Online Learning as a Bolster for Sustainable Development in the Saudi EFL Context

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Abstract

This study entirely depends on the premise that sustainable online education offers various benefits not only in the context of learning English as a foreign language but also in terms of a sustainable environment. The study's central purpose is to explore the way through which online education contributes to sustainable development, which is in line with numerous sustainable objectives adopted by the Kingdom of Saudi Arabia to help achieve the 17 Sustainable Development Goals (SDGs), whose technical component is also acknowledged and accentuated by Saudi Arabia's 2030 Vision. In light of this, this study investigates the effects of online learning on sustainable growth in Saudi Arabia's post-COVID-19 higher education institutions, particularly in terms of quality education and clean climate. In doing so, the paper uses a mixed-method approach exemplified by quantitative and qualitative processes and manifested in two instruments: a questionnaire and an interview. The sample consists of 160 EFL students and 23 EFL teachers. All participants are affiliated with a Saudi university. Results reveal that online learning has significantly contributed to sustainable development, particularly in terms of quality education and clean climate. Concerning quality education, the results reveal a positive impact of online learning on enhancing both learners' autonomy and learners' willingness to communicate and decreasing learning anxiety. As for clean climate, results demonstrate that online learning has a significant, positive impact on environmental preservation and energy saving. Also, there was a strong and positive link between how well Saudi Arabia's higher education institutions handled the digital shift and their e-learning capabilities for sustainable growth, improvisational skills, and organizational preparedness.

Keywords: sustainability, online learning, quality education, clean climate, EFL settings, Saudi Arabia

1. Introduction

By acknowledging the SDGs' (sustainable development goals) technical component in its 2030 Vision, the government of Saudi Arabia is eager to implement sustainability measures at universities since they are a crucial part of the country's sustainable development ambitions. Universities in Saudi Arabia have undertaken major digital transformation and e-learning initiatives with the goal of long-term growth. Saudi institutions abandoned traditional instruction in favor of online learning during the pandemic. Online education is being used at an astounding and overwhelming rate. Saudi Arabia is committed to promoting economic diversification and sustainable growth, as seen by Vision 2030, which is an example of the kingdom's commitment to sustainable development. Nonetheless, Saudi Arabia, like many other nations, has a variety of sustainability issues in a variety of fields, which are made more difficult by the complex web of globalization. Even while these problems are universal, cultural variations have a significant impact on how people view and react to them.

The COVID-19 epidemic has brought about considerable changes to online learning. Numerous colleges and institutions had to close all across the world (Stecuła & Wolniak, 2022). Online courses have taken the role of in-person instruction. The students discovered that they had to participate in class discussions, provide homework, meet professors from home via digital platforms, and attend courses entirely remotely. For Michelsen and Fischer (2017), sustainable development is one of the numerous benefits of online learning that is especially important on a worldwide basis. Crucially, online learning has many advantages that contribute significantly to sustainable development. For example, online learning eliminates the need for difficult travel and unnecessary transportation, allowing students to learn comfortably from home. Reducing the amount of time spent driving and using public transportation to get to the research location helps lessen the consumption of fossil fuels and the associated negative environmental impacts. Also, students may learn without having to sit in actual classrooms by enrolling in their online courses. Therefore, in the rooms that are not in use at that moment, the electronic equipment is turned off. As a result, schools use less energy for their electrical, heating, and cooling systems, which is undoubtedly better for the environment (Chen et al., 2022).

According to UNESCO (2005a & b), education for sustainable development 2030 is a reaction to the planet's pressing issues, such as ecological change that threatens life as we know it. Globally, the COVID-19 epidemic disrupted the educational system. In order to maintain viability, educational institutions quickly went online. As a result, new, cutting-edge technology and technical strategies were introduced in educational institutions, particularly higher education institutions. The focus shifted to sustainable and transformative

pedagogies. Even if the epidemic is over, it may eventually lead to a sharp rise in the usage of online learning, which would alter human behavior patterns (Mary & Bill, 2020; Dodzi, 2020). Due to the shift to online education in the majority of the educational institutions in Saudi Arabia, there are significant effects on various sectors, including the quality of education (objective No. 4) and climate action and environmental preservation (objective No. 13). For example, in education, there are positive changes and effects on learners that are proved by previous studies (e.g., Altinay et al., 2017; Bond, 2020; Vergara et al., 2022; Zhang et al., 2020, among others), whose contributions emphasize the positive influence of virtual learning on various learning constructs, including willingness to communicate, learners' autonomy, learning motivation, and learning anxiety. As for the environment, it is also revealed by previous studies that the energy sector will eventually be impacted by these shifts in educational and behavioral patterns (Yang et al., 2020), which will also alter the quantity of energy used in the educational system and maybe even reverse its structure and energy-use habits.

This study is significant because its main objectives go in parallel to the Saudi 2030 Vision, in which the technical connection between education and environmental sustainability is emphasized. This significance is twofold: first, it focuses on the effectiveness of online education as a bolster to achieve a sustainable environment; and, second, it shows the extent to which the 2030 vision of Saudi Arabia recognizes the technological aspect of the Sustainable Development Goals (SDGs). Obviously, like other nations, Saudi Arabia has put in place a number of plans and programs to help achieve the 17 Sustainable Development Goals. The Saudi Vision 2030 is a comprehensive development strategy emphasizing curriculum improvement, higher education promotion, and labor-market skills. In addition, Saudi Vision 2030 aims to push individuals to define their employment and enhance educational metrics globally.

Successfully addressing these sustainability issues requires cooperation amongst people with different cultural origins who are motivated by the same vision of sustainable development. Understanding the close relationship that exists between the different institutional bodies and EFL instruction, we contend that skilled EFL students may make a significant contribution to Saudi Arabia's efforts to solve the issues brought about by sustainability. These students may make a difference by identifying successful communication techniques, comprehending cultural quirks, and inspiring sustainability initiatives that meet the needs of a connected world. This claim is based on the knowledge that EFL is crucial in today's interconnected world and that sustainability initiatives are closely linked to the capacity to manage the issues posed by globalization. The current study, therefore, attempts to explore the extent to which online learning contributes effectively to sustainable development in the Saudi EFL context by answering the following research questions:

RQ1. How does online learning contribute to quality education in terms of learning anxiety?

RQ2. How does online learning contribute to quality education in terms of learners' autonomy?

RQ3. How does online learning contribute to quality education in terms of learners' willingness to communicate?

RQ4. How does online learning contribute to a clean climate with regard to environmental preservation and energy saving?

The answer to the abovementioned research questions comprises the primary objective of the current study: to explore the way through which online learning bolsters sustainable development in the Saudi EFL context in terms of quality education and clean climate, with a particular emphasis on four variables: learning anxiety, learners' autonomy, learners' willingness to communicate, and environmental preservation and energy saving.

