

Lorena Bašan
University of Rijeka
Faculty of Tourism
and Hospitality Management
51410 Opatija, Croatia
lorenab@fthm.hr

Kristina Črnjar
University of Rijeka
Faculty of Tourism
and Hospitality Management
51410 Opatija, Croatia
kcrnjar@fthm.hr

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Ivan Butković
University of Rijeka
Faculty of Tourism
and Hospitality Management
51410 Opatija, Croatia
ivanb@fntu.uniri.hr

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ENRICHING KNOWLEDGE FOR RAISING AWARENESS OF SUSTAINABLE TOURISM: A GEN Z PERSPECTIVE

ABSTRACT

Purpose: This study aims to identify students' understanding and awareness of sustainable tourism depending on sustainability knowledge integration into the study program and examine its influence on students' awareness of sustainable tourism.

Methodology: The research was conducted using a survey method on a convenience sample of undergraduate students enrolled in Management of Sustainable Development (MSD) and Business Economics in Tourism and Hospitality (BETH) study programs at the Croatian Faculty of Tourism and Hospitality Management. Exploratory factor analysis (EFA) was implemented on the Stakeholder Understanding of Sustainable Tourism Development Index (SUSTDI) to investigate students' understanding of sustainable tourism. An independent samples t-test highlights the significance of differences in the understanding and awareness of sustainable tourism among students in different undergraduate study programs.

Results: The results reveal the three-factor structure of the SUSTDI as a highly reliable tool for determining the overall level of sustainable tourism understanding and knowledge by Generation Z as a stakeholder. It enables the identification of areas in which knowledge about sustainable tourism should be improved. Significant differences in students' understanding and awareness were identified among different study programs, with higher levels observed in the MSD study program, which incorporates various aspects of sustainability topics through courses.

Conclusion: The research results indicate a greater level of knowledge and understanding of students in a study program that integrated sustainability issues into the study program curricula and a significant positive impact of understanding on students' awareness of sustainable tourism.

Keywords: Knowledge, awareness, sustainable tourism, Stakeholder Understanding of Sustainable Tourism Development Index (SUSTDI), Generation Z

1. Introduction

Knowledge and awareness are fundamental to providing adequate support for sustainable tour-

ism initiatives. Insufficient knowledge among all stakeholders is a major barrier to implementing sustainability in tourism (Tang et al., 2022; Ahmed

& Dwyer, 2010). Since adopting the UN Sustainable Development Goals, higher education institutions worldwide have been systematically striving to integrate sustainability into their curricula. As future agents of change, students play a crucial role in fostering knowledge, awareness, and attitudes toward sustainability challenges. They have the potential to bridge the gap between communities and higher education institutions, thereby strengthening partnerships and accelerating the transition toward sustainability (Filho et al., 2024).

The foundation of any sustainability-related initiative lies in awareness and education, as knowledge is also essential for fostering students' long-term engagement. A fundamental understanding encompassing core concepts, demonstrating relevance, and providing a global perspective ensures students' openness to participation and responsibility in sustainability efforts (Uzorka et al., 2024). Programs, curriculum design, and teaching approaches should incorporate new learning methods, promote interdisciplinarity, and balance theory and practical knowledge, encouraging students to reflect critically on suitability issues and ensure that students have the necessary competencies to implement sustainable development effectively (Idawala et al., 2024; Slocum et al., 2019).

The research gap is related to the tool for measuring students' or Generation Z's level of acquired knowledge and understanding of sustainable tourism development, areas in which their knowledge should be enriched, and influences of understanding sustainable tourism on awareness. The Stakeholder Understanding of Sustainable Tourism Development Index (SUSTDI) needs continuous validation "as a precursor to developing education and training programs to increase understanding and knowledge of sustainable tourism development" (Cárdenas et al., 2015, p. 254). Thus, SUSTDI is validated for measuring students' knowledge and understanding of sustainable tourism as Generation Z representatives. It is necessary to evaluate all stakeholders' existing knowledge levels to provide an adequate education focused on sustainable tourism, aiming at more active participation and a more active role in sustainable tourism development (Cárdenas et al., 2015). Furthermore, the authors call for integrating sustainable development goals into educational curricula (Zamora-Polo et al., 2019) and raising awareness of sustainable tourism offerings (Grapentin & Ayikoru, 2019). By gaining advanced insights into Generation Z's understanding and awareness of sustainable tourism, further educational needs are identified, strengthening

Generation Z's participation in sustainability-oriented actions.

The paper is organized into five main parts. After the introduction, there follows a conceptual research framework that includes an overview of the theoretical background on knowledge and awareness of sustainable tourism, along with a section on hypothesis development. The third part explains the methodology and it is followed by the research results and discussion. The paper concludes with remarks and recommendations for future research.

