [5] Asianet Broadband. "Do Multiple Devices Affect Internet speed?" Internet https://asianetbroadband.in/do-multiple-devices-affect-internet-speed/, Nov. 19, 2019. [May 6, 2021].
- [6] A. Bandura. "Social learning theory." Englewood Cliffs. NJ: Prentice-Hall, 1977.
- [7] P. E. Braat-Eggen, A. V. Heijst, M. Hornikx, and A. Kohlrausch. (2017, Apr.). "Noise disturbance in open-plan study environments: a field study on noise sources, student tasks and room acoustic parameters." Ergonomics. [Online]. vol. 60, no. 9, pp. 1297–1314. Available: https://www.tandfonline.com/doi/citedby/10.1080/00140139.2017.1306631?scroll=top&needAccess=tr ue& [Mar. 21, 2021].
- [8] Buchari, & Matondang, Nazaruddin. (2017, Jun.). "The impact of noise level on students' learning performance at state elementary school in Medan." AIP Conference Proceedings. [Online]. Available: https://doi.org/10.1063/1.4985498. [Mar. 15, 2021].
- [9] G. I. Butnaru, V. Niţă, A. Anichiti, and G. Brînză. (2021, May). "The Effectiveness of Online Education during Covid 19 Pandemic-A Comparative Analysis between the Perceptions of Academic Students and High School Students from Romania," Sustainability. [Online]. 13(9), 5311. Available: https://www.mdpi.com/2071-1050/13/9/5311. [May 20, 2021].
- [10] D. Carr and H. Mooney. (2021, Jan.). "Bereavement in later life," Handbook of Aging and the Social Sciences (Ninth Edition)." Academic Press. [Online]. Pages 239-254, Available: https://www.sciencedirect.com/science/article/pii/B9780128159705000152. [Mar. 8, 2021].
- [11] T. C. Chan. "Environmental Impact on Student Learning." Valdosta State Coll. GA. School of Education, (1996).
- [12] P. Chakraborty, P. Mittal, M. S. Gupta, S. Yadav, and A. Arora. (2020, Dec.). "Opinion of students on online education during the COVID-19 pandemic." Wiley Online Library. [Online]. Available: https://onlinelibrary.wiley.com/doi/10.1002/hbe2.240. [Apr. 10, 2021].
- [13] Madhuleena Roy Chowdhury. "What is Coping Theory?." PositivePsychology.com. Internet: https://positivepsychology.com/coping-theory/, May 25, 2021. [Apr. 30, 2021].
- [14] Orlu Chukwuemeka. (2013). "Environmental Influence on Academic Performance of Secondary School Students in Port Harcourt Local Government Area of Rivers State.' Journal of Economics and Sustainable Development. [Online]. Vol.4, No.12, Available: https://www.iiste.org/Journals/index.php/JEDS/article/view/6857. [Feb. 1, 2021].
- [15] Mehmet Ali Cicekci & Fatma Sadik. (2019, Oct.). "Teachers' and Students' Opinions About Students' Attention Problems During the Lesson". Journal of Education and Learning. [Online]. Vol. 8, No. 6. Available: https://doi.org/10.5539/jel.v8n6p15. [Apr. 11, 2021].

- [16] J.P. Dorman, J.M. Aldridge,& B.J. Fraser. (2006, Jan.). "Using students' assessment of classroom environment to develop a typology of secondary school classrooms." International Education Journal, [Online]. 7(7), 906–915. Available: https://www.researchgate.net/publication/242144046_Using_students'_assessment_of_classroom_envir onment_to_develop_a_typology_of_secondary_school_classrooms. [Feb. 26, 2021].
- [17] E. Dorn, B. Hancock, J. Sarakatsannis, and E. Viruleg. "COVID-19 and student learning in the United States: The hurt could last a lifetime," McKinsey & Company. Internet: https://www.mckinsey.com/industries/public-and-social-sector/our-insights/covid-19-and-student-learning-in-the-united-states-the-hurt-could-last-a-lifetime, Jun. 1, 2021. [June 25, 2021].
- [18] Ruben J. Echemendia, Frank M. Webbe, Victoria C. Merritt, Gabriela González. (2019). "9 Assessment in sports: psychological and neuropsychological approaches." Academic Press. [Online]. Pages 275-304. Available: https://doi.org/10.1016/B978-0-12-802203-0.00009-2. [Mar. 4, 2021].
- [19] E.M. Edmonds & L.R. Smith. (1984). "The Effects of Classroom Noise on Student Performance." [Online]. Available: https://eric.ed.gov/?id=ED244381. [May 12, 2021].
