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Sustainable Development Knowledge and Sustainable Consumption Practices Among Students: A Systematic Literature Review

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Abstract

In an era of pressing global sustainability concerns, promoting sustainable development knowledge and practices among students is vital. Sustainability addresses environmental degradation, climate change, and socio-economic disparities, securing our future. Education stands as a cornerstone in moulding the future generation towards responsible leadership and citizenship. This systematic literature review assesses the current state of sustainable knowledge and behaviours among students, synthesizing diverse scholarly works. The study aims to investigate the student's level of awareness regarding Sustainable Development Goals (SDGs) and investigate the most common sustainable consumption practices students frequently engage in. This systematic review used strict criteria, considering empirical articles aligned with our research questions. Out of 403 articles, 30 studies, published between 2017 and 2023, were selected from sources like Web of Science (WOS) and SCOPUS. Findings revealed that students possess a high level of knowledge regarding Sustainable Development Goals (SDGs). Moreover, students actively engage in sustainable practices, such as purchasing green products, conserving water and electrical energy, reusing and recycling materials, responsible waste management and using public transportation. In conclusion, institutions, parents, and businesses should promote eco-friendly practices, emphasizing role models and affordability while fostering sustainability through community collaboration. We also offer recommendations for further research.

Keywords: Sustainability Knowledge, Sustainable Consumption, Education For Sustainable Development, Education, Students

Introduction

Are we sure that future generations will be able to enjoy the same resources that we do now, based on current attitudes and practices? According to Said et al (2003), environmental concerns are caused by the structure and behaviour of consumer industries' production and consumption (Aini et al., 2003). In reality, environmental conservation is more important than environmental preservation in Malaysia (Rahman, 2020). Economic exploitation of the earth's resources has resulted in environmental harm such as ozone layer depletion, species

extinction, global warming, deforestation, and pollution of rivers, seas, air, and soil. As a result, many parties must play a role and take proactive measures to safeguard natural resources.

''The use of commodities and services that meet basic needs and improve the quality of life while minimizing the use of natural resources, hazardous materials, waste, and pollutant emissions throughout life cycle, so as not to affect the needs of future generations'' is the working definition of sustainable consumption, as proposed at the Oslo Symposium on Sustainable Consumption in 1994. This answer is in favor of sensible consumption practices where people current and future repercussions from their consumption may be taken into account (Quoquab & Mohammad, 2017).

In the meanwhile, Wolff and Schonherr (2011) claim that the idea encourages a safe, socially and ecologically conscious method of purchasing, utilizing, and discarding goods and services. In order to prevent future generations from losing natural resources, this idea also takes into account the primary component of resource efficiency, which is the use of fewer resources to produce the same or better results (United Nations Environment Programme, 2015). Analyses conducted recently support the significance of resource efficiency. The use of natural resources is predicted to rise from 85 billion to 186 billion tons over the course of the next 35 years, raising serious concerns about the planet's capacity to sustain human society (United Nations Environment Programme, 2015).

According to Mohammad and Quoquab (2017), sustainable consumption guarantees three things at minimum: a high standard of living, preservation of the environment, and meeting the needs of future generations. According to Lim (2017), the satisfaction of fundamental requirements and the preservation of present needs without compromising the capacity of future generations to meet their own wants, are the general features of sustainable consumption.

Bandura (1977) concurs with behaviourist learning theories of classical and operant conditioning in terms of social learning theory. He did, however, contribute two crucial concepts: that behaviour is acquired by observational learning from the environment and that there is a mediating mechanism between stimulus and reaction.

The term "learning through observation" describes the process of picking up knowledge from people's actions that are visible to them. The person being observed is referred to as a model. Children are surrounded by a variety of powerful role models in society, including their peers, instructors at school, parents in the home, and fictional characters on television. These models offer behaviour examples that may be seen and emulated. A few of these individuals serve as models for children, and they influence their action. Afterwards, children could mimic the actions they see (Mcleod, 2024).

Thus, the purpose of this study was to determine the factors that motivate school and college students to engage in sustainable consumption. The parents' educational attainment and the family's socioeconomic status are two examples of the demographic determinants that have been found. The purpose of this study was to determine how school and college students' sustainable consumption patterns relate to the socioeconomic status of their families and the educational attainment of their parents. The study's findings will help to clarify how an individual's environment affects their views and behaviours.

A Systematic Literature Review (SLR) is a comprehensive, rigorous, and reproducible process designed to identify, evaluate, and interpret all available evidence pertaining to a specific research question or topic of interest. It transcends the conventional narrative review by employing a systematic and transparent methodology, minimizing bias and ensuring a

thorough examination of the available literature. The primary objective of an SLR is to provide a comprehensive overview of the current state of knowledge within a given field, identifying gaps, inconsistencies, and areas where further research is warranted. This method is particularly valuable in areas where the volume of literature is vast, and the need for a structured approach to synthesis is paramount.

