Online English Learning: The Role of Physical and Environmental Variables on Student Performance

Adulrahman Al-Motrif[1], Yahya Hayati Nassar[2], Ritzmond Loa[3], Shahla Abu Zahra[4], Maisoon Samara[5], Shatha Sakher[6], Fany Margarita Aguilar Pichón[7], Juan Carlos Orosco Gavilán[8]

[1] Curriculum & Instructions, King Saud University, Saudi Arabia

[2] Cognitive Sciences, United Arab Emirates University, Jordan

[3] College of Nursing, University of Santo Tomas, Philippines

[4] Faculty of education Sciences, Bahcesehir University, Turkey

[5] College of education and social science, Al Ain University, United Arab Emirates (UAE)

[6] Faculty of Medicine, Al-Balqa Applied University, Jordan

[7] Universidad Nacional de Trujillo, La Libertad, Perú

[8] Universidad Privada del Norte. Lima, Perú

Correspondence: Adulrahman Al-Motrif, Curriculum & Instructions, King Saud University, Saudi Arabia.

Received: April 10, 2023 Accepted: May 25, 2023 Online Published: June 5, 2023

doi:10.5430/wjel.v13n6p284 URL: https://doi.org/10.5430/wjel.v13n6p284

Abstract

The COVID-19 epidemic has had a significant effect on education all over the globe, leading to the widespread closure of schools and institutions and the trend toward online learning. This has brought to light the significance of determining whether or not students are prepared to participate in live, online teaching and the need to consider aspects such as the classroom atmosphere and the degree to which students are responsible for their education. Students' preparedness for technical live online education was evaluated in a study conducted in Saudi Arabia using a structural equation model. This study gives significant insights for instructors adapting to various student competencies. The data also indicate that the pandemic may have contributed to a narrowing of the gender learning gap, which may have resulted from a greater focus on student responsibility. It is necessary to stimulate online networking and community building among college students. This should be done in addition to evaluating the students' preparedness from a technical standpoint. This helps to establish a feeling of community and gives chances for collaborative learning, both of which are especially crucial during times when students are studying independently from one another. In general, the COVID-19 epidemic has highlighted the significance of adaptation and creativity in education, as well as the need to consider a wide variety of elements that might affect students' achievement. Educators can assist in guaranteeing that students are equipped with the skills and information they need to thrive in a world that is becoming more complicated and changing quickly if they continue to research and assess novel ways of teaching and learning.

Keywords: academic achievement, Covid-19 pandemic, physical and environmental factors, online learning, English education

1. Introduction

The three pillars of human flourishing—safety, health, and education—should be freely available to everyone, regardless of the means of subsistence. For production to increase, a productive workplace is necessary. Also, a well-designed environment could inspire individuals to maintain their physical and emotional well-being (knowledge, motivation, creativity, and social skills). Following is the possibility of future growth in human capital. Human health and system effectiveness may benefit from using ergonomics theory and practice. The study of designing for people's comfort, safety, and health during work and play is known as ergonomics. People are likelier to put in the additional effort if they are comfortable and healthy at work. By making it more difficult for workers to perform their responsibilities safely, poor ergonomic and environmental design raises the risk of damage to employees. The design of substandard workplaces has been linked to musculoskeletal issues (MSDs). Because of ergonomic workstations, the workplace setting benefits from higher productivity. An ergonomic workstation design is crucial to increase workplace viability and health, claim (Rodrguez-Espindola et al., 2022; Liu Hongwei & Supinda 2022). It is excellent news for environmentally aware firms because ergonomically designed workstations have been demonstrated to endure longer. The efficacy of the available human resources may be significantly increased using an ergonomic arrangement.

The workplace has been the subject of many ergonomics studies. However, other vocations might be dangerous if the ergonomic design is not used. Bad posture and prolonged sitting (MSDs) increase the likelihood of acquiring musculoskeletal diseases. A similar problem occurs in education, where pupils, instructors, administrators, and directors may be in danger. Creating Pleasant Furniture and Places for

Students (Kazak, 2019; Yanrong Gao 2022) looked into what happens when ergonomics should be addressed. According to the authors, 27% of students report having headaches, and 20% report having hand/elbow pain. 64% of students are said to have physical problems. According to other Research, pupils' ergonomics are significantly impacted by noise and interruptions in the classroom.

More and more individuals are choosing to work from home. The availability of remote employment opportunities may be advantageous to many industries. A pandemic has been predicted to start in 2020 by the World Health Organization. There are 4 million instructors, 149 thousand schools, and 34 million pupils in Saudi Arabia. Before the conclusion of the academic year, all students must finish their online assignments. Other organizations have also embraced hybrid or blended education methods after the epidemic's probable termination, combining traditional classroom learning with the adaptability of digital media (Cavinato et al., 2021; Imanuddin Hasbi et al., 2022). This teaching approach is a workable substitute for the present system because of its flexibility in rethinking and rewriting curriculum, particularly in subjects where teachers must still provide students with engaging online learning experiences (Raes et al., 2020).

In order to satisfy the strict requirements of online education, students have modified their daily schedules. These analyses consider the situation's physical and psychological components. Unexpected events may harm kids' learning, health, and safety. They may need clarification on their environment's loudness, heat, or brightness. Making the most of their new study place requires students' effort. Because of the stress placed on your spine, neck, and extremities when you adopt these uncomfortable positions, you run a higher risk of developing MSDs. The emotional and mental health of children might be harmed by online education. With the development of the Internet, hyper-fast education is now a reality. Students may demonstrate that they have mastered and applied new technological abilities by completing the course requirements set out by instructors (Araşkal & Klnç, 2019; Yuming Xu et al., 2022). Studies evaluating how variables like temperature, lighting, and noise level perform in virtual classrooms are few and between. We are interested in learning how environmental factors like lighting and sound affect the academic performance of faraway pupils. This study assesses six variables, including COVID-19 and the environment (Sound, lighting, temperature). The third section of this article looks at how a student's learning environment affects their performance in online courses.

Despite the pandemic, several schools support adopting online modalities as part of learners' experiences. Thus, examining how the elements mentioned earlier affect pupils' academic progress is essential. Since the Covid-19 outbreak forced schools to adopt a new teaching method, several studies have examined online education's consequences on students' academic performance. However, several studies have examined how ambient factors like temperature, lighting, and sound affect the effectiveness of online learners. Also, most ergonomics research has been done in an industrial setting. Students need a nurturing atmosphere to learn and develop. People can better protect their health when they are in environments that are both physically and emotionally safe.

The Paradigm of the Study

The ergonomic design makes products and environments conducive to health and happiness on all levels (mental, physical, and social). This research was designed around the central idea that everyone, regardless of income level, should have access to the three essentials for human flourishing: security, health care, and formal education. The research findings stress the significance of ergonomic layouts in educational institutions, businesses, and virtual classrooms. The research demonstrates that ergonomic design may significantly boost output, human capital, and system performance, in addition to lowering the likelihood of musculoskeletal disorders.

The report acknowledges that the COVID-19 epidemic has affected the educational system, particularly with the rise of online learning as an alternative to more conventional classroom settings. This research emphasizes the value of investigating how elements such as temperature, lighting, and sound impact the academic performance of distance students. It makes the case that children can only study and grow to their full potential in a secure and supportive setting. The research also highlights the dangers of sitting for extended periods and with poor posture, which may cause musculoskeletal ailments and affect students' mental and emotional well-being. Overall, the research highlights the significance of ergonomic design in establishing safe and pleasant learning spaces and the necessity for a holistic approach to education that considers the learners' physical, emotional, and mental well-being.