- [20] C. Eisenbarth. "Coping profiles and psychological distress: a cluster analysis." N. Am. J. Psychol. 14, 485–496, 2012.
- [21] A.J. Elliott, & C.S. Dweck. "Handbook of competence and motivation". New York: Guilford Press. 2005.
- [22] Ghada Refaat El Said, (2020, Feb.). "How Did the COVID-19 Pandemic Affect Higher Education Learning Experience? An Empirical Investigation of Learners Academic Performance at a University in a Developing Country." Advances in Human-Computer Interaction. [Online]. Vol. 2021. Available: https://www.hindawi.com/journals/ahci/2021/6649524/. [Apr. 21, 2021].
- [23] D. Farrington. "Article The consequences of COVID-19 on the education system: the legal perspective." Council of Europe. Internet: https://www.coe.int/en/web/education/article-the-consequences-of-covid-19-on-the-education-system-the-legal-perspective, Jun. 20, 2020. [Mar. 17, 2021].
- [24] H. Feng and J. Li. "Head Teachers, Peer Effects, and Student Achievement." China: University Huangzhou (Journal), 2016.
- [25] C. Freire, M. del M. Ferradás, B. Regueiro, S. Rodríguez, A. Valle, and J. C. Núñez. (2020, May). "Coping Strategies and Self-Efficacy in University Students: A Person-Centered Approach" Frontiers. [Online]. Available: https://www.frontiersin.org/article/10.3389/fpsyg.2020.00841. [Mar. 17, 2021].
- [26] A. C. Frenzel, R. Pekrun, and T. Goetz. (2007, Oct.). "Perceived learning environment and students'

- emotional experiences: A multilevel analysis of mathematics classrooms," Learning and Instruction. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0959475207000928. [May 16, 2021].
- [27] B. Frey. (2018, Feb.). "Evaluation" in The SAGE encyclopedia of educational research, measurement, and evaluation." SAGE Publications, Inc. [Online]. Vols. 1-4. Available: http://dx.doi.org/10.4135/9781506326139.n240 [Mar. 16, 2021].
- [28] A. Gabor. (2020, Mar.). "Schools Aren't Ready for Online Learning," BloombergQuint. [Online]. Available: https://www.bloombergquint.com/gadfly/coronavirus-shutdowns-highlight-weakness-of-online-u-s-schooling. [Mar. 10, 2021].
- [29] C. Garcia. (2010, Jun.). "Conceptualization and measurement of coping during adolescence: a review of the literature," Journal of nursing scholarship: an official publication of Sigma Theta Tau International Honor Society of Nursing. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2904627/. [Mar. 1, 2021].
- [30] S. Ghaderizefreh & M. L. Hoover. (2018, Sep.). "Student Satisfaction with Online Learning in a Blended Course." Int. J. Digit. Soc. [Online]. Available: https://www.semanticscholar.org/paper/Student-Satisfaction-with-Online-Learning-in-a-Ghaderizefreh-Hoover/35269c6d69f78da7777a4ba02f4007bff34322dc. [Feb. 28, 2021].
- [31] Abdolreza Gilavand. (2016, Aug.). "Investigating the Impact of Environmental Factors on Learning and Academic Achievement of Elementary Students: Review". International Journal of Medical Research & Health Sciences. [Online]. 5, 7S:360-369. Available: https://www.ijmrhs.com/abstract/investigating-the-impact-of-environmental-factors-on-learning-and-academic-achievement-of-elementary-students-review-5270.html. [Apr. 2, 2021].
- [32] T. Gonzalez, M. A. de la Rubia, K. P. Hincz, M. Comas-Lopez, L. Subirats, S. Fort, and G. M. Sacha. (2020, Oct.). "Influence of COVID-19 confinement on students' performance in higher education." PloS one. [Online]. 15(10): e0239490. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7546684/. [Feb. 242021].
- [33] J. Goodman, M. Hurwitz, J. Park, and J. Smith. (2018, May). "Heat and Learning," SSRN.
- [Online]. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3180724. [Jun. 10, 2021].
- [34] Goodwin University. "Online Classes vs. Traditional Classes." Internet: https://www.goodwin.edu/enews/online-classes-vs-traditional-classes/, Jun. 22, 2020. [Apr. 10, 2021].
