



The impact of digital transformation on green behavior of university students in Vietnam

¹Hoang Xuan Lam

Abstract

Digital transformation is reshaping higher education through learning-management systems, digital course materials, electronic submission, online administration and data-enabled communication. This teaching case examines how digital transformation exposure is associated with the green behavior of university students in Vietnam. It integrates a decade-long contextual assessment for 2014-2024 with a student-level ordinary least squares (OLS) analysis based on a classroom dataset of 684 observations. Four composite constructs are examined: digital transformation exposure (DTE), environmental awareness (EA), green institutional support (GIS) and the green behavior index (GBI). All scales demonstrate satisfactory internal consistency, with Cronbach's alpha values ranging from 0.861 to 0.933. In the fully specified model, DTE ($b = 0.233$, $p < 0.001$), EA ($b = 0.230$, $p < 0.001$) and GIS ($b = 0.203$, $p < 0.001$) are positively associated with GBI. The positive interaction between DTE and GIS ($b = 0.093$, $p < 0.001$) indicates that institutional support strengthens the relationship between digital exposure and green behavior. The model explains 38.9% of the variation in GBI. Robustness checks confirm that the principal findings remain stable under alternative specifications. The case demonstrates how digital-campus governance can be linked analytically to resource-saving behavior and student participation in sustainability activities.

Keywords: digital transformation, environmental awareness, green behavior, green institutional support, higher education, Vietnam

Introduction

Universities are institutional environments in which young adults form routines that later carry into workplaces, households and communities. Environmental performance therefore depends not only on buildings and technical systems, but also on everyday student choices: whether documents are printed unnecessarily, devices are switched off when not needed, waste is sorted, reusable items are preferred, water is conserved and environmental activities receive active support.

Digital transformation increasingly shapes these routines. In higher education, digitalization includes learning-management systems, online course materials, electronic submission and feedback, digital libraries, paperless administrative procedures, campus applications and institutional communication channels. Such systems can make environmentally responsible action easier and more visible. Paperless processes reduce avoidable printing; digital resources widen access to sustainability knowledge; and online communication lowers the transaction costs of coordinating campus campaigns.

The environmental consequences of digitalization are not automatically positive. More intensive device use can raise electricity demand, hardware replacement can increase material consumption and electronic waste requires responsible collection and treatment. An environmental-science perspective should therefore avoid treating digital transformation as inherently green. The relationship must be examined at the level at which behavior occurs: the student experience within a specific institutional context.

Vietnam provides a relevant policy setting. Decision No. 117/QD-TTg established a framework for stronger information-technology application in education in 2017. Decision No. 749/QD-TTg approved the National Digital Transformation Program in 2020. Decision No. 131/QD-TTg then approved stronger information-technology application and digital transformation in education and training for 2022-2025, with an orientation to 2030. Over the same decade, Internet use expanded from above 40% of the population in 2014 to approximately 84% in 2024 according to the World Bank / ITU indicator series.

This article has two objectives. First, it places the student-level analysis within the digital-enabling context that developed in Vietnam during 2014-2024. Second, it demonstrates a complete OLS workflow for examining the relationships among digital transformation exposure, environmental awareness, green institutional support and student green behavior. The analysis is suitable for teaching research design, scale construction, regression interpretation, diagnostics and cautious discussion of cross-sectional evidence.

Theoretical Background and Hypotheses

Pro-environmental behavior in higher education

Pro-environmental behavior refers to actions that reduce environmental harm or improve environmental quality. In a university setting, such behavior includes reducing unnecessary printing, saving electricity and water, sorting waste, preferring reusable products, selecting lower-impact travel options where practical, handling unwanted electronic devices responsibly and participating in campus sustainability programs. Because these practices differ in cost, convenience and visibility, a composite index provides a more balanced measure than a single behavioral item.