The rest of this study is structured as follows: Section 2 reviews the literature pertinent to the theme addressed here. Section 3 presents the method, the instruments used in data collection, the design of the study, and the analytical stages adopted in the analysis of the collected data. Section 4 demonstrates the results of the study. Section 5 offers the discussion of the obtained results. Section 6 demonstrates the conclusion of the study, and Section 7 provides some pedagogical implications, limitations, and recommendations for future research.

2. Literature Review

2.1 Sustainability and Education

One of the well-known facts accentuated by UNESCO (2005b) is that education constitutes an essential component in the process of sustainable development. One of the basic objectives of sustainable development is quality education. Education, therefore, becomes a crucial carrier and bolster for sustainable development that has been acknowledged all over the world (Taimur & Sattar, 2020; Vilmala et al., 2022). Sustainability is frequently used to describe tenacity, endurance, or sustenance. It can also mean maintaining infrastructures, cultures, or habitats. It frequently has something to do with development, like the idea of sustainable development. Despite these various interpretations, it is widely acknowledged that social, economic, and ecological factors are all part of sustainability initiatives. These three factors are also interdependent and connected to one another (Stephens et al., 2008). According to the World Commission on Environment and Development (1987), development is often associated with sustainability. Sustainable development, for instance, is development that satisfies current demands without endangering the capacity of future generations to satisfy their own.

The definition of sustainable education development is learning that values cultural diversity and equips students to make informed decisions and assume responsibility for the environment, the economy, and a moderate community for the various generations (Bekteshi & Xhaferi, 2020). Moreover, teaching the future generation about global challenges and how to change themselves is a commitment made by educational sustainability (Petkute, 2012). Furthermore, it is acknowledged that rather than creating a brand-new, exclusive topic, the concepts of sustainable development should be taught across a variety of disciplines and integrated into the current curriculum (Xiao & Pan, 2022). Thus, in line with this idea, education on sustainable development is then integrated into a variety of subject areas, including EFL instruction. By removing geographical restrictions and facilitating access to resources and information, online learning has

completely transformed education. Students can investigate a range of environmental courses and programs, including those that address sustainability, climate change, conservation, and environmental policy, through online platforms. Because of its accessibility, students may have meaningful conversations with classmates and professionals and get a deeper knowledge of environmental issues. Furthermore, one way to reduce the negative environmental effects of production and transportation is through online education. Online learning drastically lowers the need for resources like textbooks, desks, energy, and buildings that are necessary for the traditional educational system. As a result, less trash is produced, and precious natural resources are preserved. Additionally, online learning saves money and time for both students and educational institutions.

2.2 Sustainable Development in the EFL Context

Within the scope of EFL, sustainable development is clearly shown in one of the sustainable development objectives: quality education. This objective serves to guarantee everybody better opportunities for education. Online learning functions to facilitate such a type of quality education for all persons, specifically in times of emergencies (Downes, 2023; Reese, 2014; Wang et al., 2023). Online learning provides virtual classes that enable learners to commit themselves to the learning process with all its different activities regardless of time and place (Khafaga, 2021). In seeking an answer to the question of how online learning supports sustainable development in terms of quality education, one can say that it fosters various learning constructs during the online learning process. Among these learning constructs are learning anxiety, learners' autonomy, and learners' willingness to communicate. Learning anxiety refers to the process in which a feeling of fear controls learners during the learning process in a way that may impede their academic progress (Sozudogru et al., 2019). Learners' autonomy, on the other hand, constitutes the process in which learners can create their own learning environment (Lazorak et al., 2021). As for the learners' willingness to communicate, it shows the desire of learners to communicate with their instructors and classmates during the learning process (MacIntyre et al., 1998). Much previous research deals with the effective role of online learning in decreasing learning anxiety as well as in improving both learners' autonomy and their willingness to communicate (e.g., Almekhlafy, 2020; Baloran & Hernan, 2021; Castelli & Sarvary, 2021; Gamble, 2018), among others. For example, Symonds et al. (2021) argue that online learning functions to decrease learners' anxiety in a way that enables them to manage their learning process in a more comfortable manner than is the case with face-to-face instruction. Also, Lawson and Lawson (2020) state that learners' autonomy is improved and developed during online learning more than is the case in traditional instruction. As for the learners' willingness to communicate, Antón-Sancho et al. (2022) emphasize that online learning strengthens student-teacher rapport, which in turn serves to enhance the students' desire to communicate more comfortably during virtual classes.

Despite the fact that the social dimension of sustainability is very crucial, the economic and environmental aspects frequently garner greater emphasis (Chen et al., 2021). As a result, language is crucial to the framework of human connections since it serves as a tool for negotiation and a signifier of social interaction. It is noteworthy that the three core components of sustainable development—improving communication, improving human learning, and improving critical thinking—are strongly impacted by the language used (Silva et al., 2021). Furthermore, language not only facilitates communication but also offers an insight into the conventions, traditions, and thought processes of those who use it. From the perspective of culture, wherein speakers of a specific language have a deep understanding of the message coding and transmission mechanism, it acts as a linking system that guides humans (Chen et al., 2021).

Furthermore, EFL is crucial for communicating meanings in a larger context, particularly in this globalization era that encourages the blending of many cultural and personal traits. For instance, as the global policies and guidelines intended to slow down global warming are presented in English, students also use the language extensively to communicate knowledge across many racial and cultural backgrounds (Zhao et al., 2022). In a similar spirit, the ability to communicate with speakers of a second or foreign language across cultural boundaries provides access to a range of scholarly resources, enabling both beginning and seasoned researchers to take part in the field's continuing activities (An et al., 2022). These data demonstrate that the use of English will offer speakers more chances to develop and contribute favorably to the global community's sustainable development. This is clearly shown by the fact that English is used globally as a means of communication, and it therefore can be perceived as an essential element that can contribute to a sustainable education development.

2.3 Online Education as a Bolster for Sustainable Development

Due to their pedagogical efficacy, economic efficiency, and ecologically responsible practices, sustainable online classes are a hot topic in modern education. The environmental effects of virtual classrooms are examined by Abdelwahed et al. (2022), with a focus on how less commuting and physical infrastructure needs might reduce carbon footprints. According to Safdar et al. (2020), online learning may save money for both students and institutions, which is crucial for the long-standing practicability of the economy. As stressed by Al Rawashdeh et al. (2021), pedagogical efficacy is essential in online learning contexts. They emphasize how important interaction, learner support, and instructional design are to building effective online learning environments. The significance of accessibility and inclusion in long-term online learning is emphasized by Bekteshi and Xhaferi (2020). In order to increase accessibility and inclusion, they support the usage of learner-generated content and open educational materials. Online courses that are sustainable take into account economic, educational, and environmental aspects and offer a holistic approach to modern learning that strikes a balance between efficacy, economy, and ecological responsibility.