2. Conceptual framework

2.1 Knowledge as a prerequisite for sustainable tourism development

A high level of knowledge and understanding of sustainable policies and practices among a wide range of stakeholders ensures that the goals of sustainable tourism development are achieved. Stakeholders who achieve a higher level of knowledge about sustainability develop positive attitudes and are more likely to adopt behaviors that support sustainable practices (Tang et al., 2022). One of the major barriers to implementing policies and practices in the tourism industry is the lack of sufficient knowledge and key competencies necessary to engage in sustainable practices (Ahmed & Dwyer, 2010).

Generation Z is strongly represented in communities and the labor market and represents a stakeholder group for sustainable tourism, taking on different roles (tourists, professionals, decision-makers, etc.). They can easily access information, have extensive digital connections, and are often passionate about causes, including sustainability (Çalışkan, 2021). However, research on Generation Z and their involvement in sustainability initiatives in tourism has found that, while Generation Z is aware of the concept of sustainability and understands the principles and policies, they are not proactively involved in leading sustainability initiatives (Görpe & Öksüz, 2022). To ensure greater participation of Generation Z in sustainability-oriented initiatives, emphasis must be placed on formal and informal education to ensure the acquisition of key competencies.

Considering that the acquisition of knowledge and skills is crucial for sustainable tourism development, education is seen as an essential tool to ensure this knowledge and awareness of the concept among younger generations. Educational institutions have the opportunity to integrate topics related to sustainable development into their programs, subjects, and other student activities. It should

have a positive impact on students' understanding of sustainable tourism. Studies have shown that study programs that expose students to sustainability concepts and practices develop a deeper understanding of the environmental, economic and social impacts of tourism, resulting in more responsible business and personal decisions for the future (Deale, 2019; Fernández-Villarán et al., 2024).

Developing students' action competence through the implementation of education for sustainable development in formal education requires time. Embedding sustainability into educational programs and curricula to improve students' understanding of the challenges and benefits of sustainability, specifically in the tourism industry, will significantly promote the paradigm when they are faced with decision-making in their careers. Whether they are industry professionals, students or other community members, learning about sustainable tourism development during their education will broaden their knowledge and prepare them to apply it in practice (Kubíková & Rudý, 2024). Educational institutions are expected to produce graduates with a comprehensive understanding of sustainability and equipped with tools and awareness necessary for sustainable tourism development (Görpe & Öksüz, 2022). This view is in line with the Education for Sustainable Development movement, which advocates that the education of the next generation is the basis for future sustainable action (Krstinić Nžić & Butković, 2023).

Educational institutions emphasize that the education for sustainable development is the basis for mobilizing Generation Z and other young people toward sustainable action. The research emphasized that integrating sustainability into management curricula positively impacts students' understanding of sustainability issues (Gough & Scott, 2003). Suppose these students and young people graduate with broader knowledge and individual values related to sustainable tourism, they are likely to become stakeholders in the future who demand, support and actively participate in more sustainable tourism development.

Therefore, the following hypothesis is proposed:

H1: There is a significant difference in the students' understanding of sustainable tourism development depending on the inclusion of sustainability topics in the study program.

2.2 Awareness of sustainable tourism

In recent years, many scientific studies have focused on researching awareness of sustainable tourism.

Awareness can be defined as "the ability to perceive, feel, or understand events, objects, or sensory patterns" (Gafoor, 2012). The author also emphasizes that all individuals who possess knowledge must also have awareness, but awareness does not necessarily imply the presence of knowledge. Dourish and Bellotti (1992) define awareness as "an understanding of the activities of others, which provides a context for one's activity." The core of awareness should be collaboration, which entails coordination, assistance, and communication (Gutwin & Greenberg, 1999).

Awareness of the local population regarding sustainable tourism development means that all community members and specific groups within the community "know, understand, utilize, and develop attitudes and approaches following the fundamental principles of sustainable development" (Fokiali et al., 2006). Furthermore, authorities, institutions, and all local community members must be adequately aware of sustainable tourism development to have a positive impact on a given area. These authors also highlight that community awareness has been identified as essential for the successful implementation of sustainable development policies. Moreover, Sekhokoane et al. (2017) highlight that sustainable tourism development is facilitated when there is a high level of ecological awareness.