The literature consistently emphasizes that knowledge alone is insufficient. Attitudes, perceived norms, institutional cues and the practical availability of green choices shape whether environmental concern becomes observable action (Ajzen, 1991; Kollmuss & Agyeman, 2002; Steg & Vlek, 2009). For university students, the campus environment is especially important because institutional arrangements can reduce or increase the effort required to behave responsibly.

Digital transformation as an enabling condition

Digital transformation can support green behavior through several mechanisms. Electronic course materials and online submission reduce avoidable paper use. Student portals and campus applications can distribute behavior-specific messages and provide access to participation opportunities. Digital administrative procedures reduce travel and queuing for routine transactions. Data dashboards can make electricity, water and waste outcomes visible to the university community.

Digital tools are enabling conditions rather than automatic solutions. The same platform produces different environmental outcomes depending on the surrounding institutional architecture. A waste-sorting reminder has limited value if collection points are inconvenient or labels are unclear. A paperless submission system can reduce printing only when instructors and administrators use it consistently. This reasoning places green institutional support at the center of the analysis.

Research hypotheses

Hypothesis	Statement
H1	Digital transformation exposure is positively associated with student green behavior.
H2	Environmental awareness is positively associated with student green behavior.
H3	Green institutional support is positively associated with student green behavior.
H4	Green institutional support strengthens the association between digital transformation exposure and student green behavior.

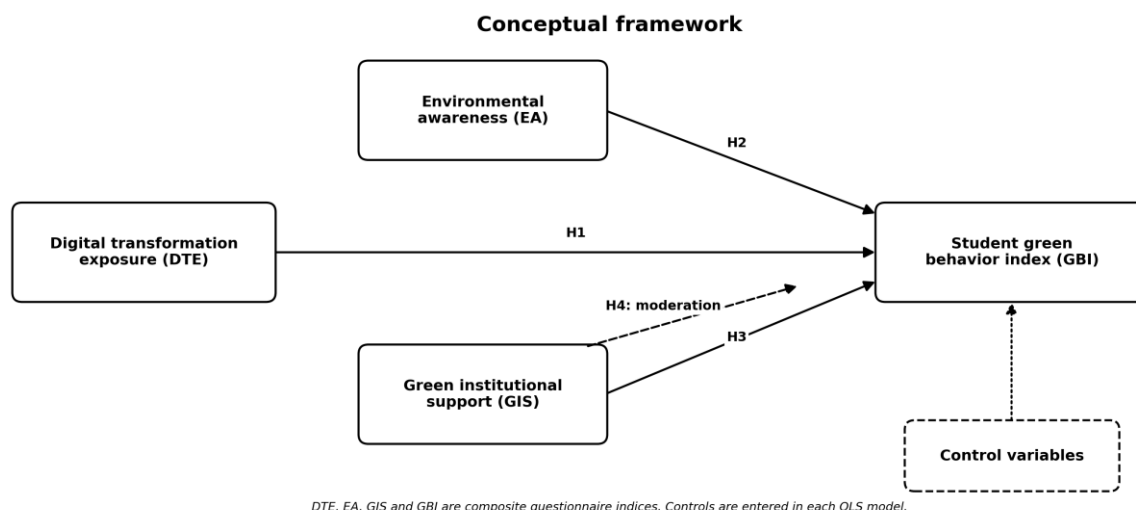


Figure 1. Conceptual framework for the student-level OLS analysis

Method

Research design and classroom dataset

The case uses a cross-sectional student-level dataset containing 684 observations. The analytical unit is the student. The dataset contains region, institution type, study level, gender, field-of-study indicators and responses to 24 five-point items. The constructs are calculated as arithmetic means of their retained items. DTE contains six items, EA five items, GIS five items and GBI eight items. Higher scores indicate greater digital exposure, stronger awareness, stronger perceived institutional support and more frequent green behavior.