A review of prior research indicates that the majority of studies have focused on universities and college students, with only a limited portion centred on school students. Most of the students also have experience limited awareness and understanding of the concepts and goals of sustainable development. Insufficient educational emphasis and awareness campaigns can contribute to a lack of knowledge about the importance of sustainable practices. Other than that, sustainable development topics are not adequately incorporated into educational curricula across different levels, leading to a gap in the coverage of key sustainability principles and goals in the learning process. Next, insufficient availability of educational materials, resources, and updated content related to sustainable development can hinder students' ability to stay informed and engaged with current sustainability issues. Attitudes toward sustainability can be influenced by cultural, social, and economic factors. Students may face attitudinal barriers, such as resistance to change or a perception that sustainable practices are inconvenient or impractical. Furthermore, limited access to resources, both within educational institutions and in students' personal lives, may impede the implementation of sustainable practices. This includes financial constraints, lack of infrastructure, and inadequate support systems. Moreover, peer pressure and societal norms can influence students' attitudes and behaviours. Negative social influences or a lack of positive role models may contribute to the perpetuation of unsustainable practices.

To explore the level of knowledge and attitudes of students regarding the sustainable development objectives outlined by UNICEF, a comprehensive literature review on their understanding of sustainable development goals and responsible consumption is imperative. This review aims to ascertain whether awareness of sustainability is effectively integrated into classroom instruction as part of the curriculum, ensuring that students receive exposure to these concepts during the teaching and learning process. Consequently, we conducted a systematic literature review to assess students' comprehension of sustainable development goals and recognize prevalent sustainable practices among students.

The research questions are:

1. What is the level of student awareness of sustainable development goals?
2. What are the sustainable practices that students often practice?

The significance of this study lies in its potential to inform educators, policymakers, and other stakeholders about the current levels of sustainable consumption knowledge and practices among students. By understanding these factors, interventions can be designed to improve education on sustainable consumption, ultimately leading to more environmentally conscious behaviors. The insights gained from this research could also contribute to the development of policies and programs aimed at integrating sustainable development principles into educational curricula more effectively.

Methodology

Finding, choosing, assessing, compiling, and analysing data from pertinent and related prior studies are all steps in the process of performing a systematic literature review (Moher et al. 2009). The method evaluates the gathered journal articles using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram. In the ever-

expanding landscape of evidence-based research, the synthesis of existing knowledge through systematic reviews and meta-analyses plays a pivotal role in informing scientific inquiry and decision-making. To uphold the rigor and transparency of these syntheses, the PRISMA guidelines have emerged as a beacon of best practices and standardized reporting. These guidelines provide a comprehensive framework for authors, reviewers, and editors involved in the preparation and assessment of systematic reviews and meta-analyses. The fundamental objective is to enhance the clarity, completeness, and reproducibility of reporting in order to facilitate a more robust understanding of the synthesized evidence.

To ascertain eligibility and inclusion, the gathered papers will be sorted and identified. Four stages comprise the selection procedure for this article: identification, screening, eligibility, and inclusion of publications in a systematic literature review carried out in. Only journal articles released between 2017 and 2023 were considered for inclusion in this study's selection process.

Resources

This study was conducted using two main databases to increase the likelihood of obtaining relevant articles, namely Scopus and Web of Science. Scopus is a robust database and consists of more than 256 fields of study, including environmental studies and social science studies. Specifically, Scopus indexes a total of 266 journals related to environmental sciences and social science studies.

Systematic Literature Review Process

The review was conducted in December 2023. The systematic review process consisted of three stages, namely identification; screening; and eligibility.

Identification

The first stage in the systematic review process was the identification of keywords (Table 1), followed by a process of searching for related and similar keywords based on thesauri, dictionaries, encyclopaedias, and past research. The keywords have been validated by an expert on the topics of sustainable development, sustainable consumption, knowledge, practices and students (Table 1). The "*" marks enable the keywords to be found in the related articles either the keyword is in the form of singular or plural. The articles found from the Scopus database totalled 318 articles while 85 articles were found from Web of Science (WOS) databases; hence, the accumulated number of articles generated from both resources was 403 articles in the first stage of the systematic review process.

Table 1
Keywords and searching information strategy

Database	Search String
SCOPUS	TITLE-ABS-KEY ((sustainable) AND (development) AND (consumption) OR (sustainability) AND (knowledge) AND (behavior) OR (attitudes) OR (practices) OR (consciousness) AND (environmental) AND (education) AND (students*))
WOS	(((ALL=(sustainable AND development AND knowledge)) AND ALL=(sustainable AND consumption)) AND ALL=(behavior*)) AND ALL=(secondary school students* OR students*)

Screening

Prior to commencing the screening process, a total of 5 papers were excluded due to their presence in both databases. During the initial screening phase, the remaining 398 articles underwent evaluation based on specific inclusion and exclusion criteria. The first criterion centred on accessibility, with a focus on articles available through open access. The second criterion prioritized the document type, specifically targeting research articles. This choice was influenced by the researcher's emphasis on primary sources providing empirical data, excluding other document types such as systematic reviews, meta-analyses, meta-syntheses, book series, books, chapters in books, and conference proceedings. Language constituted the third criterion, with only publications in English selected. The fourth criterion stipulated that the publication date of articles should fall within the last seven years. A summary of these inclusion and exclusion criteria is detailed in Table 2.