Gordon (2007) highlights the impact of early environmental conservation efforts on shaping perceptions, attitudes, and practices, thereby fostering the development of informed students who contribute to the future growth of the field. Furthermore, *Jepchirchir Rop & Kwoba Olubulyera* (2015) emphasize the importance of early tourism education in shaping future professionals. They argue that tourism education should not be introduced only at the university level but should begin as early as high school to enhance public awareness of tourism's impacts. Universities are undeniably key stakeholders in achieving sustainable development goals as they integrate these goals into the educational process (SDSN, 2021). Findings from a study conducted on undergraduate and graduate students by Goh et al. (2017) indicate that sustainability content should be a mandatory part of the curriculum in all hospitality-related educational institutions. The authors also highlight the benefits of integrating sustainability into academic study programs, including strengthening ties between educational institutions and industry partners and aligning curricula with labor market needs. Kasim & Wickens (2020) explore young people's awareness, intentions, and opinions regarding environmentally friendly travel and em-

phasize the potential of young travelers in creating demand for sustainable tourism options. In their study, Wang et al. (2023) state that students, based on their education, can significantly contribute to the promotion of environmental sustainability. Additionally, research conducted on university students by Cachero et al. (2023) examined variations in perceptions and understanding of sustainable development goals. However, students specializing in social and legal sciences demonstrate a higher level of knowledge on the topic, which the authors attribute to specialized curricula and programs integrating sustainable development.

Based on the findings and to gain a deeper understanding of the topic, the second hypothesis is proposed:

H2: There is a significant difference in student's awareness of sustainable tourism depending on the inclusion of sustainability topics in the study program.

Building awareness in the community and achieving general consent on the principles and strategies of sustainable development are crucial for long-term commitment to this cause. Recent studies show that greater awareness leads to a stronger commitment to sustainability. When locals recognize the environmental and socio-cultural benefits beyond the purely economic benefits of green tourism, their commitment to sustainable practices increases significantly (Thang & Thanh, 2023). Building knowledge about sustainable tourism development and involving local people in decision-making processes that lead to tangible results and benefits for all stakeholders contribute to long-term active engagement in sustainable tourism initiatives. Educating tourism professionals, travelers, and locals about the principles of sustainable tourism can lead to more conscious choices and behaviors consistent with the goal of sustainability.

In their study, Zamora-Polo et al. (2019) highlight a general lack of awareness and limited knowledge of sustainable development goals among students from various disciplines, calling for integrating these goals into educational curricula. A similar study by Smaniotta et al. (2020) on students at Italian universities found that most students demonstrate limited knowledge and understanding of sustainable development goals. However, the authors note that students who attended specialized extracurricular courses related to sustainable development exhibited greater knowledge. As future agents of change, university students should have a higher level of awareness and understanding about sustainable development to contribute to its imple-

mentation actively. Research findings indicate that 62.5% of students possess knowledge of sustainable development goals, while 89.5% are aware of their existence (Jati et al., 2019).

Based on the previously mentioned studies and to enhance the understanding of the topic, the third hypothesis of the study is proposed:

H3: Student's knowledge and understanding of sustainable tourism development positively and significantly influence their awareness of sustainable tourism.

3. Methodology

The research used a quantitative approach, following the set hypotheses and the defined research goal. The survey method was applied based on the structured questionnaire, which consisted of two groups of questions. The first part included three close-ended questions about a student's gender, study year, and program. The second part of the questionnaire included two questions. One question was related to sustainable tourism development and included 31 items, taken from previous research by Cárdenas et al. (2015), using the Stakeholder SUSTDI tool presented in Appendix Table A.1. The SUSTDI includes six dimensions: resource preservation (8 items), environmental education (6 items), stakeholder inclusion (6 items), economic planning (6 items), cultural awareness (2 items), and community resource identification (3 items). The next question included four items related to awareness of sustainable tourism, taken from Thang and Thanh (2023) and listed in Appendix Table A.2. Using a five-point Likert scale (from 1 – strongly disagree to 5 – strongly agree), respondents were asked to indicate to which extent they agree or disagree with each statement. The questionnaire was translated into Croatian for empirical research and re-translated into English for analysis.

Approval from the Ethics Committee at the Faculty of Tourism and Hospitality Management was requested to conduct the research with students. The Ethics Committee provided a written positive opinion on the ethical aspects of the proposed scientific research on sustainable development. Furthermore, each course instructor whose students were included in the study was informed about the goals, purpose, and research concept. Written consent was obtained from each course instructor to conduct the research with students in their courses. Prior to their participation in the study, students were informed about the goals and purpose of the

research and subsequently provided their consent to participate. The questionnaire was prepared in Google Forms for the online survey and made accessible to students in the hall via a QR code. The survey was conducted from February 3 to 7, 2025, based on a convenience sample of students at the Faculty of Tourism and Hospitality Management in Opatija, Croatia. A total of 313 questionnaires were collected from the first to fourth-year students of undergraduate studies and included in the analysis. The sample size can be considered adequate since the observations per variable are above the recommended minimum of at least five observations per variable (Hair et al., 2014).