Literature Review

Effects of the COVID-19 Virus on Academic Performance at Colleges and Universities

College performance about COVID-19 has been studied. Imen and Karada (2019) found that incarcerated pupils' learning and performance improved. 370 college students in Saudi Arabia were split into an experimental and a control group to see how the COVID-19 ban affected their ability to pursue academic interests. The study's participants were homebound college students. At the height of the COVID-19 outbreak, Noori (2021) polled college students on their experiences with online education. The information used in the research comes from a questionnaire given to undergraduates. Students in economically developing countries like Saudi Arabia, where most students do not have access to the Internet, may find that online lessons are more beneficial. Because of the COVID-19 outbreak, children are missing school, and instructors have fewer opportunities to work with them individually. (Lapitan et al., 2021; Rommel & Fathi Abunasser 2022) examined student morale by polling them on COVID-19. By having readers take out a survey, the writers could gauge their audience's receptivity to and confidence in online education. Even though it might be expensive for students with inadequate connections, many still prefer taking classes online. Students' emotional well-being during the COVID-19 pandemic was evaluated using virtual classroom technology (Mishra et al., 2020). The study required the development of a two-part questionnaire. Section 2 includes academic achievement as one of its five pillars. Using a snowball sampling method, we were able to poll 785 students. When allowed to speak to their class as a whole, however, 59.5% of students cited online education as crucial to their future success in

school.

The effects of the COVID-19 pandemic on many issues that students throughout the globe worry about were studied (Atlam et al., 2022; Zhang Ying et al., 2022). Students ranked instructors and PR professionals as the most helpful advisors overall. In contrast, 56.5% reported feeling overwhelmed by the variety of online learning opportunities. Students' lack of computer literacy and too optimistic views about their workload dampened their enthusiasm for the new learning environment. Those of Saudi Arabian descent had the lowest student satisfaction with their academic performance.

The effects of the COVID-19 pandemic on pupils' academic performance were also studied (Nen & Sincar, 2019). The authors (all chairs of the math and science departments) interviewed three professors over the phone using a semi-structured interview format. Graduates from four-year universities have their employment rates analyzed (Kesik & Ahin, 2019; Beibei Jiang 2022). The author based his study on telephone interviews with three professors (the mathematics and natural sciences department chairs). His findings indicate that a decline in students' arithmetic test scores is likely unless urgent action is taken to curb the spread of the COVID-19 virus. According to his findings, the number of children who pass mathematics examinations might drop if the COVID-19 pandemic is not rapidly addressed.

The Implications of Illumination on the Academic Achievement of College Students

Students who have shown proficiency in a subject area may be identified via exam results and instructor ratings. The scholarly output of kids is closely related to the lighting quality in their classrooms. Lack of proper illumination has been related in studies by Savage et al. (2020) to physiological discomfort and poor academic performance. There is evidence that student performance suffers when classrooms are poorly lit. Nayak (2018) looked into this to see whether a kid's home lighting and HVAC system affected their class performance. Ninety-two children, ages 9 to 15, were present. Over four weeks, data on children's intellect were gathered. Another study looked at how classroom illumination affected students' grades. Exposure to warmer illumination significantly impacted children's arithmetic abilities and mental acuity (between 3400 and 450 kelvin). Students' performance increased by 7.7 percentage points at p 0.001 when classrooms were illuminated with high-quality dynamic lighting (between 5800 K and 750 lux).

Solar-powered classroom supplies were studied for their impact on student's performance (Zhang et al., 2019). According to the findings, children's increased attendance after exposure to natural light has been short-lived. Not even extra time spent studying or in class improved my GPA. First graders' academic performance is not significantly different when exposed to different colored lighting. Three separate psychological investigations investigated the relationship between students' moods and actions and their academic performance. Light activity (at 2400 kHz), moderate exercise (at 6000 kHz), and intense exercise (at 7000 kHz) all need different heart rates. The effects of classroom illumination on 678 pupils were investigated (Bian et al., 2022). The Testo-545 lux meter was used to quantify the ambient classroom illumination, and the d2 Test of Attention was used to assess students' ability to pay attention while writing and reading. The authors conducted a poll to get student feedback on lighting in the classroom. Concentration and output increased significantly (p 0.05) between 260 and 510 lux. The results indicate that the brightness of primary school pupils' classroom lighting significantly affects their cognitive growth. A random sample of 190 students participated in the research. Researchers interviewed students (a checklist for evaluating the classroom lighting) and utilized a self-designed questionnaire focused on academic progress and student motivation. Elementary school kids' performance in the classroom is considerably affected by the brightness of the lights (p 0.05). According to the theory, H1 functions as follows:

Hypothesis 1 (H1). Those who have chosen to study online during the COVID-19 outbreak may benefit significantly from increased illumination.

Academic Achievement and Sound Exposure to University Students

Several studies have investigated the impact of sound on students' success in the classroom. Similar acoustic studies examined the connection between noise pollution and academic achievement (Morgan, 2018). Over forty percent of students have trouble focusing on activities requiring high levels of concentration, such as studying, reading, and writing, when there is background noise or other people are conversing nearby, according to studies. The academic and behavioral outcomes of children with attention deficit hyperactivity disorder (ADHD) are analyzed (Cevik, 2019). There are fifty people taking part. The time spent reading was kept track of in an informal verbal count. Students were graded on their writing skills based on factors such as the number of errors and the length of their papers. It does not seem that playing White Sound in the classroom helps students enhance their writing. (Serrano-Ruiz et al., 2020) They interviewed public and private elementary school students to learn how their young minds processed sounds of varying decibel levels. Nearly 400 students participated in a 20-question survey, and the average size of their classroom was also determined. Both public and private school kids reported that the noise level during recess was excessively high (74.56 and 82.18 dBA), despite finding equal sound levels.

Students' successes and happiness levels were analyzed (Yal çn et al., 2020;). We measured the current exposure to sound based on the opinions of 327 college students. Students' mental health was measured using the Student Well-Being Process Questionnaire, which considered their classroom participation and final grades. Students' academic performance drops when subjected to thunderous and/or high-pitched sounds (Dynarski et al., 2018; Bayr & Dönmez, 2020). Therefore, the author concludes that pupils' ability to learn is unaffected by the noise level in the classroom. A total of 133 girls and 133 boys from three separate elementary schools took part in the study. Furthermore, two groups of students (those exposed to only the background noise and those exposed to both) were given psychological exams. Auditory cues significantly impact the outcomes of the Stroop and Color Trace tests. Standardized test scores were

lower among students who went to schools in metropolitan locations near busy roadways (Wen et al., 2019). If you want to learn more about this topic, check out (Ahin et al., 2019) and (Kou et al., 2020). As a result, we propose alternative hypothesis H2.

Hypothesis 2 (H2). During the COVID-19 epidemic, the Sound level harms the academic performance of on-campus students.

Students' Academic Achievement as Affected by Temperature

Temperature, noise, and lighting affect how well students learn in a given setting. Baafi (2020) claims students do worse in class as the temperature rises. Cold temperatures confuse and activate pupils, preparing them for action (Jiang et al., 2021). It is chilly where they thrive, yet too hot, and they die. The temperature in the classroom has been shown to affect student performance (Li & Che, 2022). The changing of the seasons has frequently coincided with the maturation of children's minds. After three years of school (Mihara et al., 2022; Eusob Ali Ahmed et al., 2022), researchers assessed pupils' performance in both seasons. It was discovered that the first and third years considerably impacted students' ultimate grades.

