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The effect of civic sustainability-based civic education learning models on students' awareness of green citizenship

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Abstract: This research aims to develop and systematically evaluate a Civic Sustainability-integrated Civic Education learning model designed to cultivate students' Green Citizenship awareness within the digital era. The proposed pedagogical framework synthesises core civic concepts with contemporary sustainability imperatives, employing gamified project-based learning, interactive digital media, and comprehensive, authentic assessments to rigorously evaluate student processes, academic outcomes, and deliverables. Employing a quantitative correlational design, empirical data were gathered via a structured questionnaire administered to a cohort of 65 students at the Indonesia University of Education. Statistical analyses, including simple linear regression and Pearson's correlation coefficient, were conducted to assess the relationship between the model's implementation and increased environmental consciousness. The results yielded a statistically significant positive correlation ($r = 0.580$, $p < 0.01$) and a coefficient of determination ($R^2 = 0.336$), indicating that 33.6% of the variance in Green Citizenship awareness is directly attributable to the instructional model. These findings substantiate the efficacy of the Civic Sustainability-based paradigm in fostering ecological awareness, pro-environmental attitudes, and the capacity for active, responsible digital citizenship. Ultimately, this framework presents a strategic educational innovation within higher education, significantly contributing to the realisation of the Sustainable Development Goals (SDGs) and cultivating a generation profoundly committed to sustainability.

Keywords: Civic Education; Green Citizenship; Learning Model

Introduction

One contemporary challenge in education is to develop high-quality learning that supports sustainable development. Environmental sustainability education can be integrated into various disciplines, including Civic Education (*Teaching Environmental Issues in Social Studies*, 2022). In the digital age, an increasingly connected world, and amid global challenges such as climate change, social injustice, and conflicts between countries, citizenship requires a more inclusive and holistic approach (Dower & Williams, 2021; Rapoport, 2024). Education, as one of the main pillars in shaping individual character and understanding, plays an important role in building awareness and responsibility for global issues within sustainable development.

Civic Education is closely related to Education for Sustainable Development (ESD), which, according to Buckler & Creech (2014), enables citizens to develop the knowledge, values, and skills needed to participate in decision-making at both local and global levels. ESD aims to improve the quality of life today without compromising the planet for future generations. To achieve these goals, Civic Education must effectively convey civic knowledge, develop civic skills, and shape civic dispositions, so that students can respect humanity while also protecting natural resources (Anggraini, 2017). In this context, civic sustainability empowers change in society through civic awareness and civic participation (Awan et al., 2014), aiming to produce informed, empowered, and responsible global citizens who remain aware of common interests across local and global contexts (Ohlmeier, 2013).

Environmental issues are increasingly prominent in global forums and empirical research. Data from the Indonesian National Disaster Management Agency (BNPB) show that thousands of floods and hundreds of forest fires have caused casualties and mass displacement in recent years. This environmental damage is driven not only by natural factors but also by human behaviour that disregards nature conservation, including excessive exploitation of natural resources, improper waste disposal, and neglect of river management. These conditions have led to ecological crises, including air pollution, agricultural land degradation, and the loss of homes (Yusuf et al., 2020). Therefore, early environmental education is important, including through Civic Education (Aisyah et al., 2024; Rosita et al., 2023). C. Chen et al. (2024) confirm that environmental education in higher education institutions is crucial for achieving ecological sustainability goals and transforming human behaviour toward responsible consumption.

Education plays an important role in shaping responsible citizens, as mandated in Law No. 20 of 2003 concerning the National Education System. However, environmental damage caused by human behaviour continues, ranging from excessive resource exploitation to littering. Therefore, schools and universities, as educational institutions, play a strategic role in instilling environmental awareness through habit formation, collaborative activities, and subject integration, especially in Civic Education (Rosita et al., 2023). Torroba Diaz et al. (2023) demonstrated that environmental knowledge and attitude mediate the relationship between environmental intelligence and pro-environmental behaviour among university students, underscoring the value of formal educational interventions in cultivating ecological responsibility.

In the context of the ecological crisis, the concept of Green Citizenship has emerged as a form of citizenship that emphasises pro-environmental responsibility. Environmental citizens are positioned as active, critical, and responsible agents of change in realising sustainable coexistence (Hadjichambis et al., 2022). Machin & Tan (2024) argue that Green Citizenship entails citizens' rights to a healthy environment as well as their obligations to reduce their ecological footprint, support environmentally friendly policies, and cultivate eco-virtues such as ecological responsibility and solidarity. Citizens equipped with Green Citizenship competencies possess knowledge, skills, attitudes, and values that encourage pro-environmental actions at both the individual and collective levels, from the local to the global scales (Georgiou et al., 2021).