Data analysis was carried out using the SPSS statistical software, version 23. Furthermore, a combination of statistical methods was implemented in

the data analysis. Exploratory factor analysis (EFA) and Principal Component Analysis (PCA) were used to extract factors and identify the number of components and factors. Descriptive statistics were implemented to calculate frequency, percentage, mean, and standard deviation. For inferential statistics, an independent samples t-test was used to compare differences among student groups, and simple and multiple linear regression analyses were implemented to identify the impact of the factors on students' awareness of sustainable tourism.

4. Research results and discussion

4.1 Sample characteristics

The characteristics of the respondents are presented in Table 1.

Table 1 Characteristics of the sample structure (N=313)

	Gender	Frequency (N)	Relative share (%)
1	Female	237	75.7
2	Male	76	24.3
Year of Study			
1	First	90	28.8
2	Second	77	24.6
3	Third	78	24.9
4	Fourth	68	21.7
Undergraduate Study Program			
1	Business Economics in Tourism and Hospitality (BETH)	237	75.7
2	Management of Sustainable Development (MSD)	76	24.3

Source: Authors' calculations

Most respondents in the study are females (75.7%). An equal number of students by year of study participated in the research (ranging between 21.7% and 28.8%). Most respondents are undergraduate university students at BETH (75.7%), and one-quarter of the respondents are MSD students (24.3%).

4.2 EFA and reliability analysis

The original scale of the Stakeholder SUSTDI has a six-factor solution, and it was used to investigate students' understanding of sustainable tourism development. Exploratory factor analysis (EFA) was conducted, followed by Principal Component Analysis (PCA). The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett's sphericity test were used to identify the suitability of the data for conducting EFA analysis. Based on the calculated KMO coefficient and Bartlett's test of sphericity, the

data were found to be highly suitable for conducting EFA analysis: a) $KMO=0.966$; $KMO>0.7$, and b) Bartlett's test of sphericity ($\chi^2=8684.292$, $p<0.001$), according to Hair et al. (2014).

Upon confirming suitability for EFA, Principal Component Analysis (PCA) with Varimax rotation (7 iterations) was implemented to determine whether a six-factor solution and loading values for students or Gen Z matched those of the original SUSTDI scale used in the research. Following Hair et al. (2014), factors are acceptable, providing an eigenvalue greater than 1, total variance explained above 60%, and factor loading was above 0.5. Two items, one in Factor 2 (EE3 with factor loadings 0.498) and one in Factor 3 (EP6 with factor loading 0.475), had factor loading a little below 0.5. Stevens (2002, cited in Cheung et al., 2024) suggested that the value of a factor loading should be greater than 0.4 for interpretation purposes.

es. Thus, the authors retained these items to avoid losing useful information about Gen Z's understanding of sustainable tourism development.

The EFA results produced a three-factor structure with eigenvalues above 1 for the SUSTDI as

a tool for understanding sustainable tourism development applied to students or Gen Z (Table 2), compared to the six-factor structure in the original SUSTDI scale (Appendix Table A.1).

Table 2 EFA analysis results for students' understanding of sustainable tourism development

Dimension/Items	Factor loading	Total variance explained (%)
Students' understanding of sustainable tourism development		
Factor 1 – Resource preservation		58.378
RP7	.806	
RP2	.804	
RP1	.789	
RP6	.778	
RP8	.712	
RP3	.674	
RP5	.626	
EE6	.585	
EE5	.555	
Factor 2 – Environmental education, participation and resource identification		5.101
SI5	.792	
SI4	.735	
SI1	.708	
SI6	.687	
SI2	.669	
EE4	.618	
SI3	.595	
CRI2	.592	
CRI1	.563	
CRI3	.554	
EE1	.543	
EE2	.519	
EE3	.498	
Factor 3 – Economic planning and cultural awareness		3.288
EP2	.825	
EP3	.670	
EP1	.656	
EP5	.591	
EP4	.568	
CA1	.563	
CA2	.557	
EP6	.475	
Cumulative total variance explained (%)		66.766

Source: Authors' calculations

EFA analysis indicates a different factor structure of the SUSTDI for Gen Z, identifying three factors: Factor 1 - *Resource preservation*, Factor 2 - *Environmental education, participation and resource identification*, and Factor 3 - *Economic planning and cultural awareness*. From this factor structure, item RP4 - *Tourism development should be discouraged when it harms the environment*, was excluded as an

insignificant variable, with a factor loading below 0.4. The total variance explained by these three factors accounted for 66.766 %.