Gender differences in academic performance were also studied by Kumar and Singh (2021). As the temperature in the classroom increased, male students did poorly, while female students fared well. Twenty-four SAT-style questions on the Google form skewed the data toward the correct gender. Students' ability to feel the heat was connected with their performance across three days in the same classroom ($p = 0.048$). Both sexes performed equally well regardless of the ambient temperature. Scientists conducted two studies this summer (Leung et al., 2019). Over a week, the room temperature fluctuated significantly regardless of the functionality of the different air conditioners. Then, we used visual analog scales depicting various parts of the student's educational experiences to capture their thoughts and symptoms. When the classroom temperature was lowered from 25 to 20 degrees Celsius, students improved considerably on two math and two language assessments. The student's performance dramatically improved when the outside airflow was raised from 5.2 to 9.6 L/s per square foot. Data from 140 fifth-grade classes and 70 primary schools were analyzed for their study (Mucherah et al., 2018; Hamad Muaybid Alharbi et al., 2018). Studies have shown that students do better in the classroom when the temperature is raised. The study's authors claim that a drop in classroom temperature from 25 to 20 degrees Celsius led to a 12- to 13-point improvement in students' average arithmetic performance. Kids learn and do better when they are at ease in the classroom. Earthman found correlations in the research between thermal quality and academic performance (Alkan, 2019). One study found that students performed better at temperatures between 20 and 24 degrees Celsius (68 and 74 degrees Fahrenheit). As a consequence, H3 is shorthand for the information below. The investigation's potential causal model is shown in Figure 1.

Hypothesis 3 (H3). The temperature at home impacts college students' performance in the classroom during the COVID-19 epidemic.

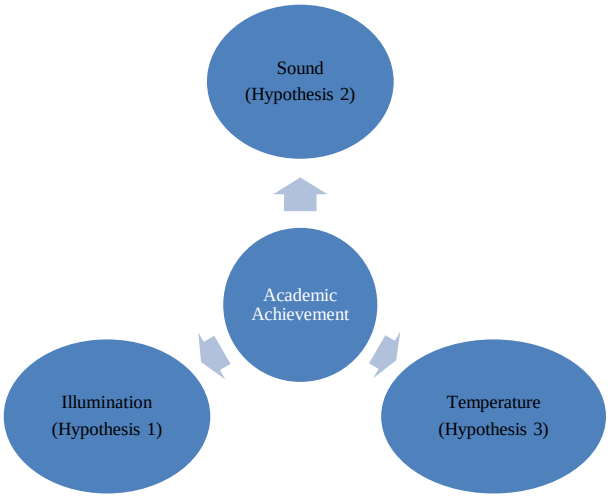

Figure 1. Model of hypothetical causality

2. Methodology

This research used a cross-sectional survey design. It consisted of three distinct phases: (1) Questionnaire design; (2) Questionnaire distribution; and (3) Statistical analysis of outcomes.

Questionnaire Development

Research suggests lighting, noise, and temperature are just a few of the classroom elements that may alter kids' capacity to study. Questionnaires have become a standard tool for researchers. (King et al., 2018) performed research using a three-part questionnaire. The classroom temperature, noise level, and lighting were three of the eight poll questions directly addressing the classroom setting. The psychological and physiological health of the pupils was discussed at length in Chapter 1. In the second part, students were given ten questions on the environmental conditions of their classrooms. In the third episode, we spoke about the challenges of headaches and mental fog. This approach was also used to examine the course structure of several degree programs. Multiple surveys were used to determine how

temperature, noise level, and lighting affected students' ability to study in the classroom (Golasi et al., 2019; Hasbi Indra et al., 2022). The widespread COVID-19 outbreak hampered data collection on environmental factors (including light, sound, and temperature). The QEOC has been founded, as was previously indicated. The members of the QEOC are as follows: We will start by discussing how kids' bodies and minds could react to an online curriculum. This study's primary concern is determining which pedagogical practices have the most significant impact on students' performance. A literature study was conducted to establish the validity of the initial survey's findings. Academic performance was investigated in experiments that varied the independent variable (temperature, decibel level, and illumination). Concerning these parts, the words "academic," "school," and "students" spring to mind. The goods are then modified for usage in virtual classrooms, allowing students to study whenever and wherever is most convenient for them. Table 1 includes citations for the revised text.

Table 1. The Questionnaire was used to assess the impact of online learning on students' well-being and performance in the classroom.

Variable	Item
illumination	The light in my study area allows me to view my screen well and maintain focus while attending my online lectures. The ability to adjust the lighting in my work room is one perk of attending courses at home on the computer (For example, by having shades and drapes that can be opened and closed, a table light, and dimmers within reach). My desk lighting and computer screens provide plenty of light to study comfortably.
Sound	As an online student, I can concentrate undisturbed on my work. The noise in my study space (from electronics, conversations, and other sources) helps me focus, take notes, and hear my teachers and classmates. If I want to adjust the temperature in my office, I can do so by opening and shutting the windows and doors.
Temperature	Adjusting the temperature of my study space helps me focus and relax as I complete my online courses. I have complete control over the temperature in my virtual study space by opening and shutting virtual windows and activating or deactivating air conditioners and heaters. My neighborhood has good enough air quality for me to attend my online classes.
Academic Performance	By taking classes online, I save time and energy that I can go to fulfilling my other responsibilities. Thanks to the flexibility of online learning, I have successfully finished all of my course assignments on time. Since taking courses online, I have seen a marked improvement in my grades. Online courses have been a great asset to my education. I enrolled in several online classes to strengthen my verbal and written expression. My ability to work with others has dramatically increased due to my participation in online courses. Taking lessons online motivates me to go out and about more. The results I obtained from my online classes exceeded my expectations.

Google Forms were duplicated with the completed questions from another location. Each question on the QEOC has a corresponding five-point Likert scale, from 1 (very seldom) to 5 (very often), as indicated below. Recent studies on the subject influenced the selection of this measure.

Participants and sampling method

One hundred ninety students from 9 different Saudi Arabian schools contributed to the study's success. You are picking respondents who can finish a survey by randomly picking them from the pool of persons available during the survey's administration (Bhardwaj, 2019;). In order to take part in this study, undergraduates needed to have taken at least one online course and fulfilled QEOC's online application requirements. Table 2 shows that most respondents (129 out of 209) were between 20 and 30, accounting for 67.89% of the total. (a random method for choosing a sample size is excellent, but after you add the predetermined criteria, you use cluster sampling, which groups people based on shared qualities).

Table 2. Socio-demographic information on the students evaluated.

Social and Demographic Information of Respondents		
Age (Years)	**Number**	**Percentage**
More than 18-20	39	20.53%
More than 20-30	129	67.89%
More than 30-40	16	8.42%
More than 40-50	6	3.16%
Gender		
Male	120	63.16%
Female	70	36.84%
Civil Status		
Single	158	84.21%
Married	14	7.38%
Free Union	13	6.84%
Other	5	2.63%

Procedures

Before starting this inquiry, the researcher obtained all required from concerned institutions and authorities. Second, once the QEOC received official clearance, students registered in online courses at nine schools were forced to complete them during the COVID-19

epidemic. These pupils might be junior high school or first-year students at a Saudi Arabian institution. The steps for filing an online application for a QEOC are as follows: Where do college teachers reside? They may use the QEOC to encourage cross-country contact between educators and students since it is also open to them. A professor's email address may be found in publications like book chapters, magazines, and conference proceedings that include their work. After collecting a list of professors' email addresses from their institutions, researchers contacted academics through Email to explain the study's objectives. We communicated with some people on Facebook and others using Google Classroom. The questionnaire results were tallied, sorted, cleaned up, and statistically assessed with the assistance of an experienced statistician. All ethical guidelines were followed throughout the study's conduct. A written report describes the findings analysis, interpretation, and presentation.

Ethical considerations

In order to conduct this research, the following ethical factors were taken into account: Researchers initially obtained approval from key figures such as school administrators using informed consent forms and letters of authorization. Researchers ensured that all participants understood the purpose of the study and were comfortable submitting answers before distributing questionnaires. Last, the Data Privacy Act ensured that the respondents' anonymity was maintained. Ultimately, everything in this investigation was conducted by the health standards set out by Covid-19.

Data Statistical Analysis

Statistics verify QEOC findings and establish the causality of various factors. The three hypotheses presented in Section 2 are well supported by substantial evidence.