Georgiou et al. (2021) confirm that formal education plays a central role in cultivating these competencies and that the quality of instructional approaches significantly influences students' ecological orientations.

Thus, Civic Sustainability and Green Citizenship represent interrelated emerging paradigms in Civic Education. Civic Sustainability emphasises the formation of empowered citizens who are aware of sustainability issues, while Green Citizenship emphasises ecological responsibility in everyday life. There is, therefore, a compelling need for innovative Civic Education learning models grounded in Civic Sustainability that can support the mastery of civic knowledge, civic skills, and civic dispositions within the context of sustainable development to build Green Citizenship awareness in the digital era (Santoso et al., 2024). (Charkova, 2024) demonstrated that gamification-driven sustainability education in higher education effectively encourages students to adopt sustainable practices and shift their perspectives on individual and civic responsibility for environmental well-being. This study responds to this need by investigating the empirical relationship between a Civic Sustainability-based Civic Education learning model and students' Green Citizenship awareness at Universitas Pendidikan Indonesia.

Method

The method used in this study was a correlational quantitative method with data collection through questionnaires. Correlational quantitative research is a form of research that examines relationships between two or more variables to reveal the presence or absence of correlations or to make predictions based on those relationships (P. Y. Chen & Popovich, 2002; Creswell & Creswell, 2018). This design is appropriate for the present study, which seeks to determine the extent to which the implementation of Civic Sustainability-based Civic Education is statistically associated with students' Green Citizenship awareness, without making causal inferences.

Research Procedure

The research procedure followed an integrated sequence of quantitative stages: (1) needs assessment and instrument development, (2) expert validation and pilot testing of instruments, (3) data collection through questionnaire administration, (4) statistical analysis including validity, reliability, normality, correlation, and regression tests, and (5) interpretation of findings in relation to theoretical frameworks of Green Citizenship and Civic Sustainability.

Research Population and Sample

The population in this study was students at the Indonesia University of Education (Universitas Pendidikan Indonesia), while the research sample was selected using purposive sampling. The sample consisted of 65 students enrolled in the Civic Education and Pancasila Education course. Purposive sampling was chosen because participants needed to have direct experience with the Civic Sustainability-based instructional approach under investigation, ensuring that respondents could meaningfully evaluate the variables in question.

Data Collection Instruments

The research instrument used was a questionnaire. This instrument was developed using a Likert scale, in which respondents rate their level of agreement or disagreement with statements using five response options. Variable X measured students' perceptions of the implementation quality of the Civic Sustainability-based Civic Education learning model (15 items). In contrast, Variable Y measured Green Citizenship awareness across dimensions of ecological knowledge, pro-environmental attitudes, and participatory dispositions (18 items).

Data Analysis and Interpretation

The data analysis used a simple regression analysis in IBM SPSS. The analysis proceeded through data editing, followed by instrument testing via validity, reliability, normality, hypothesis, and determination coefficient tests. The researcher then

interpreted the data using correlational analysis to determine the linear relationship between Variable X (Civic Sustainability-based learning implementation) and Variable Y (Green Citizenship awareness). Simple linear regression was applied to estimate the proportion of variance in Green Citizenship awareness that is statistically associated with variations in learning model implementation.

Finding and Discussion

Findings

Planning a Civic Sustainability-Based Civic Education Learning Model

Learning Materials in the Civic Sustainability-Based Civic Education Learning Model

The material in this model integrates concepts of citizenship with sustainability and environmental awareness. The course covers studies on the concepts, principles, and challenges of citizenship education in higher education, including the importance of understanding the constitution, human rights, the archipelago concept, and national resilience. In addition, the course examines contemporary issues in Civic Education, including the dynamics of national identity, national integration, and the application of democratic and legal values in the context of education and national life. The specific study materials for the Civic Education course are presented in Table 1.