Variable measurement

Construct	Items	Measurement focus
Digital transformation exposure (DTE)	6	Digital course materials; online submission; digital administration; sustainability communication; participation tools; reduced paperwork.
Environmental awareness (EA)	5	Electricity use; single-use products; electronic waste; transport emissions; practical personal actions.
Green institutional support (GIS)	5	Waste-sorting facilities; clear expectations; paper reduction; participation support; consistent green initiatives.
Green behavior index (GBI)	8	Printing; device shutdown; water conservation; waste sorting; reusable items; transport; electronic waste; participation.
Controls	7	Gender; senior-study status; postgraduate status; green-related field; region; institution type.

Empirical specification

The dependent variable is the green behavior index. The OLS models are estimated sequentially. Model 1 includes DTE and the controls. Model 2 adds EA. Model 3 adds GIS. Model 4 adds the interaction

between standardized DTE and standardized GIS. Standardization reduces scaling ambiguity when the interaction term is interpreted. The final specification is:

$$GBI_i = \beta_0 + \beta_1 DTE_i + \beta_2 EA_i + \beta_3 GIS_i + \beta_4 (DTE_i \times GIS_i) + \gamma Controls_i + \epsilon_i$$

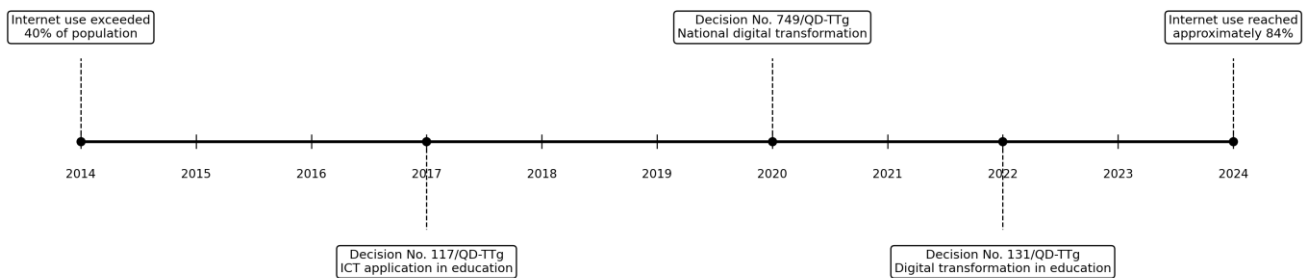
HC3 heteroskedasticity-robust standard errors are reported. The analysis also evaluates internal consistency, pairwise correlations, variance inflation factors, Breusch-Pagan and White tests, a standardized-outcome model, a winsorized-outcome model and a parsimonious model without demographic controls.

Results

Decade-long contextual assessment, 2014-2024

The student-level case sits within a decade of rapid expansion in Vietnam's digital-enabling environment. The national indicators do not measure student behavior directly, but they establish why digital systems have become a mainstream feature of higher-education governance.

Vietnam digital-enabling context, 2014-2024



Source: compiled from the Government Portal of Vietnam and the World Bank / ITU indicator series.

Figure 2. Vietnam digital-enabling context, 2014-2024

Year	Verified milestone	Interpretation
2014	Internet use exceeded 40% of the population.	The connectivity base was expanding before the formal national transformation program.
2017	Decision No. 117/QD-TTg strengthened ICT application in educational management, teaching, learning and research.	Education-sector digitalization had a policy foundation before 2020.
2020	Decision No. 749/QD-TTg approved the National Digital Transformation Program.	Digital transformation became an explicit national policy agenda.
2022	Decision No. 131/QD-TTg approved stronger ICT application and digital transformation in education and training.	The education sector received a dedicated transformation framework.
2024	Internet use reached approximately 84% of the population.	Digital-campus systems operate within a widely connected national environment.