The QEOC Questionnaire's statistical validity

Since the underlying data were ordinal, the SPSS 24® program transformed any outlying or missing values into a median. We did this (Likert scale) to consider the data's distribution. After that, a 0.7 Cronbach's alpha is considered the bare minimum for a legitimate QEOC variable. That is why it is essential to restrict the study to variables correlating 0.70 or higher. Discriminant and convergent validity may be assessed using the average variance retrieved (AVE). P-values for the AVEs of all variables must be statistically significant (greater than 0.5). The VIF index is used to determine whether there is any collinearity between the variables. 3.3 or above is too high for this field. Sorting the data into the ordinal form and computing the Q2 coefficient yields a non-parametric measure of predictive validity ($Q2 > 0.2$). The Q2 coefficient can be determined only for latent variables that originate from inside the study. Exam performance is a student's latent variable that may be used to explain other variables.

Table 3. Evaluated students at every university.

Total of the Participating Students in the Survey	**University**								
	Univ 1	Univ 2	Univ 3	Univ 4	Univ5	Univ6	Univ7	Univ8	Univ9
	78	75	11	8	5	4	4	3	2

Table 3 displays the number of students from each institution participating in the survey. University A had 78 students participate in the survey, making it the university with the highest participation rate among students. Every single student attended one of the public universities.

Structural Equation Modeling Analysis

Figure 1 and its associated relationship matrix may be analyzed using WarpPLS 6.0® software (SEM). This program's partial least squares option is helpful when data are ordinal and represent a small sample that does not match normalcy norms (PLS). Learn more about this model by calculating accuracy measures like the average path coefficient (APC), average R-squared, and adjusted R-squared (AARS). All average VIFs for blocks and VIFs for collinearity must be less than 5 for the solution to pass the test (AFVIF).

It is also essential that the Tenenhaus index (GoF) be more significant than 0.25. An SEM must also consider the components' direct, indirect, and cumulative impacts. In Figure 1, we see how direct effects may be used to test the accuracy of a model's predictions (arrows). Indirect effects may also be seen as examining the portions of a latent variable that serve as bridges between two other variables. The total effects include both immediate and subsequent consequences. As there are few connections between the two sets of variables in Figure 1, we cannot see any indirect effects. Some of the most well-known examples of direct impacts use the symbol S, which stands for standard deviations. These direct effects are used in the significance testing of a correlation between two variables, using a p-value as the statistical measure of significance. Next, we assign a value to each consideration based on our findings. The SE can categorize the impact of a given independent variable on a given collection of dependent variables.

3. Results

Detailed Examination of the Data

The components of the dependent and independent variables are presented in Table 4. The three independent variables where the majority of students put their replies were "rarely," "often," and "always," respectively. However, the most frequent answer to the dependent variable of academic accomplishment was "3" for "sometimes." These data imply that family life is unfavorable to academic performance and that other variables are more essential.

Table 4. Analysis with a Detailed Description

Factors	Statements	Respond	Frequency (0%)	Mean	Median	Standard Deviation
illumination	I need enough light in my study space to see and concentrate while taking online classes.	1 2 3 4 5	3(2%) 4(2.5%) 35(24.8%) 89(45.2%) 45(27.6%)	3.95	4	0.844
	One of the benefits of taking college classes online is having the flexibility to modify the illumination in my study space as needed. Controlling the light through the windows is essential, so you should have access to blinds and curtains, a table lamp, and dimmers.	1 2 3 4 5	11(5.8%) 11(5.8%) 35(15.6%) 59(30.2%) 93(42.8%)	4.10	4	1.118
	The amount of illumination in my study space (lights and computer screen) makes me feel comfortable visually while taking online courses.	1 2 3 4 5	2(1%) 16(7.9%) 49(25.8%) 78(36.9%) 59(30.6%)	3.90	4	0.955
	While enrolled in an online course, my learning environment is completely private.	1 2 3 4 5	18(8.8%) 31(14.5%) 52(25.3%) 48(23.3%) 54(26.2%)	3.39	3	1.308
Sound	Having a quiet place to study allows me to concentrate, take notes, and hear my professor and classmates without distraction (caused by electronic devices, discussions, and other outside influences).	1 2 3 4 5	12(6.7%) 31(16.6%) 75(35.8%) 67(32.1%) 20(10.2%)	3.19	3	1.036
	I can control the sound level in my workspace by opening and closing the windows and doors.	1 2 3 4 5	17(9.6%) 35(18.6%) 52(23.8%) 58(25.5%) 41(21.5%)	3.36	3	1.230
Temperature	While attending courses online, I can maintain complete temperature control in my study environment by adjusting the ventilation in the room using the windows and the ventilators.	1 2 3 4 5	13(6.9%) 18(9.4%) 37(18.6%) 74(38.5%) 69(35.1%)	3.84	4	1.156
	The air quality in my study area is suitable for taking the course online.	1 2 3 4 5	4(1.9%) 12(5.8%) 51(24.8%) 67(32.5%) 72(35%)	3.92	4	1.003
	Attending online courses allows me to do all of my obligations.	1 2 3 4 5	12(5.8%) 23(11.2%) 67(32.5%) 64(31.1%) 40(19.4%)	3.46	4	1.102
	I can schedule my time and complete all the assignments my teachers provide by taking online courses.	1 2 3 4 5	11(5.3%) 25(12.1%) 67(32.5%) 56(27.2%) 47(22.8%)	3.48	3.50	1.130
	Because I have been enrolled in online courses, my grades have improved.	1 2 3 4 5	13(6.3%) 27(13.1%) 72(35%) 62(30.1%) 32(15.5%)	3.52	3	2.389
Academic Performance	I have broadened my understanding by taking online classes.	1 2 3 4 5	27(13.1%) 54(26.2%) 68(33%) 39(18.9%) 18(8.7%)	2.86	3	1.137
	Taking courses online has helped me develop my verbal and written expression.	1 2	27(13.1%) 48(23.3%)			

	3 4 5	65(31.6%) 23(20.9%) 23(11.2%)	3.07	3	2.164
I am more creative now because of online classes.	1 2 3 4 5	29(14.1%) 49(23.8%) 62(30.1%) 43(20.9%) 23(11.2%)	3.04	3	2.176
The outcomes of my participation in online educational opportunities have met with my complete satisfaction.	1 2 3 4 5	29(14.5%) 35(17%) 65(31%) 40(19.3%) 34(16%)	3.25	3	2.369

Validation of Variables

The QEOC survey underwent thorough internal and content testing (Table 5). Cronbach's Alpha decreases in the QEOC when a variable is eliminated. Everything was thus moved to the QEOC.

Table 5. Variable and item validation

Statements and Factors	**Cronbach's**	**Cronbach's Alpha if the item is eliminated from QEOC**
illumination	0.766	
My desk has plenty of natural light, so I can easily keep track of my surroundings as I study for my online classes.		0.687
Adjusting the curtains and drapes, using a table lamp, and having nearby dimmers allow me to control the amount of light in my study environment, which is helpful while taking online courses.		0.735
I can better focus on my online classes with enough lighting from lights and computer screens.		0.632
Sound	0.826	
Thanks to online learning, I now have the luxury of studying in peace.		0.733
The noise in my classroom makes it difficult for me to pay attention, ask questions, and hear my professor and classmates.		0.765
It is up to me to decide how loud my study place will be (such as by opening and shutting windows and doors).		0.713
Temperature	0.851	
Keeping my body at a comfortable temperature is essential for my concentration and health when taking online classes.		0.778
When taking classes online, I can set the temperature optimal for studying (for example, by opening and shutting windows and turning ventilators on and off).		0.844
My study room has good ventilation and is therefore suited for online schoolwork.		0.820
Academic achievement	0.841	
By taking classes online, I can get everything that has to be done.		0.760
Taking classes online allows me more flexibility in my schedule than possible in a traditional classroom setting.		0.759
Online classes have helped me improve my academic performance.		0.749
The classes I have taken online have helped me expand my knowledge.		0.750
Taking courses online has helped me become a better communicator.		0.774
Taking classes online has helped me become a more collaborative person.		0.755
Online courses have helped me expand my imagination.		0.789
I am satisfied with the results I got from taking online programs.		0.739