When comparing various nations, it becomes clear that there were a variety of obstacles and factors that contributed to the idea of whether or not online education managed to be sustainable throughout the COVID-19 epidemic (Silva et al., 2021). Four essential categories are

identified by the United States: wellness (i.e., emotionally-based, mentally-based, and socially-based); usability (technology and instructional designs); and sustainable networks, such as the role of school and the role of the family. These elements emphasize how complicated the problems are that come with online education in the US (An et al., 2022). According to Abdelwahed et al. (2022), on the other hand, lists specific issues that Saudi Arabia is facing, such as stress, worry, lack of time and assistance, technological problems, insufficient technical skills, and issues with cost and internet access. These elements point to the need for a closer examination of the psychological and institutional challenges faced by Saudi Arabian students. For Zheng et al. (2021), there is a connection between student attributes and contentment with online learning, which further indicates that a person's character and abilities have a big impact on how successful online education is.

Previous research has emphasized that online learning promotes environmental sustainability by lowering carbon emissions from transportation and the corporeal infrastructure of traditional education. It is impossible to overstate the importance of developing online courses that are sustainable. Numerous advantages of these classes have been discovered, including reduced expenses, schedule flexibility, comfort, enhanced dialogue, and the opportunity for independent education (Xiao & Pan, 2022). According to Yin et al. (2022), the various emissions of carbon can be decreased if a complete shift towards digital education is achieved. This supports ecological sustainability. The pandemic has brought attention to the need for flexibility as well as the advantages that come with online education for learners. A study by Al Rawashdeh et al. (2021) indicates that most students would want to go on with their online education after the epidemic. Thus, robust technology infrastructure and digital literacy combined with sustained online learning provide educational institutions with the adaptability they need to meet unforeseen difficulties. Furthermore, the importance of accessibility in online learning cannot be overstated.

Solving sustainability problems requires an all-encompassing strategy. Global sustainability goals are aligned with Saudi Arabia's initiatives in renewable energy, conservation of natural resources, and attempts to combat climate change (Oraif, 2024). Through proactive adoption of sustainable methods, the country showcases its dedication to environmental stewardship and acts as a model for other nations confronting comparable difficulties. Moreover, Saudi Arabia's dedication to fostering a sustainable future transcends national boundaries as a global contributor. The country's commitment to actively participating in global sustainability efforts is demonstrated by its partnerships, investments, and involvement in international activities. It was discovered that chances for marginalized communities may be provided by sustainable online courses, which can aid in addressing socioeconomic and geographic gaps. In this regard, Glavič (2020) argues that there are benefits to sustainable online learning in terms of inclusivity and the environment. They are essential to preserving education's efficacy and accessibility in a world that is changing all the time.

This review of the literature looks at the problems and contextual elements that affect sustained digital learning in Saudi Arabia. The online learning environment during the pandemic was greatly impacted by a number of elements, including individual psychological and emotional states, instructional design, and technology infrastructure. To develop inclusive and adaptable online education models globally, a thorough knowledge of these diverse viewpoints is necessary. Thus, the current paper seeks to demonstrate the way through which online education supports sustainable development. Such a sustainable development is in line with the objectives adopted by the Kingdom of Saudi Arabia to help achieve the 17 Sustainable Development Goals (SDGs), whose technical component is also acknowledged and accentuated by Saudi Arabia's 2030 Vision. In light of this, the current study investigates, via an emphasis on the educational procedures that were in place during the pandemic, the effects of digital learning on sustainable growth in Saudi Arabia's post-COVID-19 higher education institutions. It also examines the challenges and opportunities presented by digital learning in Saudi higher education institutions.

3. Methodology

In this section, the paper provides data collection procedures, data description, analytical procedures, participants, and research instruments.

3.1 Data: Collection, Description, and Instruments

The methodology adopted in this study entirely depends on a mixed-method approach constituting two analytical instruments. The first instrument is the questionnaire, and the second instrument is the interview. The instruments serve to arrive at reliable results pertaining to the main objectives set in this study. The study, therefore, is a quantitative-qualitative investigation of the data collected for the analytical purposes sought to be conducted. Data were collected electronically; that is, both the questionnaire and the interview were designed and circulated among participants electronically. Before being allowed to access the survey, potential participants were required to fill out an informed consent form indicating their readiness to participate in the study and their acceptance for the data to be used for research purposes. The questionnaire was designed using the Google Forms platform and distributed among participants via WhatsApp groups at the end of the first semester, 2024. The statements of the questionnaire revolved around one basic purpose: the extent to which online learning serves as a bolster for sustainable development. The interview abounds in five open-ended questions presenting the main objective of the current study. The interview questions also focus on the extent to which online learning contributes to a sustainable development in the Saudi EFL context. Thus, this study analytically incorporates both quantitative and qualitative methods of analysis by selecting its sample from EFL learners setting in the Saudi universities. This, in turn, will provide further results that can be applied to various education and EFL settings and within different contexts.

3.2 Research Design

Based on the mixed-methods grounded theory (MMGT) (Guetterman et al., 2019), this study employs a mixed-method approach

(Creswell & Clark, 2011), which is exemplified by the incorporation of elements of both quantitative and qualitative processes. The mixed-methods approach is justified by the possibility that combining quantitative and qualitative data in the study might produce robust and legitimate conclusions. A thorough grasp of how EFL teachers and students view virtual learning in relation to classroom involvement and face-to-face instruction is also made possible by the quantitative-qualitative methodological integration. A four-part questionnaire for students and an interview for teachers comprise the design of this empirical study. Although it is one of the study's limitations, the researcher's choice to use only one Saudi university to represent the sampled population was made in order to obtain verifiable and credible results because the researcher could monitor and observe the study participants.

The four-part questionnaire pertaining to respondent students encompasses 40 statements distributed to four variables (10 statements each) that deal with two major objectives of the (SDGs): the first is quality education and the second is clean climate. The statements of the former objective revolve around three learning constructs: learning anxiety, learners' autonomy, and willingness to communicate, whereas those pertaining to the second objective constitute one variable: environment preservation and energy saving. Also, the questions of the interview focus on the four variables, either those pertaining to the first objective or those related to the second one. Despite the fact that the questionnaire is intended to test the attitudes of the participants concerning the (in)effectiveness of online learning in boosting and sustaining a sustainable development, the interview serves to investigate the attitudes, subjective experiences, and emotional responses of EFL teachers on how online learning contributes to sustainable development. The purpose of the interview, therefore, is to supplement the quantitative information from the questionnaires with qualitative information. Individual interviews with the participating instructors were carried out, and respondents' privacy and the confidentiality of the data they submitted were guaranteed. The students' questionnaire used a three-item Likert scale (agree, can't decide, and disagree) to rate agreement, disagreement, and/or inability to decide, while the teachers' interview used a three-item Likert scale (positive, neutral, and negative) to rate their attitudes, positivity, neutrality, and/or negativity.

