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# What difference does one course make? Assessing the impact of content-based instruction on students' sustainability literacy

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Composition studies, with their cross-disciplinary role in students' academic lives, can be essential in placing sustainability at the center of students' learning. This research assessed the impact of content-based instruction on students' sustainability literacy in a first-year composition course through a mixed-method design. In the quantitative part of this case study, 221 students in different classes of a first-year writing course in a higher education institute in Kuwait during the Fall term of 2022 were first given a pretest to determine their sustainability literacy levels. During a 6-week period, 121 students participated in the content-based instruction emphasizing sustainability, while 100 students comprised the control group, receiving curriculum without any emphasis on sustainability. The allocation of students in these two groups was random, determined solely by the classes they were enrolled in at the beginning of the semester. At the end of the semester, both the experimental and control groups were given a posttest to measure the impact of the instruction on their sustainability literacy levels. For the qualitative component, 60 students from the experimental group and 60 students from the control group were tasked with composing an essay identifying Kuwait's major sustainability challenges and proposing corresponding solutions. The impact of content-based instruction on students' literacy levels was measured by conducting a qualitative and quantitative content analysis on their writing. The results showed that the experimental group students made statistically significant improvements in their sustainable literacy levels, scored better on the posttest, used more sustainability terms and concepts, and identified more sustainability-related challenges and solutions in their essays.

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## Introduction

Our planet faces a critical emergency, evident in ecosystem devastation, species extinction, the depletion and destruction of vital resources, widespread pollution, and extreme poverty affecting billions of people. Scientists attribute these challenges significantly to our ignorance of the limits of Earth's resources.

With its 17 Sustainable Development Goals (SDGs), the United Nations' 2030 Sustainable Development Agenda is one of the most important attempts to solve the intricate global issues of our day. Reaching the objectives of sustainable development (SD) requires education. According to the UN, sustainability literacy includes the mindsets, abilities, and information people need to genuinely commit to creating a sustainable future and make wise decisions in that direction (Decamps, 2017).

The Education for Sustainable Development (ESD) framework, developed by the UN, serves as a roadmap for institutions and educators to revise curricula and teaching pedagogies based on sustainability principles. This framework is employed by hundreds of universities worldwide (Yuan and Zuo, 2013). ESD has gained political and institutional acceptability in many parts of the world recognizing the potential of promoting sustainability literacy to foster creative solutions to the world's problems.

There is consensus that higher education institutions (HEIs) ought to promote sustainable development via research and activism since all students, regardless of their field of study, have the capacity to be social change agents. As a result, pupils need to acquire the skills necessary to contribute to a sustainable future (Buckler and Creech, 2014).

HEIs are responsible for teaching sustainability literacy and producing environmentally conscious citizens, given their ability to shape students' attitudes and perspectives (Stephens et al. 2008). This endeavor holds particular significance in creating a new generation keenly aware of the global environmental challenges we are going through (Koehn and Uitto, 2017).

Leal Filho (2010) argues that universities cannot avoid dealing with the biggest problems that humanity is currently experiencing. Additionally, he contends that ESD is especially important in higher education since students will soon be pursuing careers in a variety of fields and will need to understand how their careers can contribute to the solution of sustainability issues. According to Leal Filho (2010), ESD will inspire students "to take action both during their time as students and, later on, as professionals" (p. 2). Therefore, in order to effectively address the difficulties they will experience in their various disciplines, undergraduates should develop competence-based sustainability awareness and literacy.

Sustainable development is not restricted to a single science. Composition studies, with their inherent cross-disciplinary and distinctive purpose in students' academic lives, can play an important role in making sustainability a core focus of the curriculum. Composition instructors have the freedom to teach in a variety of contexts and disciplines. While teaching composition is as labor-intensive as any other subject in higher education, writing instructors have more clout to urge students to investigate a wide range of topics than academics who teach in more specialized fields (Owens, 2001).

Although certain curricular initiatives have been the subject of research, the impact of curriculum design on improving sustainability understanding has not received as much attention. Because of this, there are currently no guidelines in the literature for developing curriculum that specifically address sustainability learning objectives. Therefore, the goal of this project is to enhance students' sustainability literacy by supporting the development of a structured curriculum in a first-year writing course. In order to do this, this study examined the benefits of

utilizing textual and audiovisual materials in content-based instruction to introduce students to the three dimensions of sustainability as well as the United Nations Sustainable Development Goals.

Content-based instruction (CBI) is a popular approach to language education that combines content and language learning. Content-based education varies from standard language classes in that language comes second to content. This teaching technique is deemed effective because it employs English as a medium to impart content knowledge while providing various opportunities for students to use English in class (Brinton et al. 2003). Thus, the use of English stems from meaningful purposes (content learning) and frequent practice (opportunities to use English), resulting in an environment conducive to rich discussions, ultimately improving language fluency while reinforcing the content taught in a variety of academic areas. In other words, content-based language acquisition gives pupils a valid or relevant purpose to use the language they are learning (Kennedy 2006).