Furthermore, reliability analysis was performed for the identified factors, and Cronbach's alpha coefficients were calculated (Table 3).

Table 3 Dimension reliability

No.	Dimensions and attributes	Cronbach's alpha (α)
1.	Understanding of sustainable tourism development	0.910
1.1	Resource preservation	0.946
1.2	Environmental education, participation and resource identification	0.956
1.3	Economic planning and cultural awareness	0.914
2.	Awareness of sustainable tourism	0.813

Source: Authors' calculations

As recommended by Hair et al. (2014), the validity of the instruments and the internal consistency of the scale for each variable were confirmed by Cronbach's alpha coefficient (>0.70). The calculated Cronbach's alpha coefficients for the composite variable *Understanding of sustainable tourism development* and its three factors, as well as for *Awareness of sustainable tourism*, exceed the minimal Cronbach's alpha value stated above. Indeed, all values are above 0.9 and above 0.8 for *Understanding sustainable tourism* and *Awareness of sustainable tourism*, respectively. This indicates a high internal consistency of the determined SUSTDI instrument composed of a three-factor structure used to measure Gen Z's understanding of sustainable tourism development.

The three-factor structure of the SUSTDI tool captures Gen Z's specific understanding of sustainable development. Compared to the original SUSTDI framework, the updated version emphasizes a more comprehensive approach to sustainability and combines factors on broader topics: resource conservation, environmental education and participation, resource identification, and economic planning with cultural awareness. The findings support previous research showing that Gen Z views sustainability as an interconnected system that encompasses the environment, society and the economy, rather than an isolated issue (Görpe & Öksüz, 2022; Çalışkan, 2021). For Gen Z, environmental conservation, engagement within the community, and cultural and economic responsibility are closely linked to their perception of sustainability (Kubíková &

Rudý, 2024). This perspective fits well with current trends in student sustainability education, where students are increasingly drawn to interdisciplinary, systematic learning and focused on applying what they learn (Deale, 2019; Fernández-Villarán et al., 2024). These findings reinforce the value of the revised SUSTDI tool and highlight the need for educational programs to adopt a more integrated and interdisciplinary approach to sustainable tourism development.

The three-solution factor of the SUSTDI also identifies areas where knowledge should be enriched, enhancing students' awareness as members of Gen Z and as stakeholders who play a significant role in advancing sustainable development (Murray, 2018). An identified level of knowledge and education needs is evident for their active participation in tourism planning (Cárdenas et al., 2015).

4.3 Descriptive statistics and independent samples *t*-test

Different levels of sustainability knowledge acquired through study programs (BETH and MSD) enabled research on whether there are various levels of understanding of sustainable tourism development among students enrolled in these studies and how their knowledge and understanding affect their awareness of sustainable tourism development. The importance of such studies integrating various sustainability topics into their curricula stems from previous research, such as Arrobas et al. (2020), which indicated a need to create a specif-

ic “Tourism and Sustainable Development” course for tourism undergraduate students. In order to provide further education for students or Gen Z as stakeholders necessary for ensuring sustainable tourism development, there must be an assess-

ment of awareness, knowledge, and understanding (Cárdenas et al., 2015).

A comparison of understanding sustainable tourism between the BETH and MSD study programs was made based on the calculated factor’s mean values shown in Table 4.

Table 4 Mean values – student’s understanding of sustainable tourism development by study program

No.	Dimensions / Items	BETH (N=237)		MSD (N=76)	
		Mean (M)	Std. Dev. (STD)	Mean (M)	Std. Dev. (STD)
1.	Factor 1 – Resource preservation				
	RP7	4.49	.795	4.71	.629
	RP2	4.41	.800	4.58	.698
	RP1	4.48	.842	4.74	.640
	RP6	4.51	.857	4.58	.771
	RP8	4.42	.858	4.59	.851
	RP3	4.29	.866	4.46	.807
	RP5	4.38	.892	4.55	.737
	EE6	4.34	.851	4.55	.755
	EE5	4.35	.864	4.61	.732
	Overall F1	4.41	.847	4.60	.736
2.	Factor 2 – Environmental education, participation and resource identification				
	SI5	4.32	.921	4.38	.909
	SI4	4.35	.897	4.46	.930
	SI1	4.32	.900	4.45	.755
	SI6	4.41	.847	4.50	.775
	SI2	4.35	.873	4.53	.683
	EE4	4.33	.893	4.58	.698
	SI3	4.32	.883	4.57	.772
	CRI2	4.30	.919	4.36	.890
	CRI1	4.31	.918	4.63	.629
	CRI3	4.43	.824	4.50	.792
	EE1	4.25	.880	4.38	.909
	EE2	4.18	.959	4.38	.879
	EE3	4.36	.945	4.34	.987
	Overall F2	4.33	.897	4.47	.816
3.	Factor 3 – Economic planning and cultural awareness				
	EP2	4.28	.848	4.39	.801
	EP3	4.11	.984	4.17	.870
	EP1	4.12	.885	4.12	.938
	EP5	4.35	.877	4.55	.681
	EP4	4.33	.860	4.53	.683
	CA1	4.30	.848	4.38	.832
	CA2	4.29	.851	4.51	.774
	EP6	4.34	.851	4.59	.657
	Overall F3	4.27	.876	4.41	.780
Overall	4.34	.873	4.49	.777	