3.3 Validity and Reliability

Three university English professors with expertise in teaching English as a foreign language confirmed the correctness of the four-part questionnaire and the interview. They examined and confirmed the correctness of the items included in the questionnaire and the interview questions, as well as their wording and structure, as well as their objectivity, applicability, relevance, and clarity. They suggested several adjustments and alterations, all of which were fully included in the tools used. Cronbach's alpha equation, a commonly used measurement of the reliability and internal consistency of opinion surveys, was used to quantify the internal consistency of the questionnaire questions (Kane, 2013). The students' questionnaire had reliability ratings of (0.87). Fifteen students made up the questionnaire sample that the researcher used to confirm stability using internal consistency. According to statistics, the greater the Cronbach's alpha value, the more consistent the items are with one another (Tavakol & Dennick, 2011). As a result, extremely high internal consistency was attained, demonstrating the surveys' great dependability. In addition to conducting survey analyses, the Statistical Package for Social Science (SPSS, version 25.0) was utilized to compute the Cronbach's alpha coefficient for data analysis.

3.4 Participants

The participants in this study are twofold: EFL students in the department of English at Prince Sattam bin Abdulaziz University and teachers who are teaching EFL courses at the same institution. Students are both males and females, and their ages are between 18 and 22 years. They are selected randomly in order to be proven as representative of the study sample. The total number of the student sample is 160 (n=160), whereas the number of the teachers' sample is 23 (n=23), and their ages are between 35 and 60 years. The participants are dedicated to expressing their attitudes concerning the extent to which online education is perceived as an effective and/or ineffective bolster for sustainable development. The questionnaire is dedicated to students, whereas the interview is to be conducted with the teachers. The items of the questionnaire and the questions of the interview are judged by two experts in the EFL field for validity and reliability.

3.5 Research Procedures

The procedures followed in this study constitute various stages: the preparation of data, the designation of both questionnaire and interview, the distribution of the questionnaire and interview, the collection of data, the results identification, the results discussion, and the linguistic and pedagogical implications. Throughout the different analytical procedures employed in this study, the focus is on exploring the extent to which online learning contributes to sustainable development in Saudi Arabia’s educational institutions. Analytically, this is conducted by casting emphasis on two sustainable development objectives: the first is quality education, which is investigated in terms of three learning variables: learning anxiety, learners' autonomy, and learners' willingness to communicate; and the second objective is clean climate, in which the focus is on one variable: environmental preservation and energy saving. The procedures adopted here constitute the various stages this study passes by, starting from the stage in which data are collected, passing by the analysis of data, and arriving at obtaining the results from the analyzed data.

4. Results

This part presents the results obtained from the analysis of data. It demonstrates the results in terms of the demographic data of respondent students and respondent teachers, the results pertaining to students' questionnaire in terms of the three learning constructs related to quality education, namely learning anxiety, learners' autonomy, and learners' willingness to communicate, and the results related to clean climate with regard to environment preservation and energy saving. This section also shows the results pertaining to the teachers' interview concerning the role of online learning in boosting sustainable development.

4.1 Results Pertaining to Respondents' Demographic Data

This section clarifies the demographic data of the respondent students in terms of four variables: gender, age, number of virtual classes each participant has in each semester, and nationality. Also, it shows the demographic data of the respondent teachers in terms of six variables, including gender, age, nationality, teaching experiences, academic rank, and number of assigned online courses per semester. Tables 1 and 2 add more clarification.

Table 1. Demographic data of respondent students (*n=160*)

Variable	Categorization	Number	Percentage
gender	female	111	69.375
	male	49	30.625
age	18	76	47.5
	19	51	31.875
	<19-22	33	20.625
No. of virtual classes per semester	1	21	13.125
	2	29	18.125
	3	42	26.25
	<3	68	42.5
Nationality	Saudi	160	100.00

Table 1 shows the demographic data of the student sample. The table indicates that the respondent students are descriptively categorized in terms of four variables: first, gender, which shows that they are into females (n=111/ 69.375%), and males (n=49/30.625%); second, age, which indicates that the ages of the majority of the respondent students are 18 (n=76/ 47.5%) and19 (n=51/31.875%), whereas the rest (n=33/20.625%) is between 19 to 22 years old; third, number of virtual classes, which shows that the majority (n=68/42.5%)of the respondent students have more than 3 virtual courses per semester, whereas (n=42/26.25%), (n=29/18.125%), and (n=21/13.125) reported that they have 3, 2, 1 virtual courses per semester, respectively; fourth, nationality, which indicates that all respondent students are Saudis.

Table 2. Demographic data of respondent teachers (*n=23*)

Variable	Categorization	Number	Percentage
gender	male	16	69.565
	female	7	30.434
age	35	2	8.695
	35-40	5	21.739
	40-45	8	34.782
	45-50	4	17.391
	50-55	3	13.043
	55-60	1	4.347
nationality	Saudi	5	21.739
	Egyptian	4	17.391
	Pakistani	4	17.391
	Sudanese	3	13.043
	Indian	3	13.043
	Jordanian	2	8.695
	Moroccan	1	4.347
	Algerian	1	4.347
teaching experiences	>5 years	2	8.695
	5-10	13	56.521
	10-15	6	26.086
	<15	2	8.695
academic rank	Professor	1	4.347
	Associate Professor	11	47.826
	Assistant professor	6	26.086
	Lecturer	5	21.739
number of assigned online courses per semester	1	3	13.043
	2	3	13.043
	3	7	30.434
	<3	10	43.478

Table 2 demonstrates the demographic data pertaining to the respondent teachers. As indicated from the table, the sample of the teachers is classified according to six variables, including gender, age, nationality, teaching experiences, academic rank, and number of assigned online courses per semester. In terms of gender, the participants are males (n=16/69.565%) and females (n=7/30.434%). Regarding age, the results indicate that the majority of the participants are 40-45 (n=8/34.782%) and 35-40 (n=5/21.739%) years old, whereas the ages of the rest vary from 35 (n=2/8.695%), 45-50 (n=4/17.391%), 50-55 (n=3/13.043%), 55-60 (n=1/4.347%). Concerning nationality, results show that the respondent teachers come from different countries with different nationalities, including Saudi (n=5/21.739%), Egyptian (n=4/17.391%), Pakistani (n=4/17.391%), Sudanese (n=3/13.043%), Indian (n=3/13.043%), Jordanian (n=2/8.695%), Moroccan (n=1/4.347), and Algerian (n=1/4.347%). With respect to teaching experiences, the majority of the participants (n=13/56.521%) reported that they have a teaching

experience of 5-10 years, whereas the rest of the participants stated that they have less than 5 years of experience in teaching (n=2/8.695%), 10-15 years (n=6/26.086%), and more than 15 years of experience (n=2/8.695%). With regard to the academic rank, results show that the participants have various academic ranks, including professors (n=1/4.347%), associate professors (n=11/47.826%), assistant professors (n=6/26.086%), and lecturers (n=5/21.739%). As for the number of virtual classes assigned to each participant, results indicate that the majority of teachers (n=10/43.478%) have been assigned the teaching task of more than 3 virtual courses per semester, whereas the rest of the participants reported that they are assigned 7 courses (n=7/30.434%), 2 courses (n=3/13.043%), and 1 course (n=1/13.043%). Consequently, the results demonstrated in Table 2 indicate that the respondent teachers have different cultural backgrounds, different ages, genders, teaching experiences, and various academic ranks. Significantly, the several variables that describe the two participant types, students and teachers, support a verifiable kind of results that advances the primary goal of the current study: to explore the way online learning bolsters sustainable development in terms of quality education and clean climate.