Respondent profile

Characteristic	Category	Frequency	Percentage (%)
Region	North	290	42.4
	Central	145	21.2
	South	249	36.4
Institution type	Public	495	72.4
	Non-public	189	27.6
Study level	Year 1	170	24.9
	Year 2	161	23.5

Characteristic	Category	Frequency	Percentage (%)
	Year 3	165	24.1
	Year 4+	142	20.8
	Postgraduate	46	6.7
Gender	Female	392	57.3
	Other coded category	292	42.7
Field of study	Green-related field	140	20.5
	Other fields	544	79.5

Table 3. Profile of the classroom dataset (N = 684)

The dataset covers all three regions, with 42.4% of records assigned to the North, 21.2% to the Central region and 36.4% to the South. Public institutions account for 72.4% of the observations. The study-level distribution is broad, while 20.5% of records are associated with environmentally related fields. This structure supports the use of controls in the multivariate models.

Measurement quality and descriptive statistics

Construct	Items	Cronbach alpha	Corrected item-total r	Mean	SD	Observed range
Digital transformation exposure (DTE)	6	0.894	0.701-0.735	3.576	0.637	1.722-4.897
Environmental awareness (EA)	5	0.861	0.634-0.715	3.607	0.609	1.424-4.961
Green institutional support (GIS)	5	0.879	0.690-0.729	3.411	0.635	1.776-4.997
Green behavior index (GBI)	8	0.933	0.751-0.780	3.392	0.735	1.342-4.861

Table 4. Reliability and descriptive statistics

All four scales exceed the conventional 0.70 reliability benchmark. Cronbach's alpha ranges from 0.861 for environmental awareness to 0.933 for the green behavior index. Corrected item-total correlations remain comfortably above 0.60 across the retained items. The mean GBI score is 3.392 on the five-point scale, indicating a moderate-to-positive level of green behavior in the classroom dataset. GIS has the lowest mean value (3.411) among the explanatory constructs, suggesting that institutional support provides a useful point of discussion when interpreting the regression results.

Correlation analysis

Construct	DTE	EA	GIS	GBI
DTE	1.000	0.234	0.152	0.429
EA	0.234	1.000	0.043	0.411
GIS	0.152	0.043	1.000	0.346
GBI	0.429	0.411	0.346	1.000

Table 5. Pairwise correlations among the composite constructs

GBI is positively correlated with DTE ($r = 0.429$), EA ($r = 0.411$) and GIS ($r = 0.346$). Correlations among the explanatory constructs are modest: the largest is 0.234 between DTE and EA. This pattern indicates that the constructs are related but not redundant, which is consistent with the low VIF values reported below.

OLS estimates

Variable	Model 1	Model 2	Model 3	Model 4
Digital transformation exposure (z)	0.319*** (0.026)	0.263*** (0.025)	0.233*** (0.024)	0.233*** (0.024)

Variable	Model 1	Model 2	Model 3	Model 4
Environmental awareness (z)	-	0.236*** (0.025)	0.235*** (0.023)	0.230*** (0.023)
Green institutional support (z)	-	-	0.213*** (0.022)	0.203*** (0.021)
DTE x GIS	-	-	-	0.093*** (0.021)
Female	0.048 (0.052)	0.026 (0.049)	0.009 (0.046)	0.025 (0.046)
Senior-study status	0.039 (0.061)	0.013 (0.059)	0.014 (0.056)	0.024 (0.055)
Postgraduate	0.043 (0.120)	-0.001 (0.104)	0.003 (0.096)	0.023 (0.095)
Green-related field	0.169** (0.059)	0.114* (0.055)	0.114* (0.052)	0.123* (0.052)
Central region	-0.078 (0.071)	-0.074 (0.066)	-0.052 (0.063)	-0.059 (0.062)
South region	-0.064 (0.057)	-0.053 (0.054)	-0.029 (0.050)	-0.024 (0.050)
Non-public institution	-0.006 (0.055)	-0.015 (0.053)	-0.078 (0.050)	-0.075 (0.050)
Constant	3.360*** (0.055)	3.391*** (0.051)	3.404*** (0.046)	3.374*** (0.046)
Observations	684	684	684	684
R-squared	0.197	0.293	0.373	0.389
Adjusted R-squared	0.187	0.283	0.363	0.379