The CBI is seen as an effective tool for preparing students for higher education studies in a new language and context. Song (2006) conducted a long-term study to find out how well CBI worked for ESL students at a community college in the United States. According to the study, students enrolled in the content-linked ESL program passed the ESL course with greater marks and pass rates. They also performed better in follow-up ESL and developmental English classes. Overall, compared to their peers, the ESL students who were linked to content demonstrated higher levels of long-term academic performance. Higher GPA overall, graduation and retention rates, and English proficiency exam pass rates were all indicators of this achievement.

According to Stoller (2004), CBI stands out for its dedication to both language and content-learning objectives. Over the years, the program has garnered support as a result of students' improved language skills and content-area knowledge at the elementary, middle, and post-secondary education levels, which attests to its perceived successes. According to Kennedy (2006), kids who study languages in addition to other subjects perform better academically and are able to make links between their studies and the real world. Multiple teaching methodologies are employed in content-based foreign language instruction, which also accounts for the variety of learning styles and intelligences present in the classroom (Kennedy, 2006).

However, despite the abundance of interest in using CBI to increase students' awareness of certain topics and concepts, there is still a lack of research in assessing the impact of CBI on sustainability literacy. There are a few case studies, several reports of individual attempts and class practices to implement CBI in EFL classes to familiarize students with sustainability concepts (Vorholt, 2018; Schneider, 2017), and the empirical studies tend to focus on assessing teachers' perspectives on teaching sustainability to their students (Shah et al., 2022; Majjala et al., 2023). Additionally, studies assessing the impact of CBI on students' sustainability literacy with an experimental research design are very rare in the literature. Thus, this research is expected to make an important contribution to the field of sustainability education in higher education institutions.

This research employs a case study approach due to its ability to allow in depth, multifaceted explorations of complex issues in a real-world context (Crowe et al., 2011). This methodology aligns with the exploratory nature of this research, enabling us to generate a contextualized understanding that contributes to the existing body of knowledge. The selected case institution offers a valuable opportunity to examine a real-world scenario that is both relevant to our research questions and has generated practical implications for decision-makers in the field.

The main research questions that will guide the study are as follows:

1. Did the content-based instruction have any significant effect on the participants' sustainability literacy levels?
2. Are there any differences between the control and experimental groups' essays in terms of students' perceptions of sustainability challenges and their solutions in Kuwait?

## Background

**Sustainability.** The idea of sustainability is not so new; it existed before the field of environmental sciences as we know it today. Nonetheless, the need to use resources sustainably has become more widely recognized due to factors including population growth, increased consumption following the Industrial Revolution, and the threat of the depletion of essential resources like coal, oil, and wood. Fears that living standards would not be maintained for current or future generations sparked a style of thinking that led to the creation and acceptance of sustainable development (Du Pisani, 2006).

Although there is still no commonly accepted definition of sustainability, its context has eventually widened to include “three pillars”; namely the social, economic, and environmental aspects of sustainability (Purvis et al., 2019). Initially, the focus was mainly on the environmental dimension of sustainability and many researchers considered this dimension more important than the other two, however, later, the economic, and social dimensions started to attract similar amounts of attention (Colantonio, 2007).

Following the 1972 United Nations Conference on the Human Environment, which was the first UN conference devoted to environmental issues, there have been global efforts to redefine sustainability. There are many definitions of sustainable development, but the one that is most often cited comes from the 1987 Brundtland Report, also known as Our Common Future: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987).

Solutions to sustainability issues, whether ecological, social, or economic, hinge on decision-making processes at both the organizational and individual levels. It is important to recognize that organizational decisions stem from individual choices (Carley and Behrens, 1999). Therefore, the success of sustainability goals largely relies on individual decision-making, particularly in consumer behavior. By opting for sustainable choices, consumers can drive demand for sustainable products and services, articulate their values, reduce their environmental footprint, and contribute to building a culture of sustainability. The positive effect of education on pro-environmental consumption behaviors is evident in the literature (AlNuaimi and AlGhamdi, 2022; Adjengdia and Schlegelmilch, 2020; Achola et al., 2020) and was recognized in the Brundtland Report (1987).

Furthermore, in 2002, the World Summit on Sustainable Development and the Commission on Sustainable Development emphasized the crucial role of information in informed decision-making. Hence, education emerges as a vital instrument in achieving sustainability goals. It empowers individuals and communities to take meaningful action and make informed choices that safeguard the environment while promoting social and economic development.

**Sustainability literacy.** Organizations from a variety of sectors have prioritized educational projects aimed at improving people's understanding of sustainability because they believe that a

sustainable future requires a society that is knowledgeable about sustainability. The significance of sustainability education has been emphasized recently by international organizations, private companies, and most significantly, higher education institutions. Renewing interest in creating trustworthy assessments of sustainability literacy and knowledge has coincided with the increased emphasis on sustainability education.

Various approaches have been used to develop a valid assessment tool for sustainability literacy. One noteworthy example is the SULITEST (Sustainability Literacy Test), established after the Rio+20 Conference (Decamps et al., 2017). SULITEST is an online standardized set of multiple-choice questions that can be used globally, alongside specialized modules tailored to specific national, regional, and cultural contexts. Décamps et al. (2017) outlined the structure of this tool and highlighted its potential for measuring sustainability literacy on a global scale, recommending its adoption by educational institutions.