Source: Authors’ calculations

Analyzing the overall mean values of the factors, both study programs exhibit high mean values above 4.0 for all factors, indicating a high level of students' understanding of sustainable tourism. It also confirms previous findings of Borges (2019), who reported that university students possessed favorable knowledge and attitudes toward sustainable development.

BETH students demonstrate a strong understanding of sustainable tourism development. In this study program, knowledge should be improved primarily related to Factor 3 ($M=4.27$). MSD students demonstrate a strong understanding of Factor 3 ($M=4.41$) and show an excellent association with the other two factors. Thus, economic planning

and cultural awareness (Factor 3) are the main segments in both study programs that need to enrich students' knowledge to better understand sustainable tourism development.

Furthermore, the mean values of all factors were higher in the MSD study program. Furthermore, the overall understanding of sustainable tourism development was greater among MSD students ($M=4.34$) compared to BETH students ($M=4.49$).

In addition, an independent samples t-test was conducted to determine whether there is a significant difference in students' understanding of sustainable tourism development between these two study programs. The results are presented in Table 5.

Table 5 Independent samples t-test (overall students' understanding of sustainable tourism by study program)

	Study program	N	Mean	Std. Dev.	Std. Error Mean	
1.	BETH	237	130.01	20.643	1.341	
2.	MSD	76	134.67	16.317	1.872	
Levene's test						
		F	Sig.	t-test for equality of means		
				t	df	Sig. (2-tailed)
	Equal variances assumed	5.369	.021	1.797	311	.073
	Equal variances not assumed			2.025	158.476	.045

Note: $p < 0.05$

Source: Authors' calculations

Independent samples t-test factors are formed as the sums of corresponding items. The calculated significance value from Levene's test ($p < 0.05$) indicates significant differences ($p = 0.045$) in students' understanding of sustainable tourism development between MSD and BETH study programs. Based on these results, the first hypothesis H1 is confirmed. These findings correspond to Goh et al. (2017), indicating that sustainability content should be a mandatory part of the curriculum in all hospitality-related educational institutions. Gough & Scott (2003) examined whether integrating sustainability tourism modules into management curricula positively impacts students' understanding of sustain-

ability issues. According to Shafieih et al. (2024), understanding and knowledge are prerequisites for developing students' critical thinking skills related to sustainable tourism development. On the other hand, Cole (2006) identified that a lack of knowledge can be a barrier to Gen Z's participation in decision-making related to sustainable tourism development.

Following the identified level of students' understanding and the observed differences among study programs, the research focus shifted to students' awareness of sustainable tourism. The calculated mean values for this factor are shown in Table 6.

Table 6 Mean values – students’ awareness of sustainable tourism by study program

Dimensions / Items	BETH (N=237)		MSD (N=76)	
	Mean (M)	Std. Dev. (STD)	Mean (M)	Std. Dev. (STD)
A1	4.23	.929	4.53	.791
A2	4.24	.873	4.50	.739
A3	3.75	1.050	3.96	1.160
A4	3.73	1.125	3.91	1.022
Overall	3.99	.994	4.23	.928

Source: Authors’ calculations

In general, students demonstrate a high level of awareness regarding sustainable tourism. Still, MSD students (M=4.23) demonstrated greater awareness of sustainable tourism development than BETH students (M=3.99). These findings align with Görpe and Öksüz (2022), who identified students’ sustainability awareness in Turkey and the United Arab Emirates. Thus, as emphasized by Krstinić Nižić and Butković (2023, p. 243), “Generation Z, as the new workforce of today, is ready to imple-

ment the principles of sustainable development in tourism and understands the meaning and importance of sustainable development in the early stages of their career.”

Additionally, an independent samples t-test was conducted to determine whether significant differences exist in awareness of sustainable tourism development between students in the two study programs (Table 7).