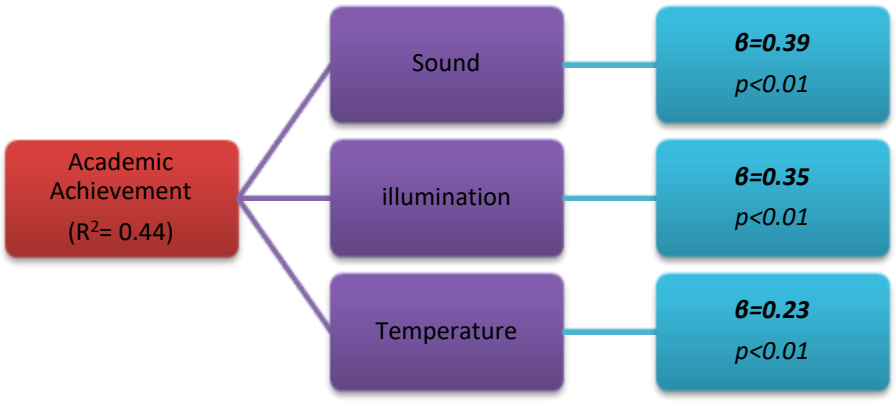

Figure 2. Model assessment

Structural Equation Modeling

The model assessment results are shown in Figure 2, where the p-values correspond to the correlations between the variables that have been presented, and the β-values show the direct consequences of those associations. Additionally, a broken arrow expresses a rejection of the hypothesis, while a straight arrow expresses a rejection of the hypothesis. R2 is a statistical measure of the extent to which independent variables explain the observed pattern of the dependent variable.

The Model's Validation

Table 6 illustrates them. The results showed that every indicator complies with the least and maximal requirements of the approach. This indicates that the model can accurately predict future events, despite collinearity issues.

Table 6. Component Variables Validation

Indexes	Value	*p*-Value	Acceptable If
Average path coefficient (APC)	0.185	<0.001	*p*-value ≤ 0.05
Average R-squared (ARS)	0.245	<0.001	*p*-value ≤ 0.05
Average adjusted R-squared (AARS)	0.225	<0.001	*p*-value ≤ 0.05
Average block VIF (AVIF)	1.556		AVIF ≤ 3.4
Average full collinearity VIF (AFVIF)	1.526		4FVIF ≤ 3.3
Tenenhaus (GoF)	0.403		GoF ≥ 0.41

Direct Effects

In Table 7, we can see the value of and the corresponding p-value for each direct influence. The level of statistical significance was set at a p-value of 0.05. Since the p-values for H2 and H3 are less than 0.05 and for H1, they are greater than 0, it is agreed that H2 and H3 will be accepted. Students taking online classes during the COVID-19 pandemic reported lower average grades. Specifically, this was linked to the impact of the independent variable, sound, on the outcome.

Table 7. Accepting or rejecting the suggested assumptions

Hypothesis	**Independent Variable**	**Dependent Variable**	***β***	***p*-Value**	**Decision**
H1	Illumination	Academic achievement	0.39	<0.001	Accepted
H2	Sound	Academic achievement	0.23	<0.001	Accepted
H3	Temperature	Academic achievement	0.35	<0.001	Accepted

Table 7 shows the findings for every hypothesis, which were as follows:

H1: As the number of people taking online classes from home increased during the COVID-19 pandemic, so did their average grade point average, with a correlation coefficient of 0.39.

H2: Students' academic performance increases by 0.23 percentage points when they take online classes during the COVID-19 pandemic.

H3: The statistical evidence shows that a one-unit increase in the standard temperature deviation due to the COVID-19 pandemic results in a 0.35-unit increase in the standard temperature deviation.

In this instance, the R2 value of 0.44 shows that the independent variables (illumination, sound, and temperature) explained 46% of the variance in the dependent variable (academic achievement), with the independent variables (Sound, Temperature, and Illumination) each accounting for 25.9%, 12.2%, and 7.1% of the variance, respectively.

4. Discussion

The findings of this research imply that the COVID-19 pandemic's impacts on children's home settings may adversely affect their academic progress. These results are identical to those of past experiments in terms of illumination. For instance, illumination has been proven to considerably adversely affect youngsters' ability to study (Monge-Barrio et al., 2022). Some writers claim that negative situations are not

favorable to learning. This also applies to pupils who primarily study online. According to (Konstantzos et al., 2020; Minwir et al., 2022), pupils perform better academically in classrooms with proper light and ventilation. Others say more than enhancing interior lighting is required to increase student performance (Kesik & Aslan, 2020). According to research by (Jafari et al., 2020), the best light intensity for increasing academic performance is between 250 and 500 lux. The material in this article demonstrates that the atmosphere in the classroom, especially the lighting, and ventilation, considerably affects how effectively kids learn. Higher education institutions should have the resources to ensure their students have access to the technology and illumination they need to excel in the classroom.

The Sound variable is subject to the same limitations. According to (Sutter & Campbell, 2022) Study from, background noise adversely influences kids' ability to concentrate while conducting mental skills like arithmetic. Due to the rise of background noise and distractions in modern households, online students encounter the same issues as their traditional counterparts. This technique supports the conclusions of the investigation. However, Cevik (2019) has demonstrated that exposure to loud noise may decrease students' writing and reading abilities, eventually reducing their academic success. According to (Yang & Mak, 2020), youngsters prosper cognitively when compassionate educators and peers surround them. People find it tough to study in noisy surroundings as a result. It is noteworthy that Marta et al. (2020), who also observed that high background noise affected students' learning ability, agreed with the findings of this research. The increasing volume may consequently harm students' abilities to study online. Lower test outcomes are connected with children finding it difficult to focus on their work in a noisy situation. Students should take their online classes at home in a peaceful atmosphere, away from any potential sources of distraction.

This study's findings coincide with earlier studies studying the influence of temperature on academic success. According to (Korsavi et al., 2020), the classroom's temperature affects pupils' performance. As per (Realyv ásquez-Vargas et al.,2020). The researchers observed that the detrimental consequences of extreme temperatures on pupils' academic performance were significantly more apparent than in temperature-neutral situations. This follows (Berman et al., 2018) .'s observation that student performance increases when the temperature lowers from 25 to 20C. According to (Fazio et al., 2022), temperatures between 21 and 25C (68F and 74F) are optimum for boosting student comfort and academic development. The conclusions of the current study are theoretically supported by these past studies and backed by statistical data. Children afflicted by a pandemic were not included in the prior studies. This research shows that excessive classroom temperatures may deleteriously influence children's cognitive ability. If the temperature in a student's house or location of study stays consistent throughout the day, their performance may decline. A sustainable online classroom design may help students and businesses by keeping a consistent temperature and humidity. Several studies have studied the link between educational institutions and environmental protection. For instance, (Stough et al., 2018) evaluated Melbourne and Singapore student perspectives of sustainability education to assess if there were any notable disparities. This research tries to understand better how sustainability education is offered in higher education institutions. Nevertheless, (Soliku & Schraml, 2018) investigated the degree of student commitment to sustainability to discover whether and how it may affect the future acceptability of sustainable development principles. In order to measure the financial stability of new college graduates, this article recommends three criteria. K öse (2019) uses participatory ecological learning to study how students' views of competence and identity affect their capacity to live sustainably over the long term. According to (Chiva-Bartoll et al., 2020), all educational community members should actively create professional capabilities for student sustainability. To promote continuous education, these writers present a range of teaching methodologies and pedagogical abilities. Despite the results, no preceding research has examined environmental elements from an ergonomic aspect. This underscores the novelty of the study and indicates how extensively the concerns of the durability and usability of online learning have been explored. The focus of this research is confined to the effects of light, sound, and temperature on the academic achievement of students utilizing online interventions as a learning tool owing to the limits of the present study and the aims of Future Research. Future research should examine additional characteristics determining how well students succeed in online courses. Including extra information on each respondent's profile in a future study on respondents' online learning success might be advantageous.