- [35] R.H. Huang, D.J. Liu, J. Guo, J.F. Yang, J.H. Zhao, X.F. Wei, S. Knyazeva, M. Li, R.X. Zhuang, C.K. Looi, & T.W. Chang. (2020, Apr.). "Guidance on Flexible Learning during Campus Closures: Ensuring

- course quality of higher education in COVID-19 outbreak." Beijing: Smart Learning Institute of Beijing Normal University. [Online]. Available: https://iite.unesco.org/wp-content/uploads/2020/05/Guidance-on-Flexible-Learning-during-Campus-Closures-in-COVID-19-outbreak-SLIBNU-V1.2 0508.pdf. [Feb. 24, 2021].
- [36] IngressQR. "How Virtual Learning Can Affect Academic Performance In 2020." Internet: https://www.ingresqr.com/virtual-learning-affect-academic-performance/, May 7, 2020. [May 25, 2021].
- [37] Innova. "How Important is Lighting in a Classroom?". Innova Design Group. Internet: https://www.innovadesigngroup.co.uk/news/how-important-is-lighting-in-a-classroom/, Dec. 5, 2014. [Jun. 5, 2021].
- [38] John Hopkins University. Global map. Internet: https://coronavirus.jhu.edu/, 2020. [Apr. 21, 2021].
- [39] T. Karageorgakis. "Constructivism And Behaviorism In Designing Online Learning Programs." Internet: https://elearningindustry.com/designing-online-learning-programs-constructivism-behaviorism, May 27, 2018. [Mar.2, 2021].
- [40] D. Kobylińska and P. Kusev. 2019, Feb.). "Flexible Emotion Regulation: How Situational Demands and Individual Differences Influence the Effectiveness of Regulatory Strategies," Frontiers. Internet https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00072/full. [March. 20, 2021].
- [41] W.W. LaMorte. "Behavioral Change Models," The Social Cognitive Theory. Internet: https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/behavioralchangetheories5.html, Sep. 9, 2019. [Mar. 8, 2021].
- [42] R.S. Lazarus & S. Folkman S. "Stress, appraisal, and coping." New York: Springer; 1984.
- [43] R.S Lazarus & S. Folkman. (1987, Sep.). "Transactional theory and research on emotions and coping". European Journal of Personality. [Online]. 1(3, Spec Issue), 141–169. Available: https://doi.org/10.1002/per.2410010304. [Feb. 28, 2021].
- [44] Learning Liftoff. "Studies Find School Air Pollution Affects Student Performance and Behavior." Internet: https://www.learningliftoff.com/school-air-pollution-affects-student-performance-and-behavior, Apr. 17, 2019. [Mar. 2, 2021].
- [45] Sarah Lipoff. "Environmental learning theory: Stuff vs. your child. Life with Child". Internet: http://sarahlipoff.com/2011/12/05/environmental-learning-theory-stuff-vs-your-child/, Dec. 12, 2011. [Mar. 12, 2021].

- [46] J. McGuire. "Why a classroom that's too warm tires you out, and the best study temperature." South China Morning Post. Internet: https://www.scmp.com/lifestyle/families/article/1928625/why-classroom-thats-too-warm-tires-you-out-and-best-study, Jul. 20, 2018. [Apr. 5, 2021].
- [47] S. Mcleod. "Behaviorist Approach". SimplyPsychology.org, Internet: https://www.simplypsychology.org/behaviorism.html, Updated 2020. [Feb. 28, 2021].
- [48] S. Mcleod. "Albert Bandura's Social Learning Theory". SimplyPsychology.org. Internet: https://www.simplypsychology.org/bandura.html. Updated 2016. [Feb. 28, 2021].
- [49] Lokanath Mishra, Tushar Gupta, and Abha Shreeb. (2020, Sep.). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. International Journal of Educational Research Open in press. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7832355/. [Apr. 18, 2021].
- [50] Moneymax. "Distance Learning in the Philippines: Is It the Best Method for Your Child?" Internet: https://www.moneymax.ph/lifestyle/articles/distance-learning-philippines, Sep. 2, 2021 [Sep. 10, 2021].
- [51] A. Morin. "How Much Should You Limit Kids' Screen Time and Electronics Use? The American Academy of Pediatrics' Screen Time Guidelines." Verywell Family. Internet: https://www.verywellfamily.com/american-academy-pediatrics-screen-time-guidelines-1094883. Mar. 26, 2021. [Feb. 28, 2021].
- [52] M.S. Mott, D.H. Robinson, A. Walden, J. Burnette, A.S. Rutherford. (2012, Apr). "Illuminating the Effects of Dynamic Lighting on Student Learning." SAGE Open. [Online]. Available: https://journals.sagepub.com/doi/full/10.1177/2158244012445585. [Jun. 1, 2021].