Table 6. OLS estimates for the green behavior index. HC3 robust standard errors are in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Model 1 shows a positive association between DTE and GBI ($b = 0.319$, $p < 0.001$). Adding EA in Model 2 reduces the DTE coefficient to 0.263 while EA is positive and statistically significant ($b = 0.236$, $p < 0.001$). GIS enters positively in Model 3 ($b = 0.213$, $p < 0.001$). The final specification supports all four hypotheses. DTE ($b = 0.233$, $p < 0.001$), EA ($b = 0.230$, $p < 0.001$) and GIS ($b = 0.203$, $p < 0.001$) remain positively associated with GBI. The interaction term is also positive ($b = 0.093$, $p < 0.001$), indicating that the DTE-GBI relationship becomes stronger where institutional green support is higher. Model 4 explains 38.9% of the variation in GBI and has an adjusted R-squared of 0.379.

Among the controls, enrollment in a green-related field is positively associated with GBI in Model 4 ($b = 0.123$, $p = 0.017$). Gender, study level, postgraduate status, region and institution type do not show statistically significant coefficients after the main constructs are included. These results suggest that the campus mechanisms captured by DTE, EA and GIS are more informative than the selected demographic controls in explaining variation in green behavior.

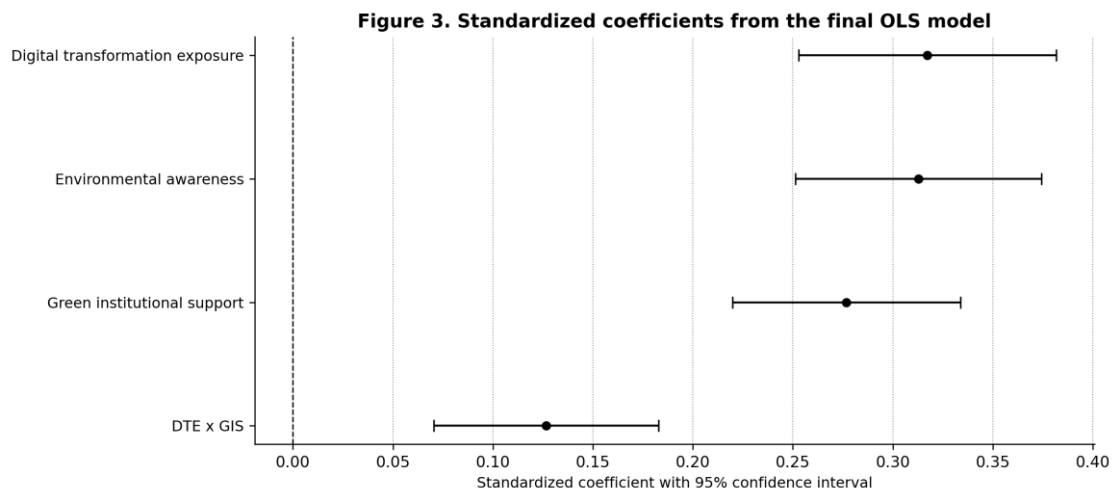


Figure 3. Standardized coefficients from the final OLS model

Diagnosics and sensitivity checks

Check	Result	Interpretation
Maximum VIF	1.195	The explanatory variables do not exhibit problematic multicollinearity.
Breusch-Pagan test	LM = 17.345; p = 0.098	The null of homoskedasticity is not rejected at the 5% level.
White test	LM = 87.741; p = 0.045	The test indicates mild heteroskedasticity; HC3 robust errors are retained.
Standardized-outcome model	DTE = 0.317; EA = 0.313; GIS = 0.277; interaction = 0.127	The relative strength and inference pattern remain stable.
Winsorized-outcome model	DTE = 0.230; EA = 0.229; GIS = 0.202; interaction = 0.093	The principal coefficients remain stable after limiting extreme outcome values.
Parsimonious model	DTE = 0.227; EA = 0.236; GIS = 0.201; interaction = 0.089	The result pattern remains stable when the demographic controls are removed.

