

ONLINE PLATFORMS AS TOOLS FOR ENVIRONMENTAL CONSUMER EDUCATION

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ABSTRACT

In the digital era, online platforms are becoming a significant channel for environmental consumer education. This paper aims to identify consumers' preferred options for environmental education through online platforms, evaluate their actual utilization, and describe the motivations and barriers to engagement. The empirical section is based on the quantitative questionnaire survey primary data. To statistically verify relations, Spearman's rank correlation coefficient and Pearson's χ^2 -test were applied; furthermore, factor and cluster analyses were conducted. The results indicate that 92% of respondents utilize online platforms to obtain environmental information, with social media, and online articles being predominant. A weak positive correlation ($\rho = 0,29$) was found between the perceived availability of eco-friendly options in the place of residence and declared pro-environmental behavior, whereas a moderate positive correlation ($\rho = 0,53$) was demonstrated between the subjective level of environmental education and pro-environmental behavior. The preferences regarding platform types differ statistically significantly based on the respondents' economic activity. Factor analysis identified three dimensions of attitudes toward online environmental education. The cluster analysis identified three distinct groups of respondents—passive online users, highly active and university-educated learners utilizing a wide spectrum of digital tools and disengaged non-users. The formulated recommendations are primarily directed at educational institutions and non-profit organizations.

Keywords: environmental education, online platforms, social media, sustainability, consumer behavior, digital literacy, cluster analysis, ecological literacy

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1 INTRODUCTION

Global environmental issues rank among the most pressing challenges of the contemporary era, and their resolution demands not only systemic measures at the state level but also responsible behavior on the part of individual consumers (Guerra *et al.*, 2024). A key prerequisite for pro-environmental behavior is an adequate level of environmental literacy, which can be developed through education in both formal and informal settings (Kollmuss & Agyeman, 2002). In the digital era, the significance of online platforms is expanding as a tool capable of making such education accessible to broad groups of consumers (Hassan *et al.*, 2024; Liu & Zhang, 2024).

Online platforms offer flexibility, visual appeal, and opportunities for interactive engagement, enabling them to reach target groups that traditional educational paths no longer influence (Xiaomeng, 2024). Social media, video platforms, podcasts, blogs, specialized non-profit websites, and online courses represent diverse formats with varying depths of content and degrees of credibility (Hajdukiewicz & Pera, 2020; Pabian & Pabian, 2023). Alongside these opportunities, the digital environment introduces risks in the form of inaccurate or misleading information, high demands on media literacy, and the phenomenon of greenwashing, which undermines the credibility of sustainability communication (Yang *et al.*, 2020). The role of information sources is further complemented by social media influencers, whose credibility and attractiveness affect consumers' intentions to act in a more environmentally friendly manner (Awang *et al.*, 2021).

Empirical studies confirm that a higher level of environmental awareness is associated with a greater propensity for pro-environmental behavior (Mkumbachi, 2020; Saptura, 2022). However, the effectiveness of education also depends on consumers' perceived capacity to act and their confidence in the impact of their own behavior (Graca & Khare, 2023). Concurrently, barriers preventing engagement have been repeatedly identified: lack of time, low trust in online sources, and the perception that individual behavior does not exert a sufficient impact (Chung *et al.*, 2020).

Despite the extensive literature on the effectiveness of digital environmental education, the question remains open as to how consumers within the Central European context actually choose among types of online platforms, what motivations and barriers guide their decision-making, and whether segments with distinct educational preferences can be identified to be targeted by specific communication strategies. Mapping these patterns is a fundamental prerequisite for effective environmental awareness.

This paper aims to identify consumers' preferred options for environmental education through online platforms and to evaluate their actual utilization. The specific sub-objectives are: (1) to identify consumer motivations for environmental education and their preferences regarding online platforms; (2) to determine the barriers preventing participation in educational activities; and (3) to segment consumers based on their educational preferences.

2 METHODOLOGY AND DATA

To achieve the established objective, a mixed-methods research design was adopted, combining secondary and primary data in the form of a quantitative questionnaire survey. Secondary sources (DataReportal, AMI Digital, documents from international environmental organizations, and academic publications) were utilized to contextualize the study and operationalize the research variables.

The quantitative survey was administered through an online questionnaire using the Microsoft Forms application between February 22 and March 10, 2025. Distribution was carried out via social

media (Facebook, Instagram), email, and through environmentally oriented non-profit organizations and educational institutions. The questionnaire featured a branching structure: respondents who declared at least a partial interest in environmental issues in the opening filter questions completed an extended version consisting of 17 items (5 of which were demographic/identifying items); respondents expressing no interest were redirected to a shortened version containing 5–6 items. Closed-ended questions with scale, single-choice, and multiple-choice options were employed. In total, 276 complete questionnaires were obtained.