Table 1. Mapping of Study Materials for Civic Education Courses

| Ses | Study Material |
|-----|---|
| 1 | The rationale and urgency of civic education, the historical, legal and sociological basis of civic education, the dynamics and challenges of civic education |
| 2 | The Concept of National Identity, The Urgency of National Identity |
| 3 | Elements, dynamics and challenges of national identity |
| 4 | The Concept and Urgency of National Integration |
| 5 | Historical, legal, sociological foundations, dynamics and challenges of national integration |
| 6 | The concept and urgency of the constitution, as well as its historical, sociological and political origins in the life of the Indonesian nation and state |
| 7 | The dynamics and challenges of the Constitution of the Republic of Indonesia |
| 8 | Mid-term examination |
| 9 | The concept of human rights and the rule of law, as well as the history of human rights and the rule of law in general, both globally and in Indonesia |
| 10 | The harmony between citizens' obligations and rights in the dynamics of human rights in Indonesia and anti-corruption education |
| 11 | The concept and urgency of democracy, Pancasila democracy and the dynamics of its implementation in Indonesia |
| 12 | The basis and urgency of the Archipelago Concept as a regional and national development concept |
| 13 | Implementation of the Archipelago Concept |
| 14 | The concept, urgency, and history of National Resilience and National Defence |
| 15 | The ASTA GATRA Model in National Resilience and the dynamics of National Resilience and National Defence |
| 16 | End-of-Semester Examination |

Methods and Syntax of Civic Sustainability-Based Civic Education Learning Models

Civic sustainability-based Civic Education learning models are designed to foster Green Citizenship among students in the digital age. This learning approach emphasises real-life contexts, so that civic education material is not only understood cognitively but also internalised in environmentally responsible attitudes and behaviours as a form of civic responsibility. Thus, learning becomes applicable, meaningful, and relevant to sustainability challenges. The form used is gamification-based project-based learning, which connects civic values with sustainability practices through interactive and innovative learning experiences. Ricoy & Sánchez-Martínez (2022) confirm that

gamification-based learning programs for ecological awareness effectively expand students' environmental knowledge and digital literacy, resulting in measurable changes in ecological attitudes and behaviours.

The integration of TPACK (Technological Pedagogical Content Knowledge) in this model ensures that technology, civic education material, and pedagogical strategies complement each other effectively. The TPACK framework, as systematically reviewed by Jiménez Sierra et al. (2023), provides a comprehensive framework for teachers to integrate content, pedagogy, and technology to create meaningful, contextually relevant learning environments. Its application in this model covers four main areas: (1) project idea and design development, (2) synchronisation of civic education material with sustainability issues, (3) utilisation of environmentally friendly digital resources, and (4) product assessment and learning experience reflection.

The learning syntax includes: (a) Project Learning Stages: formulating ideas and basic questions; designing the project; drawing up a work schedule; producing and evaluating products; reflecting on learning experiences. (b) Gamification Learning Stages: setting learning objectives and main game ideas; designing the main game idea; developing scenarios; creating digital application-based games; evaluating products. (c) Learning methods include lectures, inquiry, discussions, practical integrated learning, and simulations, all supported by digital technology. (d) TPACK integration is carried out by designing games as ICT-based collaborative projects; aligning Civic Education material on sustainability in games; utilising digital resources through game-making applications; and conducting ICT-based assessments of products and learning experiences.

Thus, the Civic Sustainability-based Civic Education learning model not only supports the achievement of 21st-century competencies but also serves as a strategy to increase students' awareness of Green Citizenship in the digital era, enabling them to play active roles as environmentally conscious and sustainability-oriented citizens. This aligns with Amorós Molina et al. (2023) scoping review, which found that integrating the SDGs into higher education curricula is associated with stronger sustainability awareness and civic competencies among students when learning is contextualised and participatory.

Media and Resources in Civic Sustainability-Based Civic Education Learning Models

The media and learning resources used in Civic Education lectures include interactive multimedia and GameMaker applications that help students create games online. Among the game-makers used are Wordwall, Baambozle, Quizwhizzer, and Gimkit. Online game-maker applications are software tools that allow users to create digital games without requiring in-depth programming knowledge. These platforms provide tools, resources, and simple interfaces for students to create games independently. In addition to these platforms, students can also develop original games using basic rules, writing tools, and available digital media. This encourages students to be more creative, innovative, and independent in designing learning media appropriate to the Civic Education course context.

Evaluation in Civic Sustainability-Based Civics Education Learning

Evaluation in Civic Sustainability-Based Civics Education learning is conducted using authentic assessment encompassing process, outcome, and product dimensions. Process assessment examines students' involvement at each stage of learning, including their understanding of the material, participation, and observable attitudes, as documented through observation sheets and attitude identification instruments. Outcome assessment focuses on students' achievements in terms of knowledge, attitudes, and skills related to Green Citizenship awareness. Product assessment emphasises the quality of individual student outputs, such as learning media or digital games, developed independently to reflect sustainability values in creative and innovative ways. Through this authentic assessment approach, data are collected to

describe the relationship between the implementation of Civic Sustainability-Based Civics Education and students' levels of Green Citizenship awareness, as reflected in learning processes, outcomes, and products within the digital learning context.