Similarly, Zwickle and Jones (2017) developed a web-based survey tool to assess the sustainability knowledge of undergraduate students at Ohio State University; this tool involved 1000 participants and comprised 16 multiple-choice questions. In the United States, the American Association for the Advancement of Sustainability in Higher Education (AASHE) introduced the Sustainability Tracking Assessment Rating System (STARS) in 2010, with participation from more than a thousand institutions by 2022. The STARS evaluates the sustainability efforts of colleges and universities in the U.S., rewarding institutions that offer a greater number of sustainability-related courses or even require students to complete at least one sustainability course as part of their general education requirements (Bullock and Wilder, 2016). Participating institutions assess the sustainability literacy of their students, focusing on their knowledge of sustainability topics and challenges.

As higher education institutions and society at large increasingly prioritize the importance of individuals' understanding of sustainability, the need for accurate assessments of sustainability knowledge becomes more significant. The development of improved measures of sustainability knowledge is anticipated to enhance sustainability education and ultimately cultivate a population with higher levels of sustainability literacy (Kuehl et al., 2023).

**Sustainability in Kuwait.** Kuwait is identified as one of the wealthiest countries in the world, owing to its substantial revenues derived from the oil sector. The country enjoys an abundance of wealth from the oil sector which make up more than 90% of Kuwait's export earnings, a dependence that makes it difficult to diversify the economy and develop other industries that are less reliant on fossil fuels (Eltony, 2002). Consequently, Kuwait encounters various sustainability challenges, primarily stemming from its heavy reliance on oil revenues (AlOthman and Palliam, 2018). Some of the major environmental challenges faced by Kuwait are air pollution, water scarcity, and waste management. The country has high levels of air pollution due to its petrochemical industry activities and transportation. Water scarcity is a significant issue in Kuwait, where desalination plants are relied upon to meet water needs. Nevertheless, Kuwaitis consume a staggering 520 l of freshwater per capita per day, one of the highest in the world (Kuwait National Development Plan, 2017). Waste management poses another significant challenge, as Kuwait generates large amounts of waste due to high mass consumption, necessitating proper disposal and recycling methods (Al Yaqout et al., 2002; Koushki et al., 2004). Currently, water and energy consumption, along with waste production per capita, rank among the highest globally in Kuwait.

The country has launched several initiatives to promote sustainable development, and the most significant initiative is the Kuwait National Development Plan (KNDP) that serves as a roadmap for sustainable development in Kuwait. The KNDP emphasizes the importance of economic, social, and environmental sustainability and sets targets for reducing carbon emissions, improving waste management, and promoting renewable energy (Kuwait National Development Plan, 2017). Kuwait officially embraced the SDGs in September 2015, subsequently integrating them into its Vision 2035 plan.

Despite these efforts, Kuwait currently holds the 101st position out of 163 countries, with an overall score of 64.53 (Sachs et al., 2022). Furthermore, there remains a gap in the implementation of sustainable practices by government agencies and a lack of sustainable awareness among the public. Very few studies exist in this domain, with the overarching message emphasizing the need for greater awareness of sustainability in Kuwait. For example, a study by Al Qattan and Gray (2021) revealed that government policies and practices inadequately address pollution issues, particularly in Kuwaiti water bodies. Similarly, AlSanad (2015) found that lack of awareness acts as a main barrier to adopting sustainable construction approaches in Kuwait and stresses the need for governmental initiatives such as standards, policies, and incentives to promote sustainability. According to similar research (Koushki et al., 2004; AlSulalili et al., 2014; Al Beeshi et al., 2020), there is a dearth of public knowledge of sustainable waste management techniques and municipal programs for waste prevention, reduction, or recycling.

Kuwait's overall score of 64.53 places it 101st out of 163 countries, notwithstanding these efforts (Sachs et al., 2022). In addition, there is still a lack of public understanding of sustainability issues and a gap in the way government agencies are implementing sustainable practices. There are very few studies in this field, and most of them emphasize how important it is for Kuwaitis to be more conscious of sustainability. Al Qattan and Gray's study from 2021, for instance, showed that pollution problems are not sufficiently addressed by government policies and practices, especially when it comes to Kuwaiti water bodies. Similar findings were made by AlSanad (2015), who highlighted the necessity of governmental initiatives such as standards, rules, and incentives and discovered that a major obstacle to Kuwait's adoption of sustainable construction practices is a lack of awareness.

In conclusion, despite burgeoning awareness of sustainability among businesses and the government's initiatives to promote sustainability, Kuwait still requires heightened awareness and implementation of sustainable practices and concerted efforts to address the nation's oil reliance and propel towards a more sustainable future.

Methodology

This study has a true experimental research design with random assignment of students in control and experimental groups, with a pretest and posttest administered to both groups. A mixed-method sequential explanatory approach was adopted to collect the data, which were first quantitative and then qualitative in two consecutive phases of the study (Creswell, 2012; Creswell and Clark, 2011). Using mixed methods helps to provide a more comprehensive framework of the phenomenon by enabling rich and informative data and validating and triangulating the data by analyzing the same issue through both quantitative and qualitative methods (Silverman, 2000).