5. Conclusion

A statistical analysis of three COVID-19 pandemic ideas was required. Saudi Arabian students who study online could be less focused, disengaged, and uneasy than students from other countries. They may need more motivation to study, hurting their academic achievement. Your kids' academic progress relies on how content they are while attending school. The classroom design has a significant negative impact on pupils' learning capacity. Academic achievement is influenced by some variables, in addition to how much time a student devotes to studying and how well they retain information. To promote student engagement, universities should ensure that their classrooms have enough lighting, ventilation, and audiovisual equipment. For instance, teachers should refrain from making pupils do their assignments.

Students now have less time in class to utilize computers. Less time will be spent under pressure, and there will be less mental strain. Discussions in class are intended to be active. Growing evidence shows that using games in the classroom may grab students' attention and aid in knowledge retention. Online course participants should set up a quiet area in their homes where they may study without being distracted by technology. These problems could make it more difficult for students to study and advance in their chosen fields. The following management and theoretical consequences were examined since these three environmental elements directly impact academic success assessments. Many factors than how much time is spent studying and memorizing material, affect college performance. As they are less likely to be distracted by their friends while attending online courses at home, students may be able to focus better and complete more work. A well-designed virtual classroom with quiet sections and climate-controlled classrooms could inspire students and schools to be more environmentally conscious.

6. Recommendations

Online students' performance in the classroom may have suffered as a result of the COVID-19 pandemic. Conditions like lighting, background noise, and temperature may also affect students' ability to concentrate and learn. Consider the student's tablet, phone, and computer and the time they spend each day. Students may get back and neck aches from using non-ergonomic furniture and equipment. Learners may experience stress, anxiety, and headaches due to these factors. The QEOC questionnaire addresses all of these areas because of their potential impact on students' engagement and achievement in the classroom. Students, teachers, and administrators in higher education have all been negatively impacted by the COVID-19 pandemic. Future studies may benefit from hearing from both students and faculty members.

References

Araşkal, S., & Kılınç, A. Ç. (2019). Investigating the factors affecting teacher leadership: A qualitative study. *Educational Administration: Theory and Practice, 25*(3), 419-468.

Atlam, E. S., Ewis, A., Abd El-Raouf, M. M., Ghoneim, O., & Gad, I. (2022). A new approach to identifying the psychological impact of COVID-19 on university student's academic achievement. *Alexandria Engineering Journal, 61*(7), 5223-5233. https://doi.org/10.1016/j.aej.2021.10.046

Baafi, R. K. A. (2020). School physical environment and student academic achievement. *Advances in Physical Education, 10*(02), 121. https://doi.org/10.4236/ape.2020.102012

Bailey, C. R., Radhakrishna, S., Asanati, K., Dill, N., Hodgson, K., McKeown, C., ... Wilkes, A. (2021). Ergonomics in the anesthetic workplace: Guideline from the Association of Anaesthetists. *Anaesthesia*, *76*(12), 1635-1647. https://doi.org/10.1111/anae.15530

Balcony, M. A., EmadEldeen, R., Farghaly, M., El-Bassiouny, N., & Mohamed, E. K. (2020). The factors affecting student satisfaction with online education during the COVID-19 pandemic: an empirical study of an emerging Muslim country. *Journal of Islamic Marketing*. https://doi.org/10.1108/JIMA-09-2020-0301

Bayır, Ö. Ö., & Dönmez, A. (2020). Being a woman school principal in Turkey. *Educational Administration: Theory and Practice, 26*(1), 163-202.

Beibei, J. (2022). Study on the Application of Chinese Traditional Culture Teaching in Higher Vocational Education. *Educational Administration: Theory and Practice, 28*(3), 142-155.

Berman, J. D., McCormack, M. C., Koehler, K. A., Connolly, F., Clemons-Erby, D., Davis, M. F., ... Curriero, F. C. (2018). School environmental conditions and links to academic achievement and absenteeism in urban, mid-Atlantic public schools. *International Journal of Hygiene and environmental health*, *221*(5), 800-808. https://doi.org/10.1016/j.ijheh.2018.04.015

Bhatti, A., Pathan, H., Tabieh, A., & Hassan, A., (2020). Impact of Learner-learner Rapport on L2 Learning: A Study of Public Sector Universities in Sindh, Pakistan. *The Asian EFL Journal, 27*(4.6), 204-226. https://doi.org/10.5296/elr.v6i1.16627

Bian, Y., Luo, J., Luo, T., & Leng, T. (2022). Contrast demand on the blackboard in typical secondary school classrooms of China: Effects of daylight reflections on text legibility. *Energy and Buildings*, *261*, 111974. https://doi.org/10.1016/j.enbuild.2022.111974

Çalışkan, Ö. (2019). Readiness for organizational change scale: Validity and reliability study. *Educational Administration: Theory and Practice*, *25*(4), 663-692.

Carayon, P., Wust, K., Hose, B. Z., & Salwei, M. E. (2021). Human factors and ergonomics in health care. *Handbook of human factors and ergonomics*, 1417-1437. https://doi.org/10.1002/9781119636113.ch53

Cavinato, A. G., Hunter, R. A., Ott, L. S., & Robinson, J. K. (2021). *Promoting student interaction, engagement, and success in an online environment.* https://doi.org/10.1007/s00216-021-03178-x

Çevik, M. S. (2019). Main problems in the school administration and solutions proposed: A qualitative study. *Educational Administration: Theory and Practice, 25*(3), 509-568.

Chiva-Bartoll, Ò., Capella-Peris, C., & Salvador-Garc á, C. (2020). Service-learning in physical education teacher education: Towards a critical and inclusive perspective. *Journal of Education for Teaching, 46*(3), 395-407. https://doi.org/10.1080/02607476.2020.1733400

Çimen, B., & Karadağ, E. (2019). Spiritual leadership, organizational culture, organizational silence, and academic success of the school. *Educational Administration: Theory and Practice, 25*(1), 1-50. https://doi.org/10.14527/kuey.2019.001

Coelho, D. A., Tavares, C. S., Lima, T. M., & Louren ço, M. L. (2018). Psychosocial and ergonomic survey of office and field jobs in a utility company. *International Journal of Occupational Safety and Ergonomics, 24*(3), 475-486. https://doi.org/10.1080/10803548.2017.1331620

Derlina, A., Bukit, N., Sahyar., & Hassan, A., (2020). Blended Learning in English and English-Medium Physics Classes Using Augmented Reality, Edmodo, and Tinkercad Media. *TESOL International Journal, 15*(3), 111-136.