Table 2
Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Publication timeline	2023–2017	2016 and before
Document type	Article (with empirical data)	Systematic review, review, meta-analysis, meta-synthesis, book series, book, chapter in a book, and conference proceeding
Language	English	Non-English
Nature of study	Related to sustainable development knowledge and sustainable consumption practices of students	Not related to sustainable development knowledge and sustainable consumption practices of students

Eligibility

Following the exclusion of 233 papers in the preceding phase, the third step in the systematic review process involved determining eligibility, with a total of 165 articles undergoing this evaluation. During this stage, a comprehensive review of the titles, abstracts, and main contents of the remaining articles was conducted to ensure alignment with the specified criteria for achieving the objectives of the current research study. Ultimately, 135 articles were omitted from consideration as they lacked empirical data and did not address the research question pertaining to sustainable development knowledge and sustainable consumption practices among students. Consequently, the remaining 30 articles were chosen for inclusion in this study, as illustrated in Figure 1

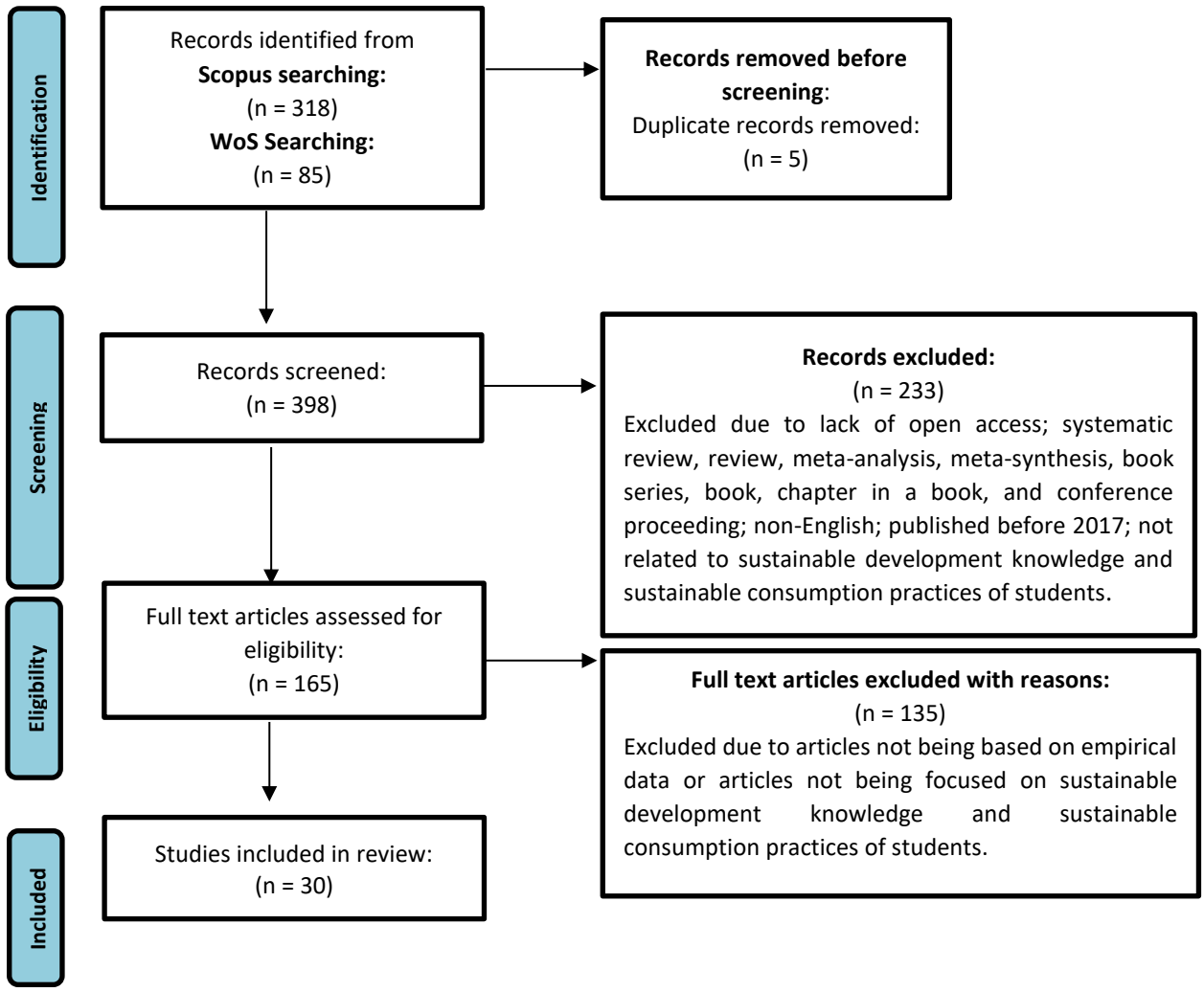

Figure 1. Flow diagram of the study

Table 3
List of Authors and Research Title

Num	Authors	Research Title
1	Chuvieco et al (2018)	Factors Affecting Environmental Sustainability Habits of University Students: Intercomparison Analysis in Three Countries (Spain, Brazil and UAE)
2	Jung et al (2019)	Sustainability in Higher Education: Perceptions of Social Responsibility among University Students
3	Faura et al (2020)	Assessment of Sustainable Development in Secondary School Economics Students According to Gender
4	Mohd Yusoff Yusliza et al (2020)	An Investigation of Pro-Environmental Behaviour and Sustainable Development in Malaysia
5	Hamon et al (2020)	Do Spanish Students Become More Sustainable after the Implementation of Sustainable Practices by Universities?
6	Bezeljak et al (2020)	Understanding of Sustainability and Education for Sustainable Development among Pre-Service Biology Teachers