**Research population.** The research population of the study consisted of students at a private university in Kuwait based on an

Table 1 Demographics of the research population.					
Variable		Control		Experimental	
		n	%	n	%
Gender	Female	83	68.6	48	48.0
	Male	38	31.4	52	52.0
High School	Other	5	4.1	6	6.0
	Private	20	16.5	19	19.0
	(Arabic/Bilingual)				
	Private (International)	26	21.5	23	23.0
College of study	Public (Arabic)	70	57.9	52	52.0
	College of Arts & Sciences	44	36.4	32	32.0
	College of Business	77	63.6	68	68.0
Grade Point Average (GPA) <sup>a</sup>	Below 2.00	27	22.3	27	27.0
	Between 2.00 and 3.0	53	43.8	42	42.0
	3.00 and above	41	33.9	31	31.0
Whether they heard the term sustainability before	YES	80	66.1	88	88.0
	NO	41	33.9	12	12.0
Total		121	100.0	100	100.0

<sup>a</sup>The GPA scale used at this university is 4.00.

American-style model of higher education that offers instruction in English. A total of 221 first-year composition students participated and were divided into experimental and control groups, with 100 students assigned to the experimental group and 121 to the control group. The allocation of students into these groups was random and determined by their enrollment in specific course sections at the beginning of the semester. The discrepancy in group sizes reflects variations in the number of students per course section, typically ranging from 20 to 25.

In the experimental group, 100 students received specialized content-based instruction focused on sustainability, while the remaining 121 students in the control group completed regular assignments as outlined in the course syllabus, covering various predetermined topics assigned by their writing instructors. Both groups underwent a pretest before the commencement of content-based instruction and a posttest at the conclusion of the semester.

The participants' demographic information is displayed in Table 1.

For the qualitative part of the study, the researcher collected essays from students at the end of the Fall semester of 2022. The research population consisted of students in both the experimental and control groups who attended the class and signed the consent form on the day of data collection, week 15 of Fall 2022. There were 65 students who produced an essay in the experimental group and 67 in the control group. Five essays from the experimental group and seven essays from the control group were eliminated because they had a very low word count (less than 100 words), thus, 120 were left for analysis.

**Data collection.** The quantitative section collected data through an adapted version of the Sustainability Literacy Assessment, prepared by a committee at the University of Wisconsin-Oshkosh to measure the university's sustainability performance, within the Sustainability Tracking, Assessment & Rating System (STARS) framework (2018). The assessment form included four sections,



Table 2 Reliability scores of the data collection tool.		
Section	Test	Cronbach's Alpha
Skills	Pretest	0.814
	Posttest	0.893
Attitudes	Pretest	0.715
	Posttest	0.806
Topics and Concepts	Pretest	0.920
	Posttest	0.950

testing the knowledge level with five multiple-choice questions, and assessing students' self-reported skills, attitudes and familiarity with some sustainability topics and concepts on a five-point Likert scale. The Institutional Review Board (IRB) approval (case number 278674) was obtained, and students signed the consent form before the data collection. A total of 221 students completed the questionnaire—121 in the control group and 100 in the experimental group.

Table 2 shows the reliability scores of these sections of the data collection tool. When the scales are examined, it is determined that they have a good level of reliability. A Cronbach's alpha greater than 0.50 indicates that the scale used is reliable. This also indicates that the internal consistency of the scale used in the study is good.

In the qualitative data collection, students in both the experimental and control groups were asked to write a short essay identifying the major sustainability challenge of Kuwait and offering solutions to this problem. This session was conducted during the scheduled class time of 50 min, on the computer under the instructor's supervision.

**Data analysis.** The quantitative data were analyzed using the SPSS Statistics (Statistical Package for Social Sciences) for Windows 25.0 program. Along with descriptive statistical methods (numbers, percentages, minimum-maximum values, median, mean, standard deviation), chi-square analysis was applied to test the homogeneity of the groups. The data were checked for the normal distribution compatibility with Q-Q plot drawing for its skewness and kurtosis values ( $\pm 3$ ).

For quantitative data comparison in normally distributed data, an independent *t* test was used for comparisons between two independent groups, and a dependent *t* test was used for comparisons between two dependent stages. One-way ANOVA was applied for comparisons of more than two independent groups.

Three processes comprise the data analysis process in qualitative research: arranging and prepping the data for analysis, coding and condensing the data to reduce the data into themes and presenting the data in tables and figures (Creswell, 2012). The content analysis method was used to assess the data collected for this study. The methodical, impartial, and, if feasible, quantitative examination of the content of different documents is known as content analysis (Bilgin, 2006). Content analysis's primary goal is to find ideas and connections that will contribute to the explanation of the information gathered.

The student essays were imported into the MAXQDA 2022 program, which utilizes visual analysis tools extensively and offers a more structured approach to data analysis than manual analysis (Kuckartz and Rädiker, 2019). To identify the most frequent words and word combinations in the essays, a quantitative content analysis was performed using the MaxDictio function of the software. For the qualitative content analysis, a combined approach incorporating both inductive and deductive methods was employed. The researcher thoroughly reviewed the data

multiple times, generating initial codes. Codes that were related to each other were then grouped together under relevant themes and assigned appropriate names. Subsequently, the obtained themes were elaborated upon in detail and the findings were interpreted.