Table 7 Independent samples t-test (overall students’ awareness of sustainable tourism by study program)

	Study program	N	Mean	Std. Dev.	Std. Error Mean	
1.	BETH	237	15.95	3.237	.210	
2.	MSD	76	16.89	2.855	.327	
		Levene’s test		t-test for equality of means		
		F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed		.294	.588	2.267	311	.024
Equal variances not assumed				2.419	141.924	.017

Note: p<0.05

Source: Authors’ calculations

Factors are formed as the sums of corresponding items when conducting the independent samples t-test. Levene’s test significance value (p<0.05) indicates the existence of significant differences in awareness of sustainable tourism between students in the two study programs, with MSD students (M=4.23) demonstrating greater awareness. These findings confirm hypothesis H2. This aligns with Shafieih et al.’s (2024) findings, which emphasizes

that knowledge provides the understanding, awareness, and insights necessary for making informed choices. Additionally, a high level of knowledge contributes to a positive attitude toward sustainable behavior and strengthens stakeholders’ motivation to engage in sustainable practice (Tang et al., 2022). Brody and Ryu (2006) suggested that graduate-level education can significantly enhance the extent to which students behave sustainably.

4.4 Regression analysis

Regression analysis was carried out to assess the impact of understanding sustainable tourism development on awareness of sustainable tourism. Both

simple and multiple linear regression analyses were employed for that purpose. The results are shown in Table 8.

Table 8 Simple and multiple linear regression analyses (overall students' awareness and understanding of sustainable tourism development)

Students' awareness of sustainable tourism	B	SE	BETA	t	Sig.
Constant	2.198	.901		2.438	.015
Understanding of sustainable tourism development	.107	.007	.665	15.689	.000
R ²	.442				
Adjusted R ²	.440				
Standard error	2.372				
F-ratio	246.150				
Significance	.000				
Students' awareness of sustainable tourism	B	SE	BETA	t	Sig.
Constant	2.232	.919		2.429	.016
Resource preservation	.030	.043	.059	.709	.479
Environmental education, participation and resource identification	.111	.035	.323	3.134	.002
Economic planning and cultural awareness	.188	.048	.321	3.916	.000
R ²	.451				
Adjusted R ²	.446				
Standard error	2.359				
F-ratio	84.715				
Significance	.000				

Source: Authors' calculations

Factors are formed as the sums of corresponding items. In a simple regression analysis, understanding of sustainable tourism development was taken as an independent variable, while students' awareness of sustainable tourism was a dependent variable. Regression analysis indicates a statistically significant ($p=0.000$, $p<0.05$), positive and strong influence ($\beta=0.665$) of understanding sustainable tourism development on its awareness. Furthermore, understanding sustainable tourism development is an important predictor variable of sustainable tourism awareness (Adjusted $R^2=0.440$) and explains 44% of the variance in students' awareness of sustainable tourism.

Furthermore, multiple regression analysis was implemented to identify understanding of sustainable tourism factors and their significance in influenc-

ing students' awareness of sustainable tourism. Three factors of understanding sustainable tourism development were taken as independent variables, and awareness of sustainable tourism represented a dependent variable for multiple linear regression calculations. Among the observed factors of understanding sustainable tourism development, *Resource preservation* has an insignificant influence ($p=0.479$) on students' awareness of sustainable tourism. The remaining two factors have a significant ($p=0.002$ and $p=0.000$, $p<0.05$) and approximately equal ($\beta=0.323$, $\beta=0.321$) positive influence on students' awareness of sustainable tourism. These significantly influencing factors enable more targeted actions to increase student awareness of sustainable tourism. Following these results, hypothesis H3 is confirmed. These results are

supported by previous findings of Hay and Eagle (2019), which point out that the inclusion of specific sustainability-related content has successfully raised awareness and achieved behavior change. Gafoor (2012) emphasizes that all individuals who possess any form of knowledge must also have awareness. Additionally, the availability of education and training also significantly influences positive perceptions of tourism (Lawelai et al., 2024).

5. Concluding remarks

To develop students' awareness and encourage their future involvement in implementing sustainable tourism solutions, all forms of education must play a key role. The study showed that students' understanding of sustainability differs significantly depending on whether sustainability issues are integrated into the curricula of their study programs. Students who had the opportunity to learn about sustainability as part of their curricula showed a higher level of awareness and competencies related to sustainability, especially sustainable tourism. This result underlines the importance of curriculum design in tourism education for future professionals.