7	Smaniotto et al (2020)	Sustainable Development Goals and 2030 Agenda: Awareness, Knowledge and Attitudes in Nine Italian Universities, 2019
8	Agirreazkuenaga and Martinez (2021)	Secondary students' perception, positioning and insight on education for sustainability
9	Amezaga et al (2021)	Measuring sustainable development knowledge, attitudes, and behaviors: evidence from university students in Mexico
10	Sanchez et al (2021)	Sustainable Economic Development Education: The Use of Artificial Neural Networks for the Profile Estimation of Students from Developing Countries
11	Owojori et al (2021)	Student's Knowledge, Attitude, and Perception (KAP) to Solid Waste Management: A Survey towards a More Circular Economy from a Rural-Based Tertiary Institution in South Aftrica
12	Chen et al (2022)	Sustainability Literacy: Assessment of Knowingness, Attitude and Behavior Regarding Sustainable Development among Students in China
13	Damico et al (2022)	What Does Sustainability Mean? Perceptions of Future Professionals across Disciplines
14	Ovais (2023)	Students' sustainability consciousness with the three dimensions of sustainability: Does the locus of control play a role?
15	Flores et al (2023)	Environmental, Social and Economic Attitudes and Sustainable Knowledge on the Sustainable Behaviour of Engineering Students: An Analysis Based on Attitudes towards Teachers
16	Hansmann et al (2019)	Determinants of pro-environmental behavior: A comparison of university students and staff from diverse faculties at a Swiss University
17	Molina et al (2018)	Does gender make a difference in pro-environmental behavior? The case of the Basque Country University students
18	Wang et al (2021)	Differentiated Impact of Politics- and Science-Oriented Education on Pro-Environmental Behavior: A Case Study of Chinese University Students
19	Yusuf and Fajri (2022)	Differences in behavior, engagement and environmental knowledge on waste management for science and social students through campus program
20	Radwan and Khalil (2021)	Knowledge, attitude and practice towards sustainability among university students in UAE
21	Michel et al (2022)	Antecedents of green consumption intentions: a focus on generation Z consumers of a developing country
22	Janmaimool and Khajohnmanee (2019)	Roles of Environmental System Knowledge in Promoting University Students' Environmental Attitudes and Pro-Environmental Behaviors

23	Al-Nuaimi and Al-Ghamdi (2022)	Assessment of Knowledge, Attitude and Practice towards Sustainability Aspects among Higher Education Students in Qatar
24	Janmaimool and Chontanawat (2021)	Do University Students Base Decisions to Engage in Sustainable Energy Behaviors on Affective or Cognitive Attitudes?
25	Zeng et al (2023)	Can Environmental Knowledge and Risk Perception Make a Difference? The Role of Environmental Concern and Pro-Environmental Behavior in Fostering Sustainable Consumption Behavior
26	Renzi et al (2022)	Agenda 2030 and COVID-19: A Young Consumer's Perception of Sustainable Consumption
27	Kang et al (2017)	Does "Science" Matter to Sustainability in Higher Education? The Role of Millennial College Students' Attitude Toward Science in Sustainable Consumption
28	Salehi et al (2021)	Socio-Cultural Determinants and the Moderating Effect of Gender in Adopting Sustainable Consumption Behavior among University Students in Iran and Japan
29	Pu et al (2022)	Toward a knowledge economy: Factors affecting the sustainable consumption behavior in the Chinese online education industry
30	Ahamad and Ariffin (2018)	Assessment of knowledge, attitude and practice towards sustainable consumption among university students in Selangor, Malaysia

Data Abstraction and Analysis

In this study, an integrative review methodology was employed, which involved the analysis and synthesis of various research designs, encompassing qualitative, quantitative, and mixed methods. Subsequently, thematic analysis was applied to develop relevant themes and sub-themes. Initially, the data were compiled through a meticulous examination of the 36 selected articles to extract statements or information addressing the research questions. The authors then transformed the raw data into usable information, determining themes, concepts, or ideas through coding methods. In instances where conflicts in themes emerged, the authors engaged in discussions to resolve discrepancies. To ensure consistency, the developed themes and sub-themes were adjusted in alignment with the study's objectives. Three expert reviews were conducted to validate the themes and sub-themes, a crucial step for establishing domain validity and ensuring the clarity and appropriateness of each subtheme within its respective theme. The authors incorporated feedback and comments from the experts, making adjustments as deemed appropriate.