Dynarski, S., Libassi, C. J., Michelmore, K., & Owen, S. (2018). *Closing the gap: The effect of a targeted, tuition-free promise on college choices of high-achieving, low-income students* (No. w25349). National Bureau of Economic Research.

https://doi.org/10.3386/w25349

Eusob, A. A., Mohammad, R. K., Munmun, B., & Subir, S. (2022). Comparison of Scholastic Attainment in English and Math amongst Other Studies at the Higher Secondary Level: A Study using Mahalanobis Distance. *Educational Administration: Theory and Practice, 28*(4), 1-13. https://doi.org/10.1155/2022/3669065

Fazio, M., Pluchino, A., Inturri, G., Le Pira, M., Giuffrida, N., & Ignaccolo, M. (2022). Exploring the impact of mobility restrictions on the COVID-19 spreading through an agent-based approach. *Journal of Transport & Health, 25*, 101373. https://doi.org/10.1016/j.jth.2022.101373

Galleli, B., Teles, N. E. B., dos Santos, J. A. R., Freitas-Martins, M. S., & Junior, F. H. (2021). Sustainability university rankings: a comparative analysis of UI green metric and the times higher education world university rankings. *International Journal of Sustainability in Higher Education.* https://doi.org/10.1108/IJSHE-12-2020-0475

Golasi, I., Salata, F., de Lieto Vollaro, E., & Peña-García, A. (2019). Influence of illumination color temperature on indoor thermal perception: A strategy to save energy from the HVAC installations. *Energy and Buildings*, *185*, 112-122. https://doi.org/10.1016/j.enbuild.2018.12.026

Gopal, R., Singh, V., & Aggarwal, A. (2021). Impact of online classes on the Satisfaction and Performance of Students during the Pandemic Period of COVID-19. *Education and Information Technologies*, *26*(6), 6923-6947. https://doi.org/10.1108/AEDS-06-2020-0131

Hamad, M. A., Habibah, A. J., Muhd, K. O., & Mohd, H. M. P. (2022). Demographic Factors of Teachers Behavioral Intentionon Madrasati Utilization in Riyadh Public Schools. *Educational Administration: Theory and Practice*, *28*(4), 13- 33.

Hasbi, I., Hendri, T., Yanti, H. S., Ibdalsyah, A. P., & Efrita, N. (2022). Prophetic Leadership Perspective Didin Hafidhuddinin in Pesantren UlilAl-baab UIKA Bogor Indonesia. *Educational Administration: Theory and Practice, 28*(4), 34-45.

Hassan, A., Alawawda, M., Alzahrani, F., & Naz, N. (2023). Developing an ESP-Based Language Learning Environment to Help Students Improve Critical Thinking Skills in Written Output. *Information Sciences Letters, 12*(4), 1131-1140. https://doi.org/10.18576/isl/120431

Hassan, A., Alhalangy, G, I, A., & Alzahrani, F. (2023). Fake Accounts Identification in Mobile Communication Networks Based on Machine Learning. International Journal of Interactive Mobile Technologies, 17 (4), 64- 74. https://doi.org/10.3991/ijim.v17i04.37645

Hassan, A., Kazi, A. S., & Asmara Shafqat, Z. A. (2020). The Impact of Process Writing on the Language and Attitude of Pakistani English Learners. *Asian EFL Journal*, *27*(4.3), 260-277.

Imanuddin, H., Mahir, P., & Dian, G. U. (2022). Entrepreneurial Educationas Antecedent of Indonesian Private University Students' Entrepreneurial Intention. *Educational Administration: Theory and Practice, 28*(3), 72-82.

Jafari, Z., Kolb, B. E., & Mohajerani, M. H. (2020). Sound exposure accelerates the risk of cognitive impairment and Alzheimer's disease: Adulthood, gestational, and prenatal mechanistic evidence from animal studies. *Neuroscience & Biobehavioral Reviews*, *117*, 110-128. https://doi.org/10.1016/j.neubiorev.2019.04.001

Jiang, J., Wang, D., Liu, Y., Di, Y., & Liu, J. (2021). A holistic approach to the evaluation of the indoor temperature based on thermal comfort and learning performance. *Building and Environment, 196*, 107803. https://doi.org/10.1016/j.buildenv.2021.107803

Kazak, E. (2019). The impact of drudgery jobs and procedures on quality and performance. *Educational Administration: Theory and Practice, 25*(4), 693-744.

Kesik, F., & Aslan, H. (2020). Metaphoric expressions of the students about the concept of happiness. *Educational Administration: Theory and Practice, 26*(2), 303-354.

Kesik, F., & Şahin, İ. (2019). The views of educational constituencies about the compulsory religious culture and morality education course. *Educational Administration: Theory and Practice, 25*(2), 339-366. https://doi.org/10.14527/kuey.2019.009

King, D., Tee, S., Falconer, L., Angell, C., Holley, D., & Mills, A. (2018). Virtual health education: Scaling practice to transform student learning: Using virtual reality learning environments in healthcare education to bridge the theory/practice gap and improve patient safety. *Nurse Education Today*, *71*, 7-9. https://doi.org/10.1016/j.nedt.2018.08.002

Konstantzos, I., Sadeghi, S. A., Kim, M., Xiong, J., & Tzempelikos, A. (2020). The effect of illumination environment on task performance in buildings–A review. *Energy and Buildings, 226*, 110394. https://doi.org/10.1016/j.enbuild.2020.110394

Korsavi, S. S., Montazami, A., & Mumovic, D. (2020). Indoor air quality (IAQ) in naturally-ventilated primary schools in the UK: Occupant-related factors. *Building and Environment, 180*, 106992. https://doi.org/10.1016/j.buildenv.2020.106992

Köse, E. K. (2019). Development and psychometric properties of teacher classroom leadership scale (TCLS). *Educational Administration: Theory and Practice, 25*(1), 139-168. https://doi.org/10.14527/kuey.2019.004

Kou, L., Tao, Y., Kwan, M. P., & Chai, Y. (2020). Understanding the relationships among individual-based momentary measured sound, perceived sound, and psychological stress: A geographic ecological momentary assessment (GEMA) approach. *Health & Place*, *64*, 102285. https://doi.org/10.1016/j.healthplace.2020.102285

Kumar, S., & Singh, M. K. (2021). Seasonal comfort temperature and occupant's adaptive behavior in a naturally ventilated university workshop building under the composite climate of India. *Journal of Building Engineering, 40*, 102701. https://doi.org/10.1016/j.jobe.2021.102701

Lapitan Jr, L. D., Tiangco, C. E., Sumalinog, D. A. G., Sabarillo, N. S., & Diaz, J. M. (2021). An effective blended online teaching and learning strategy during the COVID-19 pandemic. *Education for Chemical Engineers, 35*, 116-131. https://doi.org/10.1016/j.ece.2021.01.012

Leung, W. T. V., Tam, T. Y. T., Pan, W. C., Wu, C. D., Lung, S. C. C., & Spengler, J. D. (2019). How is environmental greenness related to student's academic achievement in English and Mathematics? *Landscape and Urban Planning, 181,* 118-124. https://doi.org/10.1016/j.landurbplan.2018.09.021

Li, J., & Che, W. (2022). Challenges and coping strategies of online learning for college students in the context of COVID-19: A survey of Chinese universities. *Sustainable Cities and Society, 83,* 103958. https://doi.org/10.1016/j.scs.2022.103958

Limon, İ., & Nartgün, Ş. S. (2020). Investigation of teachers' change fatigue level: Comparison by demographics. *Educational Administration: Theory and Practice, 26*(2), 401-448.

Liu, H. W., & Supinda (2022). Effect of Meta-cognitive Listening Teaching Instruction and Awareness on Chinese High School Students. *Educational Administration: Theory and Practice, 28,* 51-59.

Marta, O. F. D., Kuo, S. Y., Bloomfield, J., Lee, H. C., Ruhyanudin, F., Poynor, M. Y., ... Chiu, H. Y. (2020). Gender differences in the relationships between sleep disturbances and academic achievement among nursing students: A cross-sectional study. *Nurse Education Today, 85,* 104270. https://doi.org/10.1016/j.nedt.2019.104270

Mihara, K., Chen, S., Hasama, T., Tan, C. L., Lee, J. K. W., & Wong, N. H. (2022). Environmental satisfaction, mood and cognitive performance in semi-outdoor space in the tropics. *Building and Environment, 216,* 109051. https://doi.org/10.1016/j.buildenv.2022.109051

Minwir, M. A., & Dinh, T. N. H. (2022). The Case Study Benefits for Teaching Business and Economics Students in Universities and Colleges. *Educational Administration: Theory and Practice, 28*(4), 46-60.