4.2 Results Pertaining to Respondent Students' Questionnaire

This section demonstrates the results pertaining to the impact of online learning on sustainable development in terms of two sustainable development objectives. The first is quality education, which encompasses the analytical and descriptive investigation of three learning constructs, including learning anxiety, learners' autonomy, and learners' willingness to communicate. The second is clean climate, which is analytically and descriptively discussed in light of environmental preservation and energy saving. The following subsections add more clarifications.

4.2.1 Online Learning and Quality Education: Learning Anxiety

The results of this part serve to answer the first research question: how does online learning contribute to quality education in terms of learning anxiety? This is conducted by considering the results demonstrated in Table 3.

Table 3. Students' perception of online learning in relation to learning anxiety *(n=160)*

No	Statement	Response							
		Agree		Can't decide		Disagree		Mean	SD
		No	%	No	%	No	%	%	%
1	I feel less anxious when I receive my courses online.	109	68.12	13	8.12	38	23.75	2.44	0.73
2	Online learning decreases my anxiety concerning deadlines.	127	79.37	5	3.12	28	17.5	2.62	0.59
3	Online learning decreases my anxiety concerning virtual class participation.	143	89.37	3	1.87	14	8.75	2.81	0.33
4	I feel comfortable that I will receive immediate instructor's support in online learning environment.	123	76.87	17	10.62	20	12.5	2.64	0.48
5	I find it difficult to efficiently manage my time while I'm learning online, which exacerbates my anxiety.	11	6.87	7	4.37	142	88.75	1.18	0.29
6	I don't get anxious when I participate in online discussions.	113	70.62	3	1.87	44	27.5	2.43	0.8
7	Online learning flexibility reduces my anxiety in terms of academic responsibilities.	139	86.87	2	1.25	19	11.87	2.75	0.43
8	The availability of lecture recordings eases my fear of skipping classes.	153	95.62	0	0.00	7	4.37	2.91	0.17
9	Online learning allows me overcome problems of time and place.	157	98.12	0	0.00	3	1.87	2.96	0.07
10	Online learning decreases my anxiety in terms of creating my own learning environment.	126	78.75	7	4.37	27	16.87	2.62	0.58

As indicated from Table 3, the participants express positive attitudinal behavior concerning the effective role of online learning in enhancing their learning anxiety that they may encounter in face-to-face instruction. The majority of respondent students have agreed to the idea that online learning helps relieve their fear from learning and makes them feel more comfortable in dealing with the various activities conducted during virtual classes. As results in Table 3 show, the majority of participants (68.12%) agree that they feel less anxious when they undergo online classes (M=2.44), that online learning decreases their anxiety concerning deadlines (79.37%) (M=2.62), that online learning decreases their anxiety in terms of virtual class participation (89.37%) (M=2.81), and that they receive immediate support during online classes (76.87%) (M=2.64). Regarding the counter statement (Statement No. 5), the majority of the participants have expressed their disagreement that online learning increases their learning anxiety with a disagreement percentage of (88.75%) (M=1.18), which accentuates the participants' awareness of the statements delivered. Further, (70.62%) (M=2.43) of the respondent students agree that they are encouraged to participate in virtual discussions with their instructors, which also emphasizes the positive effect of online learning on students' performance. They also demonstrate their agreement that the flexibility of online learning improves their commitment in fulfilling their academic responsibilities (86.87%) (M=2.75), as well as in decreasing their fear of skipping classes thanks to the flexible option of recording lectures (95.62%) (M=2.91). In response to whether or not online learning decreases their anxiety and helps them create their own virtual learning environment, 78.75% (M=2.62) agree that being less anxious during the learning process enables them to shape and reshape a particular learning environment of their own.

4.2.2 Online Learning and Quality Education: Learners' Autonomy

This part provides an answer to the second research question: how does online learning contribute to quality education in terms of learners' autonomy? This can be clearly shown by considering the results demonstrated in Table 4.

Table 4. Students' perception of online learning in relation to learners' autonomy *(n=160)*

No	Statement	Response							
		Agree		Can't decide		Disagree		Mean	SD
		No.	%	No.	%	No.	%	%	%
1	Online learning helps me control my learning pace.	139	86.87	7	4.37	14	8.75	2.78	0.35
2	Online learning allows me the opportunity to learn on my own.	118	73.75	3	1.87	39	24.37	2.49	0.74
3	I don't feel independent when I learn online.	19	11.87	3	1.87	138	86.25	1.26	0.43
4	Online learning helps me to be a self-directed learner.	123	76.87	12	7.5	25	15.62	2.61	0.55
5	Online learning platforms improve my independent learning.	117	73.12	9	5.62	34	21.25	2.52	0.68
6	I feel more responsible for my academic performance when I learn online.	98	61.25	16	10.00	46	28.75	2.33	0.8
7	I feel more confident to manage my learning environment via online learning.	137	85.62	3	1.87	20	12.5	2.73	0.45
8	Online learning provides me the ability to make decisions concerning my learning processes.	97	60.62	19	11.87	44	27.5	2.33	0.78
9	I can get to various learning sources by my own when I learn online.	112	70.00	3	1.87	45	28.12	2.42	0.81
10	In online learning, I feel more independent to ask for the clarification of any point than in traditional classes.	141	88.12	7	4.37	12	7.5	2.81	0.31

Table 4 demonstrates a positive attitude concerning the perception of online learning as a bolster for learners' autonomy. This can be obviously noticed from the obtained results, which show that the majority of the participants agree that online learning helps them monitor their learning pace (86.87%) (M=2.78), learn on their own (73.75%) (M= 2.49), be self-directed learners (76.87%) (M=2.61), improve their autonomous learning (73.12%) (M=2.52), be responsible for their academic performance (61.25%) (M=2.33), be more confident to manage their learning environment (85.62%) (M=2.73), be able to make decisions during their virtual learning process (60.62%) (M=2.33), get to various learning sources by their own during virtual classes (70.00%) (M=2.42), and feel more independent to ask for the clarification of any point than is the case with traditional instruction (88.12%) (M=2.81). In response to the counter statement (Statement No. 3), the majority of the participants (86.25%) (M=0.43) express their disagreement to the idea that they do not feel independent when they learn online. The results in Table 4, therefore, mirror a very positive perception among participants concerning the effectiveness of online learning in boosting and sustaining an autonomous learner.