The results show that sustainability values should be integrated as a core theme across all university study programs, rather than treated as isolated topics, to ensure an informed and active generation committed to sustainable tourism development. This study identified specific areas where Gen Z students' knowledge needs to be expanded, particularly in terms of economic planning and cultural awareness, which provided a more focused direction of education. More comprehensive knowledge among students and a better understanding of sustainable tourism development will contribute to their greater interest in this concept and its implementation in decision-making processes related to tourism development. Higher education institutions should emphasize interdisciplinary curriculum design that comprehensively addresses the environmental, social and economic aspects of sustainability. This study offers both theoretical and empirical contributions. The theoretical con-

tribution of this study fills a gap in the literature by examining Gen Z's knowledge and understanding of sustainable tourism development. It proposes a revised and highly reliable three-factor SUSTDI tool that captures Generation Z's perception of sustainable tourism development as a more integrated and holistic concept. The empirical contribution of the study lies in the proposed SUSTDI tool's ability to guide educational institutions in identifying particular areas of knowledge where study programs and curricula need strengthening. The findings offer practical insights for policymakers and destination planners, emphasizing the central role Generation Z could play in advancing sustainable tourism practices.

The study has some limitations that should be mentioned. The research was based on a single-institution convenience sample that limits the generalizability of the findings to a broad population. The sample may reflect institution-specific characteristics that are not representative of Generation Z globally. Thus, future research should extend to a broader range of university study programs to assess more comprehensively the inclusion of sustainability in study programs and students' understanding and awareness of sustainable tourism development. Additionally, the research was conducted in one academic year. Such evaluation must be carried out continuously to empower Generation Z through the knowledge required for more active participation in sustainability-oriented actions, where higher education institutions play a critical role. Longitudinal studies could provide valuable insights by tracking the acquisition of sustainability knowledge and awareness throughout different phases of students' career development.

Several directions for future research are proposed. Comparative studies could examine variations in sustainable tourism awareness across generational groups, such as Millennials and Generation Z. Furthermore, cross-institutional and cross-national comparisons could provide helpful insights into the roles of formal and non-formal learning channels in shaping students' understanding of sustainable development and applying more sustainability-focused decision-making in the future.

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Appendix

Table A.1 Stakeholder Understanding of Sustainable Tourism Development Index (SUSTDI)

Item number	Item
Factor 1 – Resource preservation	
RP1	Tourism development should include the protection of the natural environment.
RP2	Environmental impact studies should be conducted for both existing and proposed tourism development.
RP3	Tourism activities should be integrated with regional conservation programs.
RP4	Tourism development should be discouraged when it harms the environment.
RP5	Tourism should improve the environment for future generations.
RP6	Tourism should not be allowed to damage the cultural resources.
RP7	The natural environment must be protected for use by future generations.
RP8	The community should be actively involved in the conservation of the region's environment.
Factor 2 – Environmental education	
EE1	Opportunities are needed to learn more about the environment.
EE2	Environmental education programs lead to the improvement of natural resources.
EE3	Plants and animals have the same rights as humans to natural resources in the community.
EE4	Education of local residents about proper land use practices is important to successful tourism development.
EE5	Education of local business owners about proper land use practices is important to successful tourism development.
EE6	Education of visitors about proper land use practices is important to successful tourism development.
Factor 3 – Stakeholder inclusion	
SI1	Tourism leaders must monitor business satisfaction with tourism in order for tourism to be successful.
SI2	Tourism leaders must monitor citizen satisfaction with tourism in order for tourism to be successful.
SI3	Community involvement increases support for tourism.
SI4	Tourism leaders must monitor tourist satisfaction with tourism in order for tourism to be successful.
SI5	Visitor participation in tourism development is essential to successful tourism development.
SI6	Community participation in tourism development is essential to successful tourism development.
Factor 4 – Economic planning	
EP1	Tourism diversifies the local economy.
EP2	Tourism is good for a community's economy.
EP3	Economic development funds should be used to promote tourism.
EP4	A long-term goal is needed when planning tourism development.
EP5	I believe tourism development needs well-coordinated planning.
EP6	Education of local governmental officials about proper land use practices is important to successful tourism development.
Factor 5 – Cultural awareness	
CA1	Opportunities are needed to learn more about the local history.
CA2	Opportunities are needed to learn more about the local culture.

Item number	Item
Factor 6 – Community resource identification	
CRI1	The culture of the community is a tourist attraction.
CRI2	Restoration of historical sites would promote tourism.
CRI3	The natural environment is a tourism attraction.

Source: Cárdenas, D. A. et al. (2015)

Table A.2 Awareness of sustainable tourism

Item number	Item
A1	I am aware of the concept of sustainable tourism.
A2	I understand the benefits of sustainable tourism for the community.
A3	I know how to engage in sustainable tourism practices.
A4	I actively seek out eco-friendly tourism options.

Source: Thang, N. D. & Thanh, N. N. (2023)