Results

**Research Question 1.** Did the content-based instruction have a significant effect on the participants' sustainability literacy levels?

The first section of the questionnaire included five questions testing students' knowledge of sustainability. Table 3 below shows the percentages of correct and incorrect answers in the control and experimental groups according to the pretest and posttest scores.

According to Table 3, the experimental group of students in the posttest scored the highest percentage in the knowledge questions. The percentage of correct answers produced by the students in the control group did not show a consistent pattern, while it increased in Q1 and Q3, it decreased in Q2, Q4, and Q5.

However, for the experimental group, the students' correct answers to all the questions increased. To assess whether these differences were statistically significant, an independent *t* test was conducted between the pretest and posttest scores of the two groups.

Table 4 shows the result of the independent *t* test conducted to compare the average knowledge of the participants before and after the CBI. There was no statistically significant difference between the control group and experimental group participants' pretest knowledge averages, but there was a statistically significant difference in posttest averages ( $p < 0.05$ ).

The questionnaire also included questions asking students to evaluate their literacy in skills, attitudes, and topics and concepts regarding sustainability. Table 5 shows the results of the independent *t* test conducted to compare the skills, attitudes, and topic and concept scores of the participants according to their groups. According to these findings, the posttest scores for skills, attitudes, and familiarity with topics and concepts were significantly greater for the experimental group participants than for the control group participants.

**Research Question 2.** Are there any differences between the control and experimental groups' essays in terms of their perceptions of sustainability challenges and their solutions in Kuwait?

To analyze this question, students were asked to write an essay identifying the major sustainability challenge of Kuwait and offering some solutions to it. The essays were processed through MAXQDA, and the frequency distributions of the control and experimental group student essays are shown in Table 6.

According to student perspectives, the major sustainability challenges in Kuwait were dependence on oil, donating money to other countries and unemployment in the economic area. In the environmental realm, pollution and littering were the most frequently mentioned problems, followed by climate change. Loss of biodiversity and scarcity of resources were the other two major environmental sustainability challenges. Social sustainability issues in Kuwait, as per student views, could be listed as health and wellbeing problems, corruption, lack of quality infrastructure, quality of education, gender inequality and discrimination and human rights issues.

Table 6 also shows the number of essays mentioning the coded sustainability problems in each group type. According to these findings, students in the control group identified similar codes for environmental and economic sustainability problems, except for unemployment, with varying frequencies. However, regarding social sustainability problems, no control group student

mentioned quality of education, reducing inequality and discrimination, or traffic accidents, and only one student mentioned malnutrition and obesity, corruption and gender equality. These issues were identified by a larger number of students in the experimental group. Overall, in the sustainability problems content analysis, 94 codes were included in the control group, and 137 codes were included in the experimental group.

Table 7 below shows the codes in the student essays for solutions to Kuwait’s major sustainability problems. According to the content analysis of the essays, the control group students did not mention five solutions that were mentioned by the experimental group. These were Kuwaitization and creating jobs in the economic sustainability domain, improving the quality of education, reducing inequality and discrimination, and reducing traffic accidents in the social sustainability domain. Both groups proposed the same solutions in the environmental domain, with control group 84, and experimental 68 codes. However, overall, the control group students had 104 codes, and the experimental group students had 137 codes for sustainability solutions.

A final content analysis was conducted quantitatively, via the MAXdictio function of MAXQDA to test how many sustainability related terms and concepts the students used in their essays. The list prepared by The Association for the Advancement of Sustainability (AASHE)’s Suggested Keywords for Sustainability Course and Research Inventories (The Association for the Advancement of Sustainability in Higher Education, 2023) was uploaded to the software and the student essays were analyzed based on these keywords.

According to Table 8, the word count of the essays in the experimental group reached 27,751, and that of the control group reached 28,303. Despite the higher word count, dictionary-based content analysis revealed that the experimental group used more sustainability related keywords, as listed in the inventory. Students in the experimental group used 122, and the control group used 97 of these suggested sustainability keywords in their essays.

Discussion

This study aimed to assess the impact of a 6-week course on content-based instruction (CBI) on the sustainability literacy levels of composition students. Our findings indicate that CBI significantly improved the sustainability literacy of the experimental group, as evidenced by their post-test scores and written work.

The first research question was addressed quantitatively, revealing significant improvements in the experimental group’s knowledge levels, skills, attitudes, and familiarity with sustainability concepts compared to those of the control group. This finding suggested that CBI effectively enhanced students’ sustainability literacy.

The second research question was explored qualitatively through the analysis of student essays. The experimental group demonstrated a greater ability to identify sustainability problems facing their country and propose solutions, particularly in the social sustainability domain. Additionally, they used more sustainability-related keywords in their essays, despite the control group having longer essays.