The demographic profile of the respondents reflected the nature of online data collection (Table 1): females accounted for 66.66%, the 18–25 age group represented 60.87%, university-educated respondents constituted 53.26%, students made up 55.79%, and residents of major cities with over 100,000 inhabitants comprised 51.81%. Consequently, the sample primarily captures a young, digitally literate population, a factor that must be taken into account when interpreting the results.

Tab. 1 Demographic profile of the questionnaire survey respondents (source: own questionnaire, n = 276)

	Absolute frequency	Relative frequency
Gender		
Female	184	66.66%
Male	89	32.25%
Other	3	1.09%
Age		
18–25	168	60.87%
26–35	48	17.39%
36–45	18	6.52%
46–55	23	8.33%
56–65	14	5.07%
66+	5	1.81%
Place of residence		
100 000 and more inhabitants	143	51.81%
50 000–100 000 inhabitants	20	7.25%
10 000–50 000 inhabitants	25	9.06%
5 000–10 000 inhabitants	17	6.16%
1 000–5 000 inhabitants	53	19.20%
Up to 1 000 inhabitants	18	6.52%
Highest level of education		
Primary education	1	0.72%
Secondary education	128	46.38%
Higher education / University	147	53.26%
Economic status		
Employee	82	29.71%
Self-employed	21	7.61%
Unemployed	2	0.72%
Student	154	55.79%
Retired	8	2.90%
Maternity / Parental leave	5	1.81%
Other	4	1.45%

To test relationships, Spearman's rank correlation coefficient was employed (for ordinal variables) and Pearson's χ^2 -test of independence was utilized (for categorical data); the significance level was set at $\alpha = 0,05$. Prior to the analysis, variable coding was performed, with higher values representing a stronger pro-environmental attitude. Variables regarding the utilization of individual online platforms were converted into binary form.

Two hypotheses were tested. H1 examined the relationship between the perceived availability of eco-friendly options in the place of residence and the respondents' declared pro-environmental behavior. H2 tested the relationship between economic activity (student / employee / other) and the utilization of specific types of online platforms for environmental education. Additionally, the correlation between the subjectively perceived level of environmental education and the degree of pro-environmental behavior was evaluated.

To explore motivational and barrier factors more deeply, an exploratory factor analysis was conducted using Kaiser's criterion (factors with an eigenvalue greater than 1 were included, and variables with a factor loading greater than 0.7 were interpreted). For respondent segmentation, a k-means cluster analysis was applied prior to the k-means cluster analysis, the optimal number of clusters was assessed using the elbow method. Based on the identified elbow point in the within-cluster sum of squares curve, a three-cluster solution was selected. The variables included in the analysis were pro-environmental behavior, level of environmental education, use of online platforms, and the type of most frequently utilized platform. Data processing was performed using Statistica and Microsoft Excel software.

3 RESULTS

Online platforms represent the predominant information channel for the respondents, with 92% declaring that they utilize them to obtain environmental information. In a direct comparison of the effectiveness of online platforms versus traditional media, respondents rated online platforms as more effective (mean score of 1.94 on a five-point scale, where 1 = online platforms, 5 = traditional

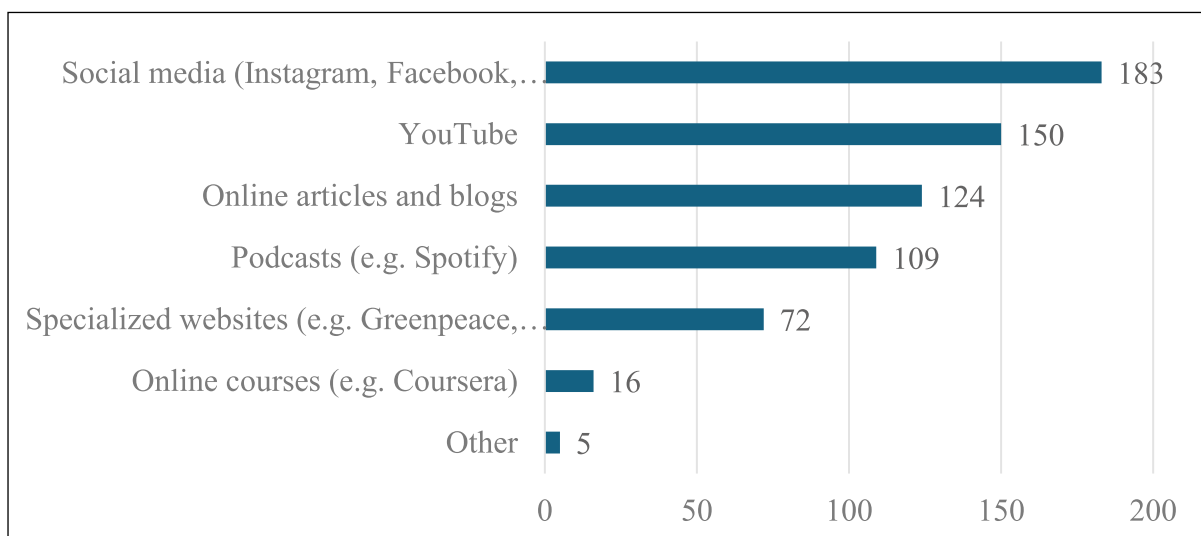


Fig. 1: Most frequently utilized types of online platforms for environmental education (source: own questionnaire, n = 276)