4.2.3 Online Learning and Quality Education: Learners' Willingness to Communicate

This part offers the answer to the third research question: how does online learning contribute to quality education in terms of learners' willingness to communicate? This can be descriptively clarified in Table 5.

Table 5. Students' perception of online learning in relation to willingness to communicate *(n=160)*

No	Statement	Response							
		Agree		Can't decide		Disagree		Mean	SD
		No.	%	No.	%	No.	%	%	%
1	Online learning helps me communicate with my peers without shyness.	124	77.5	2	1.25	34	21.25	2.56	0.68
2	I can develop more communicative skills while learning online.	119	74.37	13	8.12	28	17.5	2.57	0.6
3	I can express my ideas more comfortably in virtual classes than in face-to-face learning.	114	71.25	7	4.37	39	24.37	2.47	0.74
4	Online learning decreases my willingness to communicate.	9	5.62	15	9.37	136	85.00	1.21	0.28
5	I feel more confident to communicate with my instructors in online learning.	149	93.12	3	1.87	8	5.00	2.88	0.21
6	I feel more willing to communicate because of the various interaction tools used in online learning.	107	66.87	19	11.87	34	21.25	2.46	0.68
7	My readiness to speak in academic settings has grown as a result of online learning.	133	83.12	8	5.00	19	11.87	2.71	0.45
8	My ability to communicate in real-life settings is improved by the abilities I acquire from online learning.	98	61.25	23	14.37	39	24.37	2.37	0.72
9	The encouraging atmosphere of online classes enhances my willingness to communication.	115	71.87	4	2.5	41	25.62	2.46	0.77
10	I feel less anxious about communicating with others when I participate in online learning activities.	152	95.00	2	1.25	6	3.75	2.91	0.16

The results in Table 5 show that the majority of the respondent students have a positive attitude in terms of the effectiveness of online learning on their willingness to communicate during virtual classes. As is clarified in Table 5, respondent students express their unanimous

agreement that online learning helps them communicate with their peers without shyness (77.5%) (M=2.56), develop more communicative skills during virtual classes (74.37%) (M=2.57), express their ideas more comfortably in virtual classes than in face-to-face learning (71.25%) (M=2.47), feel more confident to communicate with their instructors (93.12%) (M=2.88), feel more willing to communicate because of the various interaction tools used in online learning (66.87%) (M=2.46), improve their readiness to speak in academic settings (83.12%) (M=2.71), enhance their ability to communicate in real-life settings (61.25%) (M=2.37), and feel less anxious about communicating with others when they participate in online learning activities (95.00%) (M=2.91). Further, the majority of the participants (85.00%) (M=1.21) demonstrate a unanimous disagreement on the counter statement (Statement No. 4) that online learning decreases their willingness to communicate.

4.2.4 Online Learning and Clean Climate: Environment Preservation and Energy Saving

This part attempts to answer the fourth research question: how does online learning contribute to a clean climate with regard to environmental preservation and energy saving? The results displayed in Table 6 add more clarification.

Table 6. Students' perception of online learning in relation to environment preservation and energy saving *(n=160)*

No	Statement	Response							
		Agree		Can't decide		Disagree		Mean	SD
		No.	%	No.	%	No.	%	%	%
1	By eliminating the need for commuting, online learning lowers carbon emissions.	143	89.37	3	1.87	14	8.75	2.81	0.33
2	Online learning minimizes the use of paper, encourages digital alternatives and lessens deforestation.	111	69.37	27	16.87	22	13.75	2.56	0.53
3	Compared to traditional campus energy use, the energy needed for online learning platforms is typically more sustainable.	121	75.62	32	20.00	7	4.37	2.71	0.29
4	I think my own carbon footprint may be greatly decreased by switching to online education.	127	79.37	30	18.75	3	1.87	2.78	0.21
5	I have been inspired to embrace environmentally friendly habits like taking notes digitally via online education.	119	74.37	12	7.5	29	18.12	2.56	0.61
6	Online learning encourages resource conservation by decreasing the demand for physical textbooks and resources.	142	88.75	4	2.5	14	8.75	2.8	0.34
7	Online learning lowers air pollution and traffic jamming.	151	94.37	4	2.5	5	3.12	2.91	0.14
8	Online learning encourages the utilization of green energy to further enhance sustainability.	97	60.62	42	26.25	21	13.12	2.48	0.52
9	I am less conscious of how much energy I use when taking online classes.	24	15.00	13	8.12	123	76.87	1.38	0.54
10	Campus operations' energy usage is decreased with online learning.	138	86.25	5	3.12	17	10.62	2.76	0.4

Table 6 displays the perception of respondent students in terms of the effectiveness of online learning as a bolster for sustainable development, particularly with regard to environmental preservation and energy saving. As indicated from Table 6, the majority of the participants emphasize the positive effect online learning has on sustaining a clean climate. They express their agreement that online learning serves to eliminate the need for commuting and, therefore, lower carbon emissions (89.37%) (M=2.81), minimize the use of paper, encourage digital alternatives, and lessen deforestation (69.37%) (M=2.56), use less energy than is the case with traditional learning (75.62%) (M=2.71), decrease the carbon footprint (79.37%) (M=2.78), encourage learners to embrace environmentally friendly habits like taking notes digitally (74.37%) (M=2.56), decrease the demand for physical textbooks and resources (88.75%) (M=2.8), decrease air pollution and traffic jamming (94.37%) (M=2.91), encourage the use of green energy (60.62%) (M=2.48), and lessen campus operations' energy use. Concerning the counter statement (Statement No. 9), the majority of the participants disagree to the idea that they are less conscious of how much energy they use when taking online classes (76.87%) (M=2.76). Thus, the majority of the respondent students show a very positive attitude towards the effective role of online learning on the environment's preservation and energy saving.

4.3 Results Pertaining to Respondent Teachers' Interview

As mentioned before, the purpose of the interview is to find out how EFL instructors subjectively perceive online learning's role as a bolster in sustainable development, particularly in terms of quality education manifested in the three learning constructs of learning anxiety, learners' autonomy, and learners' willingness to communicate, and clean climate represented by the variable of environment preservation and energy saving. Therefore, the primary aim of the interview is to add qualitative information to the quantitative data from the questionnaire.