The results of our data analysis for both research questions revealed the positive effect of CBI on student learning. Content-based instruction is indeed widely recognized for its potential to enhance language learning outcomes and our findings are consistent with those of several previous studies in the field. While sustainable development is not frequently included in language education or promoted as part of teacher preparation for language learners (Majjala et al. 2023), it can readily succumb to

Table 3 Percentages of correct/incorrect answers to knowledge questions.

	Control						Experimental					
	Pretest (n = 121)			Posttest (n = 89)			Pretest (n = 100)			Posttest (n = 84)		
	Incorrect		Correct	Incorrect		Correct	Incorrect		Correct	Incorrect		Correct
	n	%	n	n	%	n	n	%	n	n	%	n
Q1	111	91.7	10	79	88.8	10	91	91.0	9	70	83.3	14
Q2	89	73.6	32	67	75.3	22	77	77.0	23	53	63.1	31
Q3	85	70.2	36	58	65.2	31	60	60.0	40	47	56.0	37
Q4	84	69.4	37	65	73.0	24	59	59.0	41	43	51.2	41
Q5	88	72.7	33	67	75.3	22	68	68.0	32	57	67.9	27

The lower number of participants in the posttest compared to pretest results from students’ absence on the posttest date, withdrawal from the course or reluctance to complete the form due to survey fatigue.

**Table 4 Independent T test results of the control and experimental groups' knowledge averages.**

	n	Pretest					Posttest				
		Min	Max	Med	Mean	Sd	Min	Max	Med	Mean	Sd
Control	121	0.00	4.00	1.00	1.22	1.15	0.00	5.00	1.00	1.22	1.17
Experimental	100	0.00	5.00	1.00	1.45	1.18	0.00	5.00	2.00	1.79	1.33
Test value		-1.445 <sup>a</sup>					-2.959 <sup>a</sup>				
p		0.150					<b>0.004*</b>				

\*p &lt; 0.05.

<sup>a</sup>Independent t test.

Bold values emphasize the significant difference for p value.

**Table 5 Independent T test results of the control and experimental groups' averages.**

		n	Pretest					Posttest				
			Min	Max	Med	Ort	SS	Min	Max	Med	Ort	SS
Skills	Control	121	1.00	5.00	3.25	3.24	0.82	1.00	5.00	3.25	3.17	0.93
	Experimental	100	1.75	5.00	3.50	3.49	0.68	1.00	5.00	3.75	3.74	0.75
	Test value		-2.370**					-4.409 <sup>a</sup>				
	p		0.019*					<b>0.000*</b>				
Attitudes	Control	121	2.00	5.00	3.75	3.66	0.59	1.00	5.00	3.50	3.56	0.80
	Experimental	100	1.00	5.00	3.75	3.66	0.68	1.50	5.00	3.75	3.79	0.67
	Test value		-0.040**					-2.105 <sup>a</sup>				
	p		0.968					<b>0.037*</b>				
Topics & Concepts	Control	121	1.00	5.00	3.06	3.08	0.78	1.00	5.00	3.12	3.11	1.01
	Experimental	100	1.12	5.00	3.12	3.12	0.71	1.00	5.00	3.56	3.55	0.71
	Test value		-0.365**					-3.272 <sup>a</sup>				
	p		0.716					<b>0.001*</b>				

\*p &lt; 0.05.

<sup>a</sup>Independent t test.

Bold values emphasize the significant difference for p value.

**Table 6 Codes for sustainability problems in Kuwait in student essays.**

Sustainability Problems	Control	Experimental	SUM
Economic Sustainability Problems			
Dependence on oil	10	2	12
Unemployment	0	4	4
Helping other countries	6	0	6
Social Sustainability Problems			
Health & Wellbeing	3	25	16
Corruption	0	10	10
Lack of quality infrastructure	6	4	10
Quality of education	0	8	8
Discrimination & Inequality	1	4	5
Gender inequality	0	4	4
Environmental Sustainability Problems			
Pollution & Littering	45	51	96
Climate change & Extreme heat	16	13	29
Loss of Biodiversity	3	8	11
Scarcity of resources	4	4	8
SUM	94	137	231

CBI. CBI has begun transforming language-learning environments into places where students utilize language to research urgent global challenges, such as climate change (Turpin, 2022). A wide range of curricular approaches are included in CBI, ranging from language-focused programs where content is viewed

as a helpful tool for extending the goals of the language curriculum to content-focused programs where content acquisition is prioritized over language learning (Met, 1999). As a result, teaching environmental and sustainable education in English as a foreign language (EFL) classes is growing in popularity.

Vorholt (2018) designed and taught a 6-week CBI course titled, "Environmental Issues" to undergraduate students at Lewis & Clark College, USA. The course focused on ecology versus economy, sustainability, and activism, which involved activities such as service learning and speaking. However, although she published her experiences and guidelines for designing the course, she did not assess the impact of student learning at the end of the course. Another review involved evaluating the opportunities for using an online German class as a vehicle for sustainability education in Ecuador, through content-based instruction (Schneider, 2017). This paper proposes adjusting the content of an online class and offering activities that will promote sustainability in a developing economy such as Ecuador.