Relationship between Civic Sustainability-Based Civic Education Implementation and Green Citizenship Awareness

Instrument Validity Test

The validity test was conducted using Pearson product-moment correlation between item and total scores. The validity criterion used was a calculated r-value exceeding the r-table value (0.244) at $p < 0.05$, with a total of 65 respondents. Table 2 presents the results of the validity test.

Table 2. Instrument Validity Test Results

| Variable | Number of Items | Total Range | Sig. | Description |
|------------|-----------------|----------------|--------|-----------------|
| Variable X | 15 | 0.712 to 0.887 | < 0.01 | All items valid |
| Variable Y | 18 | 0.612 to 0.841 | < 0.01 | All items valid |

The analysis results show that all items in Variables X and Y have item-total correlation coefficients greater than the r-table value and are statistically significant. Thus, all items in the instrument are declared valid and capable of representing the constructs being measured.

Instrument Reliability Test

A reliability test was conducted to assess the instrument's internal consistency using Cronbach's Alpha. The instrument is considered reliable if the Alpha value is greater than 0.70. Table 3 presents the reliability test results.

Table 3. Instrument Reliability Test Results

| Variable | Number of Items | Cronbach's Alpha | Category |
|------------|-----------------|------------------|-----------------|
| Variable X | 15 | 0.962 | Highly reliable |
| Variable Y | 18 | 0.949 | Highly reliable |

Cronbach's Alpha values for both variables were above 0.90, indicating very high internal consistency. Thus, the instrument was reliable and suitable for collecting research data.

Data Normality Test

The normality test was conducted using the One-Sample Kolmogorov-Smirnov Test on the residuals from the research data. The data were deemed normally distributed if the p-value was greater than 0.05. Table 4 presents the results of the normality test.

Table 4. Data Normality Test Results

| N | K-S Statistics | Asymp. Sig. (2-tailed) | Description |
|----|----------------|------------------------|------------------------------|
| 65 | 0.085 | 0.200 | Data is normally distributed |

The Kolmogorov-Smirnov test results show a significance value of 0.200 (> 0.05), confirming that the residual data is normally distributed. The assumption of normality is therefore met, and the data are suitable for analysis using parametric statistics, including Pearson's correlation. Based on the results of the validity, reliability, and normality tests, the research instrument meets all psychometric criteria for use in analysing the relationship between variables in a correlational research design.

Table 5. Correlations

| | | X | Y |
|---|---------------------|--------|--------|
| X | Pearson Correlation | 1 | .580** |
| | Sig. (2-tailed) | | .000 |
| Y | N | 65 | 65 |
| | Pearson Correlation | .580** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 65 | 65 |

** . Correlation is significant at the 0.01 level (2-tailed).

The relationship between the implementation of Civic Sustainability-Based Civic Education and students' Green Citizenship awareness was examined using Pearson's correlation analysis. The results indicate a correlation coefficient of $r = 0.580$ and a significance value of $p = 0.000 (< 0.01)$, demonstrating a statistically significant, moderately strong positive relationship between the two variables. This finding indicates that greater implementation of Civic Sustainability-Based Civic Education is associated with higher levels of students' Green Citizenship awareness.

In this context, implementation refers to the extent to which sustainability principles are integrated into civic education learning through instructional planning, learning strategies, use of digital media, and authentic assessment practices. Meanwhile, Green Citizenship awareness encompasses students' understanding of environmental issues, appreciation of sustainability values, and orientation toward pro-environmental attitudes and actions.

Table 6. Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|------------------------------|-------|----------|-------------------|----------------------------|
| 1 | .580a | .336 | .326 | 7.304 |
| a. Predictors: (Constant), X | | | | |

Further analysis using the Model Summary indicates an R value of 0.580, reinforcing the presence of a positive and moderate relationship between Civic Sustainability-Based Civic Education implementation and Green Citizenship awareness. The R-squared value of 0.336 indicates that approximately 33.6% of the variance in students' Green Citizenship awareness is statistically associated with variations in the level of implementation of Civic Sustainability-Based Civic Education. This proportion of variance is considered substantial within the context of social science research, where complex social, cultural, and environmental factors interact simultaneously.