Table 7. Teachers' perception of online learning as a bolster for sustainable development *(n=23)*

No.	Question	Positive attitude		Neutral attitude		Negative attitude		Mean	SD
		No.	%	No.	%	No.	%	%	%
1	Do you think that online learning provides high-quality education that can effectively support sustainable development?	17	73.91	1	4.34	5	21.73	2.52	0.1
2	Do you think that online learning supports environmental sustainability and energy conservation?	19	82.60	0	0.00	4	17.39	2.65	0.08
3	Do you think that online learning is a sustainable alternative to face-to-face education in terms of environmental impact?	21	91.30	0	0.00	2	8.69	2.83	0.05
4	Do you think online learning has made quality education more accessible to students from diverse backgrounds?	23	100.00	0	0.00	0	0.00	3	0
5	Do you think that online learning decreases learning anxiety and enhances learners' autonomy and willingness to communicate?	16	69.56	2	8.69	5	21.73	2.48	0.1

Table 7 shows the perceptions and subjective experiences of respondent teachers regarding the impact of online learning on sustainable development in terms of quality education and clean climate. In response to the first interview question, the majority of the respondent teachers (73.91%) (M=2.52) express a positive attitude concerning the assumption that online learning provides high-quality education that can effectively support sustainable development. They also agree (82.60%) (M=2.65) that online learning has a positive impact on achieving environmental sustainability and energy conservation. In terms of quality education, respondent teachers demonstrate an agreement (91.30%) (M=2.83) that online learning is a sustainable substitute to face-to-face education in terms of environmental impact. The respondent teachers unanimously (100.00%) (M=3) agree that online learning has made quality education more accessible to students from diverse backgrounds. As for their attitudes concerning the impact of online learning on the three learning constructs pertaining to quality education, the majority of the participants (69.56%) (M=2.48) have positive attitudes that online learning functions to decrease learning anxiety on the part of their students, enhance their autonomy in the learning process, and improve their willingness to communicate during virtual classes.

5. Discussion

The aforementioned analysis and results show that online learning is unquestionably a crucial part of sustainable growth and should be further promoted for green education, even though it cannot completely replace in-person instruction. This, in turn, correlates with many previous studies (e.g., Altinay et al., 2017; Michelsen & Fischer, 2017; Mary & Bill, 2020; Chen et al., 2022; Vilmala et al., 2022; Wang et al., 2023), whose contributions also emphasize the effective role online learning plays to achieve sustainable development, particularly in terms of education and clean climate. The obtained results show that online learning provides high-quality education that can effectively support sustainable development, which also goes in conformity with Bond (2020), who accentuates the assumption that online learning has a positive impact on students' engagement within virtual classes, and also reconciles with Zheng et al. (2021), whose study emphasizes that the virtual learning environment helps produce a better performance on the part of the students than is the case with face-to-face instruction. Significantly, the analysis of the current study further highlights the assumption that online learning reduces barriers to education and contributes to sustainable development, creating inclusive, flexible learning environments that can change to meet the requirements of society is a component of sustainable development in education. This is greatly aided by online learning, which offers flexible and scalable learning options.

The analysis demonstrates that, within the Saudi EFL context, online learning promotes sustainable development in terms of quality education and clean climate, which goes in conformity with a number of previous studies (e.g., Glavič, 2020; Chen et al., 2022; Downes, 2023), which highlight the effective role of online education in boosting sustainable development. With regard to the quality education objective, the analysis clarifies that online learning has impacted students in terms of three learning constructs: learning anxiety, learners' autonomy, and learners' willingness to communicate. Concerning the learning construct of learning anxiety (research question No. 1), it is analytically shown that Saudi EFL students' learning anxiety is significantly reduced by online learning, which also significantly contributes to the advancement of sustainable educational growth. Whereas this result correlates with Sozudogru et al.'s (2019) argument that virtual learning functions to reduce learners' anxiety during the process of learning, it does not reconcile with Autman and Kelly's (2017) and Yaghi's (2022) contention that learners' anxiety is increased during online learning imposed during the pandemic. Online platforms enable students to participate more successfully and confidently in their language learning journeys by providing environments that are resource-rich, flexible, and helpful. To guarantee that the advantages of online learning are fully realized, it is crucial to proactively address related difficulties as educational institutions continue to integrate digital technologies. Further, the analysis of the collected data reveals that online learning platforms, compared to typical classroom settings, provide a more laid-back and encouraging atmosphere. In the same vein, this study tunes in with Martin et al.'s (2020) and Ritzhaupt et al.'s (2022) assumption that students can overcome their worries and participate more actively in speaking activities when they have the freedom to study at their own speed and feel comfortable in familiar circumstances. This implies that speaking anxiety may be successfully reduced through online learning, which, in turn, improves language competency. Additionally, because online learning facilitates asynchronous involvement, students have more time to absorb knowledge and prepare answers without the immediate pressure of in-person encounters. This temporal flexibility promotes more deliberate interaction with the content and lessens performance anxiety.

As for the learning construct of learners' autonomy (research question No. 2), the obtained results show that online learning platforms enable students to take control of their education. This is conducted by providing flexibility, individualized resources, and a range of interactive technologies. This result is in conformity with Baloran and Hernan (2021) and Lazorak et al. (2021), who argue that the transition to online learning offers students the chance to hone their self-control, critical thinking, and problem-solving abilities in the Saudi EFL setting, where conventional teacher-centered techniques have long predominated. Furthermore, in consonance with Almusharraf and Khahro's (2020) study, the analysis demonstrates that the availability of a wide range of resources catered to specific requirements is a major benefit of online learning. Saudi EFL students have access to interactive modules, language learning applications, and digital libraries that accommodate different skill levels. With these tools, students may study at their own speed, go over difficult content again, and delve into subjects that interest them. As a result, and reconciling with Susanti et al. (2023), students have a sense of control over their educational path, which promotes long-term engagement and intrinsic motivation. Additionally, online learning makes it easier to collaborate and communicate through peer review platforms, virtual discussion forums, and real-time video conferencing. By exchanging ideas, asking for comments, and having meaningful conversations, these resources empower Saudi EFL students to take an active role in their education. These encounters not only improve language proficiency but also foster self-assurance and independence in negotiating challenging educational settings.

Regarding the learning construct of the willingness to communicate (research question No. 3), the analysis clarifies that Saudi EFL learners' willingness to communicate is enhanced when they undergo online classes and also shows that online learning and online platforms provide a less daunting learning environment for them. Despite the fact that this result is not in line with some previous studies, such as Alawamleh et al. (2022) and Altunel (2021), who argue that students felt much more alone and personalized and were easily distracted at home, which ultimately made them less eager and ready to communicate with others during virtual classes, it goes in the same direction with some previous studies (e.g., Chaisiri, 2023; Fan, 2022; Le et al., 2018; Punyaporn & Soontornwipast, 2022), who argue that students may communicate asynchronously or in real time using features like chat rooms, discussion boards, and video conferencing, which boosts self-esteem and lowers anxiety. Students can progressively improve their communication ability by using text-based tools to communicate their ideas, for example, if they might be reluctant to speak in a traditional classroom. Additionally, the obtained results indicate that the usage of online learning platforms, which offer a variety of multimedia materials including podcasts, movies, and interactive exercises, enhances learning and allows for customization to meet the requirements of each individual. By encouraging students to actively participate in their education, this individualized method raises their willingness to communicate. Significantly, as the results of the questionnaire show, the opportunity to hone language proficiency in a safe, encouraging virtual setting gives Saudi EFL students the self-assurance they need to interact successfully in everyday situations. Consequently, it is analytically demonstrated that online education has shown itself to be a potent instrument for increasing students' communication readiness and promoting sustained educational progress. In the Saudi EFL setting, it offers a nurturing, welcoming, and stimulating atmosphere that enables students to get over obstacles to communication and realize their greatest potential. Saudi Arabia can continue to lead educational changes that support global sustainability goals by embracing online learning and tackling its obstacles, guaranteeing a better future for students and society at large.