Table 7. Diagnostic tests and sensitivity checks

The maximum VIF is 1.195, far below conventional concern thresholds. The Breusch-Pagan test does not reject homoskedasticity at the 5% level, while the White test indicates mild heteroskedasticity. Reporting HC3 robust standard errors is therefore appropriate. The standardized-outcome model shows similar relative effects: DTE has the largest standardized coefficient (0.317), followed closely by EA (0.313), GIS (0.277) and the interaction (0.127). Winsorization and the parsimonious specification do not change the substantive interpretation.

Discussion

The results demonstrate how a student-level OLS analysis can connect digital-campus governance to environmental behavior. Digital transformation exposure remains positively associated with GBI after awareness, institutional support and controls are included. The result is not a claim that every digital initiative is environmentally beneficial. Rather, it indicates that digital systems can support green routines when they reduce unnecessary paperwork, distribute relevant information and lower the practical costs of participation.

Environmental awareness is nearly as influential as digital exposure in the standardized model. This finding is consistent with the broader behavioral literature, which distinguishes the availability of information from the internal recognition that action matters. Digital platforms can expand reach, but environmental content needs to be practical and behavior-specific. Messages about paper reduction, device shutdown, waste sorting and electronic-waste collection are more actionable than generic sustainability slogans.

Green institutional support has both a direct and a moderating role. The positive GIS coefficient indicates that visible and consistent institutional arrangements support student behavior. The positive interaction shows that DTE becomes more effective when these arrangements are present. This result is aligned with Vietnamese evidence reported by Hieu et al. (2022), who found that university environmental-protection policies contribute to environmental commitment among students. The managerial implication is straightforward: universities should not separate digital-transformation strategy from green-campus operations.

For teaching purposes, the sequential models are especially useful. The DTE coefficient declines from 0.319 in Model 1 to 0.233 in Model 4 as EA and GIS are added. This change illustrates how omitted institutional and cognitive variables can inflate a bivariate or lightly controlled association. The final model also shows why diagnostics matter: the White test indicates mild heteroskedasticity even though the Breusch-Pagan test is not significant at the 5% level. Robust standard errors and sensitivity checks strengthen the interpretation.

Conclusion and Teaching Implications

This study examined the relationship between digital transformation and the green behavior of university students in Vietnam using a student-level dataset of 684 observations and a series of linear regression models. The findings provide consistent evidence that digital transformation is positively associated with students' green behavior. In the final specification, digital transformation exposure remained statistically significant ($b = 0.233$, $p < 0.001$) after controlling for environmental awareness, green institutional

support, demographic characteristics, and the interaction between digital transformation and institutional support. This result indicates that greater exposure to digital learning platforms, online academic services, paperless administrative procedures, and digital communication channels can encourage students to adopt more environmentally responsible practices.

Environmental awareness was also found to be a significant predictor of green behavior ($b = 0.230$, $p < 0.001$). This finding confirms that digital transformation alone is not sufficient to generate sustainable behavioral change. Digital tools produce stronger environmental outcomes when students understand the environmental consequences of their daily choices and recognize the practical value of resource conservation. In the context of higher education, digital learning systems should therefore be accompanied by environmental education, sustainability-oriented communication, and experiential activities that help students translate awareness into concrete actions.

The results further highlight the role of universities as institutional facilitators of green behavior. Green institutional support exerted a positive and statistically significant effect ($b = 0.203$, $p < 0.001$). Students are more likely to practice environmentally responsible behavior when universities provide visible incentives, clear guidelines, accessible digital services, and operational conditions that make sustainable choices easier. The positive interaction between digital transformation exposure and green institutional support ($b = 0.093$, $p < 0.001$) reinforces this conclusion. Digital transformation has a stronger effect on green behavior when it is embedded in a supportive institutional environment. In other words, technology adoption and green campus governance should not be treated as separate policy areas.