Results

This systematic literature review was conducted in this study with the goal of determining the level of students' knowledge about sustainable development, identifying sustainable use practices practiced by students and identifying factors that can influence the practice of sustainable use among students. There were 30 papers that matched all of the criteria set by the researcher as a result of research conducted throughout the selection and screening process using the PRISMA approach.

Seven out of thirty articles chosen, focus on Spain, four on China, two on Italy, UAE, United States, Malaysia and Thailand. Another twelve article focuses on Dominican Republic, Austria, Mexico, South Africa, India, Switzerland, Indonesia, Haiti, Qatar, Argentina, Japan and Iran each (Figure 2). The total countries number are different from the total number of selected articles due to several studies that had been done in more than one country.

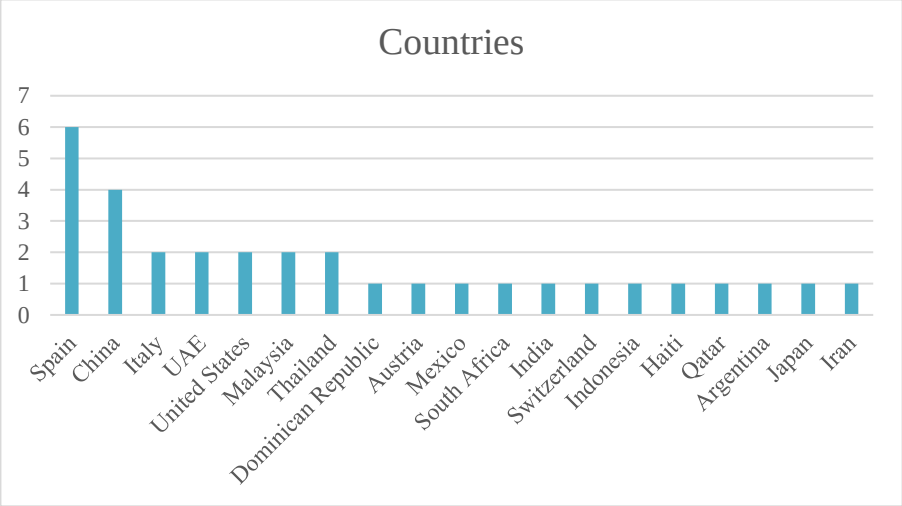

Figure 2. Countries where studies were conducted

Table 4
Summary of Country, Experimental Design, Instrument and Sample Size of 30 selected articles

Author	Country	Experimental Design	Instrument	Sample Size
Chuvieco, et al (2018)	Spain, Brazil, UAE	Quantitative	Questionnaire	1011
Jung, et al (2019)	United States	Quantitative	Questionnaire	95
Faura et al (2020)	Spain	Quantitative	Questionnaire	572
Yusliza, et al (2020)	Malaysia	Quantitative	Questionnaire	72
Hamon, et al (2020)	Spain	Quantitative	Questionnaire	504
Bezeljak, et al (2020)	Austria	Quantitative	Questionnaire	120
Smaniotto, et al (2020)	Italy	Quantitative	Questionnaire	1676
Agirreazkuenaga, et al (2021)	Spain	Qualitative	Focus Group Interview	39
Amezaga, et al (2021)	Mexico	Quantitative	Questionnaire	350
Sanchez et al (2021)	Spain	Quantitative	Questionnaire	328
Owojori, et al (2021)	South Africa	Quantitative	Questionnaire	376
Chen, et al (2022)	China	Quantitative	Questionnaire	2548
Damico et al (2022)	Argentina	Quantitative	Questionnaire	1063
Ovais (2023)	India	Quantitative	Questionnaire	205
Flores, et al (2023)	Dominican Republic	Quantitative	Questionnaire	626
Hansmann, et al (2020)	Switzerland	Quantitative	Questionnaire	1864
Molina, et al (2018)	Spain	Quantitative	Questionnaire	1089

Wang, et al (2021)	China	Quantitative	Questionnaire	13404
Yusuf, et al (2022)	Indonesia	Quantitative	Questionnaire	279
Radwan, et al (2020)	UAE	Quantitative	Questionnaire	200
Michel, et al (2022)	Haiti	Quantitative	Questionnaire	843
Janmaimol, et al (2019)	Thailand	Quantitative	Pre-Post Test	278
Al-Nuaimi, et al (2022)	Qatar	Quantitative	Questionnaire	472
Janmaimool, et al (2021)	Thailand	Quantitative	Questionnaire	426
Zeng, et al (2023)	China	Quantitative	Questionnaire	285
Renzi, et al (2022)	Italy	Qualitative	In-depth Interview	133
Kang, et al (2017)	United States	Quantitative	Questionnaire	1480
Salehi, et al (2021)	Iran, Japan	Quantitative	Questionnaire	198
Pu, et al (2022)	China	Quantitative	Questionnaire	559
Ahamad et al (2018)	Malaysia	Quantitative	Questionnaire	390

Based on the results of this study for all 33 articles, the pattern for year of publication shows that a total of eighteen (18) articles were published from 2021 until 2023. Then, thirteen articles were published from 2017 until 2020 and another one were published in 2017. The pattern regarding total of articles about sustainable knowledge and consumption published increased after year 2019.