media). Respondents primarily turned to social media, YouTube, and online articles for environmental information (indicated via a multiple-choice question – Figure 1). Conversely, online courses and specialized websites received the lowest engagement.

The subsequent question focused on the credibility of information sources. Specifically, respondents indicated the highest level of trust in scientists and experts, who received 227 choices, followed by non-profit organizations with 153 choices. Conversely, sources such as news media, eco-influencers, and family or friends achieved substantially lower recognition, while outright skepticism toward online environmental information remained entirely marginal.

To verify H1, Spearman's rank correlation coefficient was applied between the perceived availability of eco-friendly options in the place of residence and the degree of pro-environmental behavior. The result ($p = 0.29$) indicates a weak, statistically significant positive correlation, on the basis of which the null hypothesis was rejected. Respondents who perceive a higher availability of eco-friendly options thus also declare a higher degree of pro-environmental behavior. An additional analysis revealed a stronger relationship between the subjectively perceived level of environmental education and pro-environmental behavior ($p = 0.53$), aligning with the assumption that education serves as an important predictor of pro-environmental behavior.

Hypothesis H2 was tested using a χ^2 -test of independence for each type of online platform individually (Table 2). A statistically significant relationship between the respondents' economic activity and platform utilization was demonstrated for social media ($p = 0.0014$), YouTube ($p = 0.0073$), and online courses ($p = 0.031$). Regarding social media and YouTube, students exhibit higher utilization rates, whereas for online courses, the opposite is true, with employees showing higher engagement. For online articles and blogs, podcasts, and specialized websites, no statistically significant relationship was proven, indicating their cross-cutting acceptance across different economic groups.

The factor analysis identified three factors with an eigenvalue greater than 1, which collectively explain 63.0% of the total data variance. Factor 1 (Intrinsic Motivation; 31.4% of variance) loads heavily on a desire to contribute to environmental protection (0.837), interest in the topic (0.830), and social responsibility (0.769), while showing a strong negative correlation with an apathetic attitude (-0.563). Factor 2 (Information Barriers; 18.4% of variance) highlights a clear connection between digital literacy and trust. It links a lack of knowledge on where to find quality resources (0.749) with a general distrust of online information (0.796). Factor 3 (Intrinsic Passivity; 13.0% variance) captures internal behavioral barriers, dominated by laziness or a lack of energy (0.865) and further constrained by time limitations (0.530).

Among the strongest motivations for online environmental education are the perception of social responsibility (mean score of 4.09 on a five-point scale) and the effort to know how to personally

Tab. 2 Summary of hypothesis testing regarding the relationship between economic activity and the utilization of individual online platform types (source: own questionnaire processed in Statistica software)

Online platform	p-value	Decision	Conclusion
Social networks	0.0014	H0 rejected	Statistically significant
YouTube	0.0073	H0 rejected	Statistically significant
Online articles and blogs	0.558	H0 not rejected	Statistically non-significant
Podcasts	0.408	H0 not rejected	Statistically non-significant
Specialized websites	0.161	H0 not rejected	Statistically non-significant
Online courses	0.031	H0 rejected	Statistically significant

Tab. 3 Consumer segments (source: own questionnaire processed in Statistica software)

Questions from the questionnaire	Segment 1	Segment 2	Segment 3
Do you do something for environmental protection in your daily life?	2.909	3.919	2.786
Do you consider yourself to be a sufficiently environmentally educated person?	3.082	3.661	2.405
Do you use online platforms to obtain information?	1.000	0.992	0.024
What online platforms do you use for education in the field of ecology?			
Social media	0.846	0.726	0.000
Online articles and blogs	0.473	0.581	0.000
YouTube	0.627	0.653	0.000
Podcasts	0.400	0.524	0.000
Specialized websites	0.118	0.476	0.000
Online courses	0.045	0.089	0.000
ewobox	0.000	0.016	0.000
EPALE	0.009	0.000	0.000
Newsletter	0.000	0.008	0.000

contribute to environmental protection (3.64). The most significant barriers identified are a lack of time (3.15) and a lack of intrinsic motivation or energy (3.05). Consequently, consumers generally recognize the need for education but encounter organizational and motivational obstacles.