Miranda-Zapata, E., Lara, L., Navarro, J. J., Saracostti, M., & de-Toro, X. (2018). Modeling the effect of school engagement on attendance to classes and school performance. *Revista de Psicodidáctica (English ed.), 23*(2), 102-109. https://doi.org/10.1016/j.psicoe.2018.03.001

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in Higher Education during the lockdown period of the COVID-19 pandemic. *International Journal of Educational Research Open, 1,* 100012. https://doi.org/10.1016/j.ijedro.2020.100012

Monge-Barrio, A., Bes-Rastrollo, M., Dorregaray-Oyaregui, S., González-Martínez, P., Martin-Calvo, N., López-Hernández, D., ... Sánchez-Ostiz, A. (2022). Encouraging natural ventilation to improve indoor environmental conditions at schools. Case studies in the north of Spain before and during COVID. *Energy and Buildings, 254,* 111567. https://doi.org/10.1016/j.enbuild.2021.111567

Morgan, I. G. (2018). Myopia prevention and outdoor light intensity in a school-based cluster randomized trial. *Ophthalmology, 125*(8), 1251-1252. https://doi.org/10.1016/j.ophtha.2018.04.016

Mucherah, W., Finch, H., White, T., & Thomas, K. (2018). The relationship of school climate, teacher defending and friends on students' perceptions of bullying in high school. *Journal of Adolescence, 62,* 128-139. https://doi.org/10.1016/j.adolescence.2017.11.012

Nayak, J. K. (2018). Relationship among smartphone usage, addiction, academic achievement and the moderating role of gender: A study of higher education students in India. *Computers & Education, 123,* 164-173. https://doi.org/10.1016/j.compedu.2018.05.007

Noori, A. Q. (2021). The impact of the COVID-19 pandemic on students' learning in higher Education in Afghanistan. *Heliyon, 7*(10), e08113. https://doi.org/10.1016/j.heliyon.2021.e08113

Önen, Z., & Sincar, M. (2019). An analysis of teacher's performance evaluation at private schools: Kahramanmaraş and Gaziantep sample. *Educational Administration: Theory and Practice, 25*(1), 169-190. https://doi.org/10.14527/kuey.2019.005

Raes, A., Detienne, L., Windey, I., & Depaepe, F. (2020). A systematic literature review on synchronous hybrid learning: gaps identified. *Learning Environments Research, 23*(3), 269-290. https://doi.org/10.1007/s10984-019-09303-z

Realyvásquez-Vargas, A., Maldonado-Macías, A. A., Arredondo-Soto, K. C., Baez-Lopez, Y., Carrillo-Gutiérrez, T., & Hernández-Escobedo, G. (2020). The impact of environmental factors on academic achievement of university students taking online classes during the COVID-19 Pandemic in Mexico. *Sustainability, 12*(21), 9194. https://doi.org/10.3390/su12219194

Rodríguez-Espíndola, O., Cuevas-Romo, A., Chowdhury, S., Díaz-Acevedo, N., Albores, P., Despoudi, S., ... Dey, P. (2022). The role of circular economy principles and sustainable-oriented innovation to enhance social, economic and environmental performance: Evidence from Mexican SMEs. *International Journal of Production Economics, 248,* 108495. https://doi.org/10.1016/j.ijpe.2022.108495

Rommel, A. A., & Fathi, A. (2022). Can the Leadership Capabilities of Gifted Students be Measured? Constructing a Scale According to

Rasch Model. *Educational Administration: Theory and Practice, 28*(3), 109-126.

Şahin, F., Yenel, K., & Kılıç, S. (2019). Investigation of teachers' views on a happy work environment by perma model. *Educational Administration: Theory and Practice, 25*(4), 773-804.

Savage, M. J., James, R., Magistro, D., Donaldson, J., Healy, L. C., Nevill, M., & Hennis, P. J. (2020). Mental health and movement behavior during the COVID-19 pandemic in UK university students: Prospective cohort study. *Mental Health and Physical Activity, 19*, 100357. https://doi.org/10.1016/j.mhpa.2020.100357

Serrano-Ruiz, M. P., Ram ́ırez-Quintana, A. L., & Ibarra-Mej ́a, G. (2020). *Role of Physical Environment Factors in Semantic Memory and Cognitive Performance in Open-Plan Offices Users: A Systematic Literature Review.* Retrieved from http://ieworldconference.org/content/SISE2020/Papers/Serrano-Ruiz.pdf

Sheshadri, A., Gitinabard, N., Lynch, C. F., Barnes, T., & Heckman, S. (2019). Predicting student performance based on online study habits: a study of blended courses. *arXiv preprint arXiv:1904.07331*. https://doi.org/10.48550/arXiv.1904.07331

Soliku, O., & Schraml, U. (2018). Making sense of protected area conflicts and management approaches: A review of causes, contexts, and conflict management strategies. *Biological Conservation, 222*, 136-145. https://doi.org/10.1016/j.biocon.2018.04.011

Stough, T., Ceulemans, K., Lambrechts, W., & Cappuyns, V. (2018). Assessing sustainability in higher education curricula: A critical reflection on validity issues. *Journal of Cleaner Production, 172*, 4456-4466. https://doi.org/10.1016/j.jclepro.2017.02.017

Supriyatno, T., Susilawati, S., & Hassan, A., (2020). E-learning development in improving students' critical thinking ability. *Cypriot Journal of Educational Sciences, 15*(5), 1099-1106. https://doi.org/10.18844/cjes.v15i5.5154

Sutter, C. C., & Campbell, L. O. (2022). The Role of Academic Self-Determined Reading Motivation, Reading Self-Concept, Home Reading Environment, and Student Reading Behavior in Reading Achievement among American Indian and Hispanic Students. *Contemporary Educational Psychology*, 102093. https://doi.org/10.1016/j.cedpsych.2022.102093

Us Saqlain, N., Shafqat, A., & Hassan, A. (2020). Perception Analysis of English Language Teachers about Use of Contextualized Text for Teaching ESP. *The Asian ESP Journal, 16*(5.1), 275-299.

Wen, X., Lu, G., Lv, K., Jin, M., Shi, X., Lu, F., & Zhao, D. (2019). Impacts of traffic Sound on roadside secondary schools in a prototype large Chinese city. *Applied Acoustics, 151,* 153-163. https://doi.org/10.1016/j.apacoust.2019.02.024

Yalçın, M., Aypay, A., & Boyacı, A. (2020). Principals' ordeal with bureaucracy. *Educational Administration: Theory and Practice, 26*(1), 203-260.

Yang, D., & Mak, C. M. (2020). Relationships between indoor environmental quality and environmental factors in university classrooms. *Building and Environment, 186*, 107331. https://doi.org/10.1016/j.buildenv.2020.107331

Yanrong, G. (2022). The Role of Russian Spatial Preposition Structure in Russian Language Teaching. *Educational Administration: Theory and Practice, 28*(3), 60-71.

Yuming, X., Jianhua, S., & Kanakarn, P. (2022). Research on Teaching Resource Reform of Innovation and Entrepreneurship Education for Business Administration Specialty. *Educational Administration: Theory and Practice, 28*(3), 83-96.

Zhang, D., Tenpierik, M., & Bluyssen, P. M. (2019). Interaction effect of background sound type and sound pressure level on children of primary schools in the Netherlands. *Applied Acoustics, 154*, 161-169. https://doi.org/10.1016/j.apacoust.2019.05.007

Zhang, Y., & Norhiza, B. I. (2022). The Effectiveness of Digital Game Playing on Vocabulary Learning for Chinese EFL Students *Educational Administration: Theory and Practice, 28*(3), 127-141.