A similar study was conducted in Switzerland, where SULITEST was administered to first-semester students in an HE institution, both before and after the survey (Zizka and Varga, 2021). Although the method used was not content-based instruction, the authors suggested that students from various nationalities and linguistic backgrounds in the Swiss HEI received an introductory course in English and French to sustainable hospitality culture aimed at providing insight into hospitality and tourism challenges and to reflecting on their sustainable solutions. The course did not specifically target the SDGs, but according to the posttest results, students'

Table 7 Codes for sustainability solutions in Kuwait in student essays.			
Solutions	Control	Experimental	SUM
Economic Sustainability Solutions			
Diversification of income	9	1	10
Creating jobs	0	2	2
Increasing salaries	1	1	2
Kuwaitization	0	2	2
Taxation	1	1	2
Environmental Sustainability Solutions			
Switching to clean energy	21	16	37
Raising awareness	14	10	24
Imposing fine & penalty on violators	12	8	20
Conserving & Recycling	8	11	19
Investing in public transportation	6	8	14
Planting trees	7	4	11
Better waste management	7	2	9
Laws to reduce carbon emissions	2	7	9
Moving industry outside residential areas	7	2	9
Social Sustainability Solutions			
Improving quality of education	0	17	17
Fighting malnutrition & obesity	1	16	17
Accountability & Anticorruption	1	9	10
Building resilient infrastructure	6	5	11
Providing gender equality	1	6	7
Reducing inequality & discrimination	0	5	5
Reducing traffic accidents	0	4	4
SUM	104	137	241

knowledge about sustainability in general improved, and even exceeded the worldwide averages overall.

An attempt to incorporate environmental sustainability was made by task-based teaching in a translation course at two universities in Indonesia (Siregar et al., 2022). At the end of the course, the posttest demonstrated that the student’s confidence, one of the keys to acquiring a language, increased when using specific terms. The combination of task-based learning with appropriate content that is relevant to personal life, such as environmental sustainability increased the students’ motivation to learn and benefit from the translation activity.

Task-based learning was used in a translation course at two Indonesian institutions in an effort to include environmental sustainability (Siregar et al. 2022). The post-test at the end of the course showed that utilizing particular terms boosted the student’s confidence, which is one of the cornerstones to learning a language. Students were more motivated to learn and gain from the translation exercise when task-based learning was combined with relevant, real-world topics, including environmental sustainability.

A closer look at the findings of the second research question highlights the fact that students in both the experimental and control groups produced the highest number of codes for sustainability problems and solutions in the environmental pillar of sustainability. This aligns with the literature which suggests that the environmental pillar of sustainability is most often the one that students are more aware of (Zizka and Varga, 2021). For example, Chaplin and Wyton (2014) found that university students strongly associate recycling and sustainable living, and in

Table 8 Dictionary-based content analysis results according to group.		
Document set	Total word count	Frequency of Sustainability Keywords
Control group	28,303	97
Experimental group	27,751	122

many cases, they are believed to be the same thing. According to Drayson et al. (2014) the environmental dimension is the most prominent dimension in university students’ understanding of sustainable development. Another study conducted in China (Yuan and Zuo, 2013) showed that the students’ perceptions of the top priorities for higher education for sustainable development are generally environmentally oriented.

One interesting finding of the content analysis of the essays is that students in the experimental group mentioned more social sustainability problems and solutions than did those in the control group. These essays produced codes such as corruption, gender inequality and (lack of) quality of education, which are indeed some major social sustainability challenges Kuwait is facing, as reported in the Sustainable Development Report by the UN (Sachs et al., 2022). Gender inequality in Kuwait has been described as “significant challenges stagnating” by the UN, scoring particularly low in indicators such as the “ratio of female-to-male labor force participation” and ‘seats held by women in the national parliament’. Despite the growing achievements of Kuwaiti women, they still face challenges in social, cultural, and political arenas (Al Zuabi, 2016). In his study, Al Zuabi explored the Kuwaiti women’s challenges in attaining participation in the sociopolitical development of Kuwait and found that there are barriers preventing their empowerment and effective participation in national development. The fact that four students in the experimental group presented this problem and offered solutions to ensuring gender equality in the country as opposed to zero students in the control group could be interpreted as a positive influence of the sustainability-focused CBI.

Another major social problem that the country is facing and that emerged in the experimental group essays is corruption. Kuwait’s score in the Corruption Perceptions Index is decreasing (Sachs et al., 2022) and is defined as a significant challenge indicator. According to Al Saif (2020), corruption is a multi-layered system in Kuwait that involves more than embezzlement and money laundering, with “wasta” (the Arabic word for the use of connections and influence to gain favors) serving as the cornerstone. Although corruption poses an existential threat to the country, it remains widespread to the extent that it has “become a staple of governance and a feature of everyday life in Kuwait” (Al Saif, 2020). Kuwait’s ranking in corruption indices falls every year, and this major social problem was identified solely by experimental group students, rather than by the control group.