Concerning the second sustainable objective, namely clean climate (research question No. 4), the results show that online learning has a positive impact on sustainable development in terms of environment preservation and energy saving. The analysis clarifies that the capacity of online learning to lessen the carbon footprint associated with traditional education is one of its biggest benefits. This result is in line with many previous studies (e.g., Aljaradin et al., 2024; Al Mdawi et al., 2024; Kim & Ryu, 2023; Yin et al., 2022), who also accentuate the effectiveness of online learning on promoting sustainable development. Traditional educational models mostly rely on physical infrastructure, such as training facilities, colleges, and universities, which need a lot of energy to build, maintain, and run on a daily basis. Moreover, transportation to and from schools adds to greenhouse gas emissions. These environmental expenses are eliminated or much reduced by online learning (Alotaibi, 2022). Also, in the Saudi EFL environment, where a large number of students live in rural or isolated places, switching to online learning eliminates the need for lengthy commutes or moving to an urban area. In addition to saving energy, this change lessens the harm that transportation-related emissions do to the environment. Reconciling with Meryem et al.'s (2023) study, this paper argues that one of the manifestations of promoting ecological sustainability is that online learning reduces waste and paper consumption due to its decreased reliance on printed materials. Additionally, and in consonance with Mustafa et al.'s (2022) study, this paper's results show that digital technology, which online learning systems rely on, may result in significant energy savings when properly adjusted. When it comes to online learning, centralized data centers and cloud computing platforms are frequently more energy-efficient than the dispersed energy needs of traditional classrooms (Sharma et al., 2024). Within the Saudi EFL university context, EFL instruction has been delivered more efficiently thanks to the widespread use of platforms like Blackboard, which also lowers the energy costs associated with traditional classroom settings. Online learning promotes the use of energy-efficient personal devices, like laptops and tablets, which use a lot less power than the lighting, heating, and cooling systems needed in traditional classrooms. Consequently, by customizing instructional materials to meet the needs of each student, cutting-edge technology like adaptive learning systems helps reduce the need for unnecessary resources.

To recap, in education, sustainable development places a strong emphasis on fairness, inclusion, and chances for lifelong learning. These ideas are supported by online learning, which removes social, economic, and geographic obstacles to education. Online learning is a driving force behind Saudi Arabia's educational changes under Vision 2030, which places a high priority on skill development and technology integration. The accessibility of online learning is one of its main benefits. It bridges the gap between urban and rural communities by providing access to top-notch educational resources for students from isolated or underserved locations. All students, regardless of their

financial situation, will have equal opportunity to improve their language proficiency and succeed academically because of this inclusion. Additionally, by supporting a variety of learning styles and speeds, online education promotes a culture of lifelong learning. Saudi EFL students have access to self-paced courses, recorded lectures, and international language exchange programs, all of which promote ongoing development and flexibility. In line with sustainable development goals, this strategy not only improves individual skills but also helps create a workforce that is competitive and skilled.

6. Conclusion

By employing a mixed-method approach manifested in the incorporation of elements of both quantitative and qualitative methods, this paper provided an empirical investigation to explore the way through which online learning supports sustainable development in the Saudi EFL context. This was conducted by casting emphasis on two sustainable development objectives: quality education, which was discussed in terms of three learning constructs: learning anxiety, learners' autonomy, and learners' willingness to communicate; the second objective was clean climate, which constitutes the discussion of one variable, namely environment preservation and energy saving. The analysis demonstrated that online learning in the Saudi EFL context has a significantly positive effect on sustainable development as it served to decrease students' learning anxiety, improved their learning autonomy, and enhanced their willingness to communicate, on the one hand; and significantly contributed to the preservation of the environment and achieving a high level of energy saving, on the other. As such, it was analytically shown that sustainable online education offered various benefits not only in the EFL context but also in terms of a sustainable environment. Further, findings of this study clarified how the latest pandemic has significantly changed Saudi Arabia's higher education institutions. The findings indicate that online learning programs have become well-known as useful learning tools for postsecondary education because traditional, in-person instruction was suddenly forced to move online due to the COVID-19 epidemic. The current study, therefore, provided analytical evidence that online learning within the Saudi EFL context has the potential to revolutionize education by improving learning anxiety, learners' autonomy, and learners' willingness to communicate, as well as by contributing to sustainable development. This, in turn, accentuates the fact that there is a strong and favorable correlation between Saudi Arabia's higher education institutions' performance in the digital transformation and their e-learning potential for sustainable development, improvisational skills, and organizational preparedness.

7. Pedagogical Implications, Limitations, and Recommendations

Pedagogically, the obtained results are expected to contribute to the process of using and applying modern technologies in the different fields of life in order to achieve a comprehensive sustainable development. Also, EFL instructors may incorporate elements and concepts of sustainable development into their lessons and within an online learning environment. This is anticipated to contribute to a deeper understanding of sustainability topics in an online learning setting and to offer useful insights into the concept of green education that is mainly concerned with both educational and environmental sustainability. Further, EFL instructors can adapt particular teaching strategies in order to ensure that their students are successfully acquainted with the basic concepts of sustainability, particularly in terms of quality education and environmental preservation. Additionally, adopting a hybrid strategy that blends online and in-person education is also crucial to improving the efficacy of online learning in the Saudi EFL environment. This approach preserves the human relationships and support of traditional classrooms while enabling students to take advantage of the flexibility of online resources. To create comprehensive frameworks that incorporate technology into the curriculum while honoring cultural values and traditions, policymakers and educational institutions should work together.

The limitations of this study can be summarized in the fact that it is confined to EFL learners and EFL teachers affiliated with only one Saudi university, which means that its data was collected from only one EFL setting. This emphasizes the fact that the results obtained from this study cannot be generalized to other EFL settings, which further necessitates conducting other studies in other EFL contexts in order to make sure that the obtained results are representative and applicable. Crucially, widening the sample size to cover various educational settings would be constructively useful in producing general and applicable results.

For future research, this study recommends more extensive studies on the extent to which online learning contributes significantly to sustainable development. These studies are recommended to be conducted on other EFL settings and to address other sustainable development goals (e.g., gender inequalities) and additional learning constructs (e.g., learning motivation and learning efficacy) than those investigated here. These recommended studies might offer various results similar to or different from the results revealed in this study, which further contributes effectively to the credibility, representativeness, and applicability of the obtained results.

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