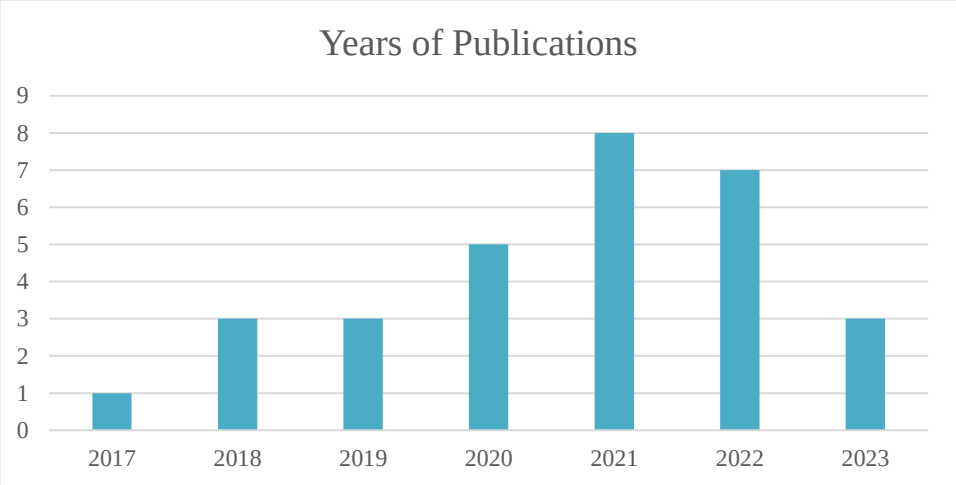

Figure 3. Years of Publication

Table 5
Findings on Students' Awareness Level regarding Sustainable Development Goals

Authors	Year	Students' level of SDGs awareness		
		Low	Moderate	High
Kang et al	2017		x	
Chuvieco et al	2018			x
Molina et al	2018			x
Ahamad and Ariffin	2018			x
Jung et al	2019	x		
Hansmann et al	2019		x	
Janmaimool and Khajohnmanee	2019			x
Faura et al	2020		x	
Yusliza et al	2020			x
Hamon et al	2020			x
Bezeljak et al	2020			x
Smaniotto et al	2020	x		
Salehi et al	2021		x	
Wang et al	2021			x
Agirreazkuenaga and Martinez	2021		x	
Amezaga et al	2021		x	
Sanchez et al	2021			x
Owojori et al	2021	x		
Radwan and Khalil	2021			x
Janmaimool and Chontanawat	2021		x	
Yusuf and Iwan Fajri	2022			x
Chen et al	2022			x
Damico et al	2022			x
Michel et al	2022			x
Al-Nuaimi and Al-Ghamdi	2022			x
Pu et al	2022			
Renzi et al	2022	x		
Ovais	2023			x
Flores et al	2023			x
Zeng et al	2023			x

Table 6
Findings on Students' Sustainable Practices

Authors	Year	Students' Sustainable Practices			
		Saving Energy and Resource	Use of Public Transportation	Reuse, Reduce, Recycle (3R)	Green Purchase
Kang et al	2017				x
Chuvieco et al	2018	x	x	x	x
Molina et al	2018		x	x	x
Ahamad and Ariffin	2018	x		x	x
Jung et al	2019				x
Hansmann et al	2019	x	x	x	x
Janmaimool and Khajohnmanee	2019	x		x	x
Faura et al	2020	x		x	x
Yusliza et al	2020	x		x	x
Hamon et al	2020	x		x	
Salehi et al	2021	x	x	x	x
Wang et al	2021	x		x	
Amezaga et al	2021	x	x	x	x
Sanchez et al	2021			x	x
Radwan and Khalil	2021	x	x	x	x
Janmaimool and Chontanawat	2021			x	x
Yusuf and Fajri	2022			x	x
Chen et al	2022	x	x		x
Al-Nuaimi and Al-Ghamdi	2022	x			
Pu et al	2022				x
Renzi et al	2022	x	x	x	x
Ovais	2023			x	x
Flores et al	2023	x			
Zeng et al	2023	x		x	x

Findings and Discussions

RQ1: What is the Level of Student Awareness of Sustainable Development Goals?

The level of awareness among students regarding the Sustainable Development Goals (SDGs) has been a focal point of numerous studies within the academic community, reflecting a global emphasis on integrating sustainable practices into education systems. This systematic literature review, titled "Sustainable Development Knowledge and Sustainable Consumption Practices Among Students," delves into the existing body of research to assess how well-informed students are about the SDGs and the extent to which this knowledge translates into sustainable consumption behaviors.

A majority of the reviewed articles indicate a high level of awareness about the SDGs among students Chuvieco et al (2018); Molina et al (2018); Ahamad and Ariffin (2018); Janmaimool and Khajohnmanee (2019); Yusliza et al (2020); Hamon et al (2020); Bezeljak et al (2020); Wang et al (2021); Sanchez et al (2021); Radwan and Khalil (2021); Yusuf and Fajri (2022); Chen et al (2022); Damico et al (2022); Michel et al (2022); Al-Nuaimi and Al-Ghamdi (2022); Ovais (2023); Flores et al (2023); Zeng et al (2023) These findings suggest that educational institutions have successfully implemented programs and curricula that highlight the importance of sustainable development.