The quality of education was another social sustainability problem mentioned by the experimental group students, but not by the control group. Despite some challenges, Quality Education (SDG 4) is a domain in which Kuwait seems to be doing better according to UN standards, with its high literacy and school enrollment rates. However, the Kuwaiti education system falls far below international standards and is quite inefficient, resulting in a higher cost per student. Among 141 countries, Kuwait has been ranked 112th globally in the skillset of graduates and 83rd in the quality of vocational training, according to the Global Competitiveness Report (World Economic Forum, 2019). Kuwait University, the only state university in the country, was ranked 9th in the GCC region, 19th in the Arab World, and 83rd in the MENA



region (Abualrub, 2016). The major underlying reasons include a short school year, a high repetition rate, and low expenditure on school textbooks and teaching materials (Burney et al., 2013). The education system would benefit from increased use of technology, improved educational curriculum, and higher recruitment standards for teachers and their teaching skills (Murad and AlAwadhi, 2018; AlFelaij, 2016; AlHashem and AlHouti, 2021).

Foreign language teachers can play a crucial role in promoting sustainability; however, there are certainly some obstacles to implementing sustainability education in foreign language classes. Academics' attitudes and level of awareness play a key role in shaping the successful implementation of a range of pedagogical techniques for ESD goals (Crosling et al. 2020). Currently, the greatest challenge is teachers' lack of knowledge of sustainability concepts and their limited experience in teaching sustainability (Maijala et al., 2023; Shah et al., 2022).

In some countries where sustainability issues are on the political and educational agenda, in-service courses aiming to strengthen university teachers' competence in integrating sustainable development (SD) into their classes are underway. At Uppsala University, Sweden, such a course was open to diverse participants from different faculties and allowed for stimulating exchanges of knowledge and perspectives (Rehn, 2018).

## Conclusions and recommendations

In conclusion, this study aimed to evaluate the effects of a six-week content-based instruction (CBI) on the sustainability literacy of first-year composition students. The results from the experimental group showed significant enhancements in knowledge, skills, attitudes, and familiarity with sustainability concepts, as evidenced by the independent t test and content analysis findings.

Quantitative analysis revealed a clear increase in students' sustainability literacy, aligning with CBI's recognized potential to enhance language learning outcomes. Qualitative examination of the student essays further highlighted a deeper grasp of sustainability issues, particularly in the environmental domain, echoing existing literature regarding heightened environmental awareness among students.

Additionally, the experimental group demonstrated a heightened awareness of pressing social sustainability challenges in Kuwait, such as gender inequality, corruption, and educational quality. These topics were less emphasized or absent in the control group essays, indicating the positive influence of sustainability-focused CBI on students' understanding of the social dimension of sustainability.

This study contributes to the existing research in two significant ways. First, it highlights the effectiveness of integrating sustainability into language education through CBI within an ESL context. The observed positive impact suggests that targeted interventions can effectively enhance students' sustainability literacy, even within traditional language-focused curricula.

Second, the study emphasizes the potential of interdisciplinary approaches to bolster sustainability education in higher education. Collaborative efforts, workshops, and training opportunities across departments can equip writing and composition instructors with the pedagogical tools to integrate sustainability into their curriculum, fostering a more sustainable language-teaching culture.

This study is subject to several limitations. These include the relatively short duration of the CBI, and a small research population focusing on a specific group of students. Importantly, this was a case study in which one faculty member designed her own course materials to integrate sustainability into a first-year writing course at a higher education institution. Despite these constraints,

the results were positive. Students exposed to CBI with a sustainability theme demonstrated increased sustainability literacy, evident in their improved scores on knowledge tests, incorporation of sustainability concepts, and the identification of sustainability problems and solutions in their essays. While these findings may not be broadly applicable, they suggest the potential impact of dedicated teachers designing courses to enhance student learning. Additionally, the scope of the study was limited because the effects of CBI were measured shortly before the semester ended, precluding assessment of students' retention levels in subsequent semesters or years. Therefore, further research is necessary to explore this aspect.

Higher education institutions have a powerful opportunity to equip students in all disciplines with the knowledge and skills needed to achieve the UN's SDGs by 2030 (Briens et al., 2022). By integrating sustainability education across all programs, universities can create a generation of graduates prepared to tackle global challenges.

To this end, preparing teachers and faculty to integrate sustainability issues in language teaching is essential. Higher education institutions should create collaborative programs and training for faculty to boost their understanding of sustainability. These initiatives should educate participants on integrating environmental, social, and economic issues into their teaching subjects and encourage them to develop activities that facilitate integrated teaching approaches (Nur et al., 2022; Hauschild et al., 2012; Çetinkaya et al., 2015).

Finally, educators should be encouraged to conduct similar case studies to contribute to a growing body of evidence showing the positive impact of dedicated teaching efforts in promoting sustainability literacy.

## Data availability

<https://data.mendeley.com/datasets/fhny7btkg7/1>.

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### Author contributions

Inan Deniz Erguvan as the sole author of this manuscript wrote the literature review, collected and analyzed the data and produced the discussion section of the manuscript.

### Competing interests

This study has been funded by Gulf University for Science and Technology, ISG case 4.

### Ethical approval

The study used human subjects and the ethics approval from the Institutional Review Board (IRB) of Gulf University for Science and Technology was obtained prior to the application of the survey on students, with the registration number: IRB-278674/2023-24.

### Informed consent

Informed consent was obtained from all participants. Students signed a consent form before they completed the data collection process.

### Additional information

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