The final regression model explained a meaningful proportion of the variation in students' green behavior ($R^2 = 0.389$; adjusted $R^2 = 0.379$). The low level of multicollinearity, reflected in a maximum VIF of 1.195, also indicates that the explanatory variables capture distinct dimensions of the relationship between digital transformation and sustainable behavior. The consistency of the coefficients across alternative model specifications strengthens the reliability of the findings.

These results have several implications for higher education institutions in Vietnam. First, universities should expand digital learning ecosystems, paperless academic procedures, online student services, and data-driven campus management systems. Second, digital transformation strategies should explicitly incorporate environmental objectives rather than focusing only on administrative efficiency or teaching convenience. Third, universities should strengthen environmental education and communicate measurable sustainability targets to students. Finally, green campus policies should be designed to create an enabling environment in which digital tools, institutional incentives, and student participation reinforce one another.

This study also suggests several directions for further research. Future studies may extend the model by examining differences across universities, disciplines, and regions. Longitudinal research would help determine whether the observed relationships remain stable over time and whether digital transformation produces lasting behavioral change. Additional studies may also investigate mediating mechanisms, such as environmental knowledge, perceived behavioral control, and student engagement in green campus initiatives.

Overall, the findings show that digital transformation can contribute to greener behavior among university students when it is combined with environmental awareness and institutional support. The transition toward sustainable higher education therefore requires more than technological modernization. It requires an integrated approach in which digital infrastructure, environmental education, and green campus governance are implemented as complementary components of university development.

References

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
2. Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27(1), 14–25. <https://doi.org/10.1016/j.jenvp.2006.12.002>
3. Hieu, L. M., Hung, H. T., Trang, T. T., Ngan, P. T. T., Huyen, D. T. T., Kien, N. T., & Hong, N. T. (2022). Factors affecting pro-environmental behaviour among young people: The case of students at University of Economics, Hue University. *Hue University Journal of Science: Economics and Development*, 131(5A), 219–235. <https://doi.org/10.26459/hueunijed.v131i5A.6782>
4. Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239–260. <https://doi.org/10.1080/13504620220145401>
5. Lange, F., & Dewitte, S. (2019). Measuring pro-environmental behavior: Review and recommendations. *Journal of Environmental Psychology*, 63, 92–100. <https://doi.org/10.1016/j.jenvp.2019.04.009>
6. Prime Minister of Vietnam. (2017, January 25). Decision No. 117/QĐ-TTg approving the project on strengthening the application of information technology in educational management and support for teaching, learning and scientific research during 2016–2020, with an orientation to 2025. Government Portal of Vietnam. <https://vanban.chinhphu.vn/default.aspx?docid=188112&pageid=27160>

7. Prime Minister of Vietnam. (2020, June 3). Decision No. 749/QĐ-TTg approving the National Digital Transformation Program to 2025, with an orientation to 2030. Government Portal of Vietnam. <https://vanban.chinhphu.vn/?docid=200163&pageid=27160>
8. Prime Minister of Vietnam. (2022, January 25). Decision No. 131/QĐ-TTg approving the project on strengthening information-technology application and digital transformation in education and training during 2022–2025, with an orientation to 2030. Government Portal of Vietnam. <https://vanban.chinhphu.vn/?classid=0&docid=205236&pageid=27160>
9. Shafiei, A., & Maleksaeidi, H. (2020). Pro-environmental behavior of university students: Application of protection motivation theory. *Global Ecology and Conservation*, 22, e00908. <https://doi.org/10.1016/j.gecco.2020.e00908>
10. Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309–317. <https://doi.org/10.1016/j.jenvp.2008.10.004>
11. Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407–424. <https://doi.org/10.1111/0022-4537.00175>
12. Wooldridge, J. M. (2020). *Introductory econometrics: A modern approach* (7th ed.). Cengage.
13. World Bank. (n.d.). Individuals using the Internet (% of population) – Viet Nam [Data set]. World Development Indicators. Retrieved June 12, 2026, from <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=VN>