Various factors contribute to this heightened awareness, including the incorporation of SDG-related content in school subjects Janmaimool and Khajohnmanee (2019), extracurricular activities focused on sustainability, and the use of digital platforms to disseminate information. Janmaimool and Khajohnmanee (2019) studies shows that students who taking courses in environmental studies have higher awareness of sustainable development goals. This comprehensive awareness is often linked to innovative teaching methodologies that emphasize critical thinking and problem-solving skills, encouraging students to view sustainability as a holistic and interconnected challenge (Damico et al., 2022). However, not all high awareness and knowledge about SDGs will give positive impact on their attitudes and behavior. This outcome might be due to cultural norms or environment from the individuals surrounding that causing them to not practicing a good sustainable behavior. According to Bezeljak et al (2020), even though the students show high awareness and concern on the environmental issues but most of the students did not understand the connection between environmental, economic and social dimensions.

Since oil was discovered in the Arabian Gulf region during the 1960s, the Gulf Cooperation Council (GCC) countries, particularly the UAE and Qatar, have witnessed consistent growth in both population and per capita income and wealth (Al-Nakeeb et al., 2015). The resulting high-income levels have enabled households to purchase multiple cars, making it easier for women to use their own or their parents' cars instead of relying on public transportation. Furthermore, the culture of cycling is not well-established among local women due to cultural restrictions related to dress codes and safety concerns (Chuvieco et al., 2018). Additionally, the infrastructure for cycling, such as paths and parking, is not available for all destinations, and the land use planning does not support a cycling-friendly environment in the UAE (Chuvieco et al. 2018). The hot climate also poses a significant challenge to cycling activities for most of the year.

Despite the overall high levels of awareness reported, a subset of studies points to moderate and low levels of awareness among certain student groups (Kang et al., 2017; Jung et al., 2019; Hansmann et al., 2019; Faura et al., 2020; Smaniotto et al., 2020; Salehi et al., 2021; Agirreazkuenaga and Martinez, 2021; Amezaga et al., 2021; Owojori et al., 2021; Janmaimool and Chontanawat, 2021; Renzi et al., 2022). These discrepancies are often attributed to regional and socio-economic differences, as well as variations in educational policies and resource allocation. Owojori et al (2021) in their studies in South Africa suggested that inclusions of incentives can help promoting sustainable consumption practice and improves their behavior. For example, research conducted in less developed regions or among marginalized communities frequently highlights gaps in SDG knowledge. This gap is primarily due to limited access to quality education and a lack of resources that can effectively promote awareness about global sustainability issues. Moreover, cultural factors and the prevailing socio-economic conditions in these regions can also influence the level of priority given to sustainable development education. Countries with high temperature also prevents the

students from practicing sustainable behavior because they prefer to commute using motor vehicles instead of walking of cycling.

In addition to regional disparities, the moderate and low awareness levels are sometimes linked to differences in educational focus and priorities. In some educational systems, the emphasis may still be on traditional subjects with limited integration of sustainability topics. This traditional approach often overlooks the importance of interdisciplinary learning, which is crucial for fostering a deeper understanding of the SDGs. Furthermore, students in technical and vocational education tracks may receive less exposure to sustainability concepts compared to their peers in academic programs, leading to uneven levels of awareness across different fields of study (Renzi et al., 2022).

The literature also highlights the role of informal education and social influences in shaping students' awareness of the SDGs. Peer influence, family attitudes towards sustainability, and the presence of environmental clubs and organizations within schools significantly impact students' knowledge and attitudes. In environments where sustainability is a shared value and actively promoted, students are more likely to exhibit higher levels of awareness and engagement with the SDGs (Hansmann et al., 2020). Conversely, in settings where such support structures are lacking, awareness levels tend to be lower.

Overall, the systematic review underscores the importance of a multifaceted approach to education that not only integrates SDG content into formal curricula but also fosters an environment that supports sustainable practices through informal learning and community engagement. Policymakers and educators are encouraged to address the identified gaps by promoting inclusive and equitable quality education, ensuring that all students, regardless of their background or field of study, have access to the knowledge and skills needed to contribute to sustainable development. By addressing these disparities and enhancing the overall awareness of the SDGs among students, educational institutions can play a pivotal role in advancing global sustainability goals and preparing the next generation to tackle the complex challenges of the future.

RQ2: What are the sustainable practices that students often practice?

The integration of sustainable consumption practices among students is a critical aspect of advancing global sustainability efforts. This systematic literature review, examines the prevalent sustainable behaviors adopted by students, highlighting the most practiced actions and identifying areas where improvements are needed.