- [53] Lin Y. Muilenburg & Zane L. Berge. (2017, Jan.). "Student barriers to online learning: a factor analytic study." Taylor & Francis. [Online]. 26(1):29–48. Available: https://doi.org/10.1080/01587910500081269. [Apr. 21, 2021].
- [54] Nieto-Escamez Francisco Antonio, Roldán-Tapia María Dolores. (2021, May). "Gamification as Online Teaching Strategy During COVID-19: A Mini-Review". Frontiers. [Online]. Available: https://www.frontiersin.org/article/10.3389/fpsyg.2021.648552
- [55] G. Onukwo. "Class note on educational psychology, postgraduate diploma in education." 2004/2005.
- [56] Iwuagwu Blessing Oselumese, Don Omoike ,Ojemhenkele Andrew. (2016, Mar.). "Environmental Influence On Students' Academic Performance In Secondary School". International Journal of Fundamental Psychology and Social Sciences. [Online]. Vol 6, No 1,pp 10-14. Available: https://docplayer.net/47257828-Environmental-influence-on-students-academic-performance-in-

- secondary-school.html. [Feb. 25, 2021].
- [57] A. Pascucci. "Does Classroom Temperature Affect Students Performance?" Sansone Air Conditioning. Internet: https://www.sansone-ac.com/ac-affect-student-performance/, Dec. 11, 2018. [Jun 12, 2021].
- [58] C. Peechapol, J. Na-Songkhla, S. Sujiva, & A. Luangsodsai. (2018, Sep.). "An Exploration of Factors Influencing Self-Efficacy in Online Learning: A Systematic Review." International Journal of Emerging Technologies in Learning (iJET). [Online]. 13. 64. Available: https://www.researchgate.net/publication/327967411_An_Exploration_of_Factors_Influencing_Self-Efficacy_in_Online_Learning_A_Systematic_Review. [Feb. 5, 2021].
- [59] C.A. Platt, A.N.W. Raile, & N. Yu. (2014, Jan.). Virtually the same? Student perceptions of the equivalence of online classes vs. face-to-face classes. Journal of Online Learning and Teaching. [Online]. 10. 489-494. Available: https://www.researchgate.net/publication/271205198_Virtually_the_same_Student_perceptions_of_the _equivalence_of_online_classes_vs_face-to-face_classes. [Mar. 7, 2021]
- [60] ProFuturo. "Spotlight on quality education for all during Covid-19.HundrED and OECD." Internet: https://profuturo.education/en/topics/spotlight-quality-education-during-covid-19-hundred-oecd/, Apr. 15, 2020. [May 7, 2021].
- [61] L. Rew. "Adolescent health A multidisciplinary approach to theory, research, and intervention". Thousand Oaks, CA: Sage. 2005. [Mar. 1, 2021].
- [62] Sanaz Ahmadpoor Samani. (2012, Dec.). "The Impact of Indoor Lighting on Students' Learning Performance in Learning Environments: A knowledge internalization perspective". International Journal of Business and Social Science. [Online]. Vol. 3 No. 24. Available: https://ijbssnet.com/journals/Vol_3_No_24_Special_Issue_December_2012/14.pdf. [Jun. 8, 2021].
- [63] Timothy Ado Shamaki. (2015). "Influence of Learning Environment on Students' Academic Achievement in Mathematics: A Case Study of Some Selected Secondary Schools in Yobe State Nigeria." Journal of Education and Practice. [Online]. Vol.6, No.34. Available: https://eric.ed.gov/?id=EJ1086080. [Jun. 4, 2021].
- [64] B. M. Shield and J. E. Dockrell. (2008, Jan.) "The effects of environmental and classroom noise on the academic attainments of primary school children," The Journal of the Acoustical Society of America. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/18177145/. [Jun. 29, 2021].
- [65] Kuldeep Singh, Shival Srivastav, Abhishek Bhardwaj, Abhinav Dixit, Sanjeev Misra. (2020, Jul.). "Medical education during the COVID-19 pandemic: a single institution experience." Indian Pediatr. [Online].57(7):678-679. Available: https://pubmed.ncbi.nlm.nih.gov/32366728/. [Apr. 6, 2021].

- [66] R. Spencer. "How to Apply Social Learning Theory for Effective E-Learning". Training Industry. Internet: https://trainingindustry.com/blog/e-learning/how-to-apply-social-learning-theory-for-effective-e-learning/. Oct. 2, 2015. [Apr. 2, 2021].