The k-means cluster analysis segmented the respondents into three distinct profiles based on their behaviors and platform preferences (Table 3). Segment 1 (n = 110) is characterized by a passive approach to environmental topics. Although all members actively utilize online platforms, they exhibit only moderate pro-environmental behavior and self-perceived education. Social media constitutes their dominant information channel. Demographically, this group is predominantly composed of students and urban residents aged 18–25. Segment 2 (n = 124) represents the largest and most proactive segment, where respondents display the highest rates of both pro-environmental behavior and self-perceived education. Unlike the other groups, they utilize a wide spectrum of digital platforms, frequently engaging with specialized websites. This segment includes both students and employed professionals, with university education being predominant. Segment 3 (n = 42) clusters respondents with the lowest interest in ecology. They manifest almost no utilization of online platforms for environmental information and exhibit the lowest rates of pro-environmental behavior and self-assessed knowledge. Within this segment, secondary education with a school-leaving exam prevails.

Insights from the minority segment of unengaged respondents (21 individuals who declared no interest in environmental issues) revealed that the main reasons provided were a general disinterest in the topic and a lack of time; according to them, the most effective motivational stimulus would be clear, practical benefits of environmental education for everyday life.

4 DISCUSSION AND CONCLUSIONS

The presented study confirmed that online platforms serve as the predominant information channel for consumers to obtain environmental information; the declared utilization rate of 92% aligns with the position of Slovakia as a highly digitalized country with a 91.4% internet penetration rate (DataReportal, 2024). These findings are consistent with the literature, which asserts that digital tools represent an effective pathway for raising environmental awareness across various age groups (Hassan *et al.*, 2024; Liu & Zhang, 2024; Xiaomeng, 2024).

The moderate positive correlation between subjectively perceived environmental education and pro-environmental behavior ($\rho = 0,53$) supports the assumption that knowledge translates into daily decisions. Similar findings were reported by Mkumbachi (2020) among university students and Saptura (2022) within a broader consumer context. The weaker, yet statistically significant correlation between the availability of eco-friendly options in the place of residence and behavior ($\rho = 0,29$) suggests that knowledge and attitude are stronger predictors than infrastructural accessibility; therefore, infrastructure improvement and educational activities should complement each other.

A key practical finding is that the choice of an online platform is related to economic activity. Students prefer visually interactive social media and YouTube, whereas employees seek more professionally oriented online courses. This conclusion is aligned with the findings of Chung *et al.* (2020), according to whom students utilize social media as their primary information channel. For educational content creators, this implies a necessity to segment both the format and the channel according to the target audience: short videos and social media campaigns for younger audiences, and courses and professional texts for working professionals.

The factor analysis demonstrated that the effectiveness of online environmental education depends not only on content availability but also on individual values, the digital literacy required to identify high-quality information, and intrinsic initiative. This three-dimensional perspective corresponds to the theoretical model of motivations and barriers to pro-environmental behavior proposed by Kollmuss and Agyeman (2002) and the empirical results of Graca and Khare (2023), which suggest that education operates through the consumer's perceived self-efficacy.

Segmentation via cluster analysis uncovered three distinctly different target groups whose needs require differentiated communication approaches. Passive social media users require concise, visually appealing content with an emphasis on practical applicability. Active, educated consumers represent not only recipients but also potential multipliers suitable for more advanced professional content and community activities. Respondents with low interest require a completely distinct strategy: engagement through emotionally powerful content highlighting specific personal benefits, or a combination of online and offline formats.

Two priority recommendations for practice emerge from the results. For educational institutions, it is advisable to integrate environmental content in the form of short interactive videos, online quizzes, and webinars with experts, and to conduct communication through channels that students utilize (social media, YouTube). Non-profit organizations should more intensively occupy formats with the highest perceived credibility among respondents—given that NGOs ranked second in credibility after scientists and experts—while simultaneously making professional content accessible through podcasts and short visual videos, i.e., formats with cross-cutting reach.

The study is subject to several limitations. The primary limitation concerns sample representativeness: the dominance of students, younger age groups, and residents of major cities reflects the distribution method of the questionnaire via online channels, leading to an underrepresentation of older and less digitally literate individuals. Furthermore, the subjective evaluation of one's own

environmental education may not accurately correspond to objectively measurable knowledge levels. Future research should focus on capturing older age groups, utilizing gamification and virtual reality in environmental education, and conducting longitudinal tracking of transitions between the identified segments.

In conclusion, online platforms possess high potential to support environmental literacy and pro-environmental consumer behavior; however, their effectiveness is conditional upon a sensitive choice of channel and format regarding the characteristics of the target segment, content credibility, and the enhancement of consumers' digital literacy.

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