The analysis of numerous studies reveals that green purchasing is one of the most frequently practiced sustainable behaviors among students (Kang et al., 2017; Chuvieco et al., 2018; Molina et al., 2018; Ahamad et al., 2018; Jung et al., 2019; Hansmann et al., 2019; Janmaimool et al., 2019; Faura et al., 2020; Yusliza et al., 2020; Salehi et al., 2021; Amezaga et al., 2021; Sanchez et al., 2021; Radwan et al., 2021; Janmaimool et al., 2021; Yusuf et al., 2022; Chen et al., 2022; Pu et al., 2022; Renzi et al., 2022; Ovais, 2023; Zeng et al., 2023). Green purchasing involves choosing products that have minimal environmental impact, such as those made from recycled materials, produced through sustainable methods, or packaged in eco-friendly materials (Goh and Wahid, 2014). Students' high level of engagement in green purchasing can be attributed to increased awareness of environmental issues and the availability of sustainable products in the market. Educational institutions play a pivotal role by promoting green consumerism through campaigns, sustainability-focused curricula, and collaborations with eco-friendly brands. As a result, students are more inclined to consider the

environmental footprint of their purchases, opting for products that align with their sustainability values.

In addition to green purchasing, students commonly practice the 3R principles: Reuse, Reduce, and Recycle (Chuvieco et al., 2018; Molina et al., 2018; Ahamad et al., 2018; Hansmann et al., 2019; Janmaimool et al., 2019; Faura et al., 2020; Yusliza et al. 2020; Hamon et al., 2020; Salehi et al., 2021; Wang et al., 2021; Amezaga et al., 2021; Sanchez et al., 2021; Radwan et al., 2021; Janmaimool et al., 2021; Yusuf et al., 2022; Renzi et al., 2022; Ovais, 2023; Zeng et al., 2023). These principles are foundational to sustainable living and are widely endorsed across educational platforms. Reuse involves finding new purposes for items instead of discarding them, thereby extending their life cycle (Dillon, 2023). Reduce focuses on minimizing waste by consuming less and making conscious choices to lower one's environmental impact (Dillon, 2023). Recycling entails processing used materials into new products, thereby conserving resources and reducing landfill waste (Dillon, 2023). The widespread adoption of the 3R practices among students is facilitated by educational programs that emphasize the importance of waste management and resource conservation. Workshops, seminars, and community projects often highlight practical ways to incorporate these principles into daily life, fostering a culture of sustainability within educational environments.

Another significant sustainable practice adopted by students is saving energy and resources. This includes actions such as turning off lights and electronic devices when not in use, using energy-efficient appliances, conserving water, and minimizing the use of single-use plastics. The high prevalence of these practices among students reflects their understanding of the environmental and economic benefits of energy and resource conservation (Salehi et al., 2021). Schools and universities contribute to this awareness by implementing energy-saving initiatives, installing renewable energy systems, and incorporating resource management topics into their curricula. Students are encouraged to adopt these behaviors not only within educational settings but also in their homes and communities, thereby promoting a broader culture of sustainability.

Despite the high levels of engagement in green purchasing, the 3R principles, and energy or resource conservation, the review indicates that using public transportation is the least practiced sustainable action among students. This finding highlights a significant area for improvement, as public transport is a critical component of sustainable urban mobility. The underutilization of public transportation can be attributed to several factors, including the convenience and availability of private vehicles, the perceived inefficiency of public transport systems, and socio-cultural preferences (Chuvieco et al., 2018). In many regions, students may find it easier and faster to use private cars, especially when public transport networks are underdeveloped or unreliable (Chuvieco et al., 2018). Additionally, societal attitudes towards car ownership and the status associated with it can deter students from opting for public transportation. To address this gap, it is essential for policymakers and educational institutions to work together to improve public transport infrastructure and promote its benefits. Initiatives such as subsidized student fares, enhanced safety measures, and awareness campaigns about the environmental advantages of public transportation can encourage more students to use these services. Furthermore, integrating sustainable transportation topics into educational programs can help shift perceptions and highlight the importance of reducing carbon footprints through the use of public transport.

In conclusion, while students demonstrate a commendable commitment to various sustainable practices, there is a clear need to enhance the adoption of public transportation.

By continuing to promote green purchasing, the 3R principles, and energy or resource conservation, and by addressing the barriers to public transport use, educational institutions can significantly contribute to the advancement of sustainable consumption practices among students. This holistic approach will not only foster a more sustainable future but also equip students with the knowledge and habits necessary to become responsible global citizens.

Conclusion

The systematic literature review reveals that students generally exhibit a high level of awareness regarding Sustainable Development Goals (SDGs) and actively engage in various sustainable practices. Most notably, students frequently practice green purchasing, adhere to the 3R principles (Reuse, Reduce, Recycle), and actively save energy and resources. However, the adoption of public transportation remains low, highlighting an area for improvement. Despite these encouraging findings, the review acknowledges several limitations. The studies analyzed often focus on specific regions or educational institutions, which may not fully represent the global student population. Additionally, variations in educational systems and socio-economic conditions can influence the generalizability of the results. Future research should aim to address these limitations by including a more diverse range of geographical locations and educational settings. Longitudinal studies could provide deeper insights into how students' awareness and sustainable practices evolve over time. Furthermore, investigating the barriers to public transportation use among students and developing targeted interventions could enhance the effectiveness of sustainability programs. By expanding the scope and depth of research, we can better understand and promote sustainable behaviors among students, contributing to the achievement of global sustainability goals.

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