- [67] Statistics Solutions. "Thematic Analysis" Complete Dissertation by Statistics Solution." Internet: https://www.statisticssolutions.com/thematic-analysis/, June 23, 2021. [June. 25, 2021].
- Ömer Faruk Tavşanlı & Mizrap Bulunuz & Nermin Bulunuz & Yurdun Orbak & Nejla Mutlu. (2017, Jun.). "An Evaluation of Primary School Students' Views about Noise Levels in School". International Electronic Journal of Elementary Education, [Online]. 9(4), 725-740. Available: https://www.researchgate.net/publication/317973844_An_Evaluation_of_Primary_School_Students'_V iews_about_Noise_Levels_in_School. [Jun. 1, 2021].
- [69] UNESCO. "Guidance on Flexible Learning during Campus Closures: Ensuring Course Quality of Higher Education in COVID-19 Outbreak. UNESCO Institute for Information Technologies in Education." Internet: https://iite.unesco.org/publications/guidance-on-flexible-learning-during-campus-closures-ensuring-course-quality-of-higher-education-in-covid-19-outbreak/, Jun. 2, 2020. [Feb. 24, 2021].
- [70] University of Otago. "Guidelines for the Assessment of Student Performance." Internet: https://www.otago.ac.nz/administration/policies/otago078920.html, Last approved revision on Apr. 8, 2018. [Feb. 27, 2021].
- [71] A. Realyvásquez-Vargas, A. A. Maldonado-Macías, K. C. Arredondo-Soto, Y. Baez-Lopez, T. Carrillo-Gutiérrez, and G. Hernández-Escobedo. (2002, Nov.). "The Impact of Environmental Factors on Academic Performance of University Students Taking Online Classes during the COVID-19 Pandemic in Mexico." Sustainability. [Online]. vol 12, no. 21: 9194.Available: https://www.mdpi.com/2071-1050/12/21/9194. [Mar. 20, 2021].
- [72] J. Walinga. (2008). "Change Readiness: The Roles of Appraisal, Focus, and Perceived Control".

 Journal of Applied Behavioral Science. [Online]. 44(3), 315–347. Available: https://opentextbc.ca/introductiontopsychology/chapter/15-2-stress-and-coping/. [Mar. 15, 2021].
- [73] A.M. Wanjohi. (2010). "Child Development Theories." KENPRO Publications. Available: http://www.kenpro.org/papers/childhood-theory.htm. [Mar. 4, 2021].
- [74] K. Warfield. "How Surroundings Affect Students' Learning." Character Exchange. Internet: https://exchange.character.org/how-surroundings-affect-students-learning/, May 5, 2016 [Mar. 18, 2021].
- [75] Pawel Wargocki, Jose Ali Porras-Salazar, Sergio Contreras-Espinoza. (2019, Jun.). "The relationship between classroom temperature and children's performance in school". Building and Environment.

- [Online]. Vol 157,Pages 197-204. Available: https://doi.org/10.1016/j.buildenv.2019.04.046. [Apr. 8, 2021].
- [76] J.B. Watson. (1913). "Psychology as the behaviorist views it." Psychological Review, 20(2), 158–177. Available: https://doi.org/10.1037/h0074428 [March 1, 2021]
- [77] John. Watson (n.d.). "A Science Odyssey: People and Discoveries: John Watson," PBS. [Online]. Available: http://www.pbs.org/wgbh/aso/databank/entries/bhwats.html. [Mar. 2, 2021].
- [78] Western Governors University. "What Is The Behavioral Learning Theory?". Internet: https://www.wgu.edu/blog/what-behavioral-learning-theory2005.html, May 29, 2020. [Mar. 20, 2021].
- [79] York, Travis T.; Gibson, Charles; and Rankin, Susan. (2015, Mar.). "Defining and Measuring Academic Success." Practical Assessment, Research, and Evaluation. [Online]. Vol. 20, Article 5. Available: https://doi.org/10.7275/hz5x-tx03. [Mar. 29, 2021].
- [80] Spyros Zogas, Aikaterini Kolokathi, Konstantinos Birbas, Gregory Chondrocoukis, John Mantas. (2016, Jan.). "The e-Learning Effectiveness Versus Traditional Learning on a Health Informatics Laboratory Course. Studies in Health Technology and Informatics. [Online]. 226:109-12. Available: https://pubmed.ncbi.nlm.nih.gov/27350479/. [May 12, 2021].