Discussion

This study confirms a significant positive relationship between the implementation of Civic Sustainability-based Civic Education and students' Green Citizenship awareness, as evidenced by $r = 0.580$ ($p < 0.01$) and an R-squared value of 0.336. These findings are discussed in relation to the learning model's planning components and to existing empirical evidence from the Scopus-indexed literature.

The planning of the Civic Sustainability-based Civic Education learning model is oriented toward integrating values, knowledge, skills, and attitudes relevant to sustainability issues to support the development of students' Green Citizenship awareness. Civic Education not only teaches citizens' rights and obligations normatively, but also fosters concern for social, political, cultural, and environmental issues (Anggraini, 2017). This aligns with the view of Olibie & Akudolu (2013) that world-class citizenship education is important for preventing apathy and discrimination that can weaken civic participation. The concept of Civic Sustainability serves as the main foundation for planning, emphasising civic awareness and participation (Awan et al., 2014), and supporting the formation of adaptive global citizens who can integrate knowledge, skills, and values responsibly from the local to the global level (Rapoport, 2024).

The empirical relationship found in this study aligns with Hadjichambis et al.'s (2022) systematic review of 31 green cities, which demonstrated that green city environments and structured environmental citizenship education significantly enhance citizens' pro-environmental competencies. Similarly, Georgiou et al. (2021) systematic review confirmed that the quality of instructional approaches directly influences teachers' and students' perceptions and expressions of environmental citizenship. The concept of Green Citizenship, as framed by Machin & Tan (2024) in the context of the European Green Deal, situates citizens not merely as passive beneficiaries of environmental governance but as active agents who exercise ecological rights, fulfil

environmental duties, and participate in the democratic transition toward sustainability. This perspective reinforces the model's emphasis on developing participatory ecological dispositions alongside knowledge and skills.

Theoretically, the association between Civic Sustainability-based learning and Green Citizenship awareness is grounded in the understanding that sustainability is not only a conceptual framework but also an operational orientation encompassing the development of healthy social, economic, and ecological environments (Milne & Gray, 2013). Students as eco-citizens are positioned to engage with the principle of fair intergenerational resource distribution and to support the integrity of ecological systems over time (Basiago, 1998). The relationship aligns with the SDGs, particularly in promoting sustainable awareness, social justice, and active participation in environmental conservation (Amorós Molina et al., 2023). UNESCO's framework for ESD (2014) further underscores that education enabling citizens to develop the knowledge, values, and skills for sustainable development is foundational to responsible global citizenship.

The integration of gamification-based project-based learning within the TPACK framework represents a key pedagogical innovation of this model. Charkova (2024) demonstrated that gamification-driven sustainability education effectively encouraged students to adopt sustainable practices, with students' perceptions of individual civic and environmental responsibility shifting substantially in a positive direction. Ricoy & Sánchez-Martínez (2022) further confirmed that gamification-based ecological awareness programs significantly expand students' environmental knowledge and lead to measurable behavioural changes.

The TPACK framework's integration into the model ensures that digital technologies are deployed not merely as transmissive tools but as interactive, collaborative, and reflective resources that deepen students' engagement with civic sustainability content. Systematic reviews of TPACK in educational contexts, Jiménez Sierra et al. (2023) confirm that meaningful technology integration requires alignment among content knowledge, pedagogical strategies, and technological affordances, and that such alignment is associated with deeper student learning and higher-order thinking. In the context of the present model, TPACK integration enables students to use digital game-making platforms as vehicles for synthesising civic education content with sustainability principles, thereby operationalising the Green Citizenship dispositions targeted by the model.

These findings are consistent with previous studies reporting associations between Civic Sustainability, ecological empathy, social responsibility, and environmental awareness (Hariyadi & Saleh, 2022; Yunita et al., 2024). The present study extends this evidence by providing quantitative correlational data from a higher education context, demonstrating that the specific instructional approach of Civic Sustainability-based learning is significantly associated with students' Green Citizenship awareness. Students are thereby positioned not only as holders of the right to a healthy environment but as potential agents of change who may participate in green policy advocacy, in alignment with the broader citizenship principles articulated by Machin & Tan (2024) within the European Green Deal framework.

Conclusion

Students who experience greater integration among civic education content, sustainability issues, digital learning strategies, and authentic assessment tend to demonstrate stronger Green Citizenship awareness. The model's integration of gamification-based, project-based learning with TPACK-informed digital media represents a pedagogically innovative approach empirically associated with positive ecological awareness outcomes. However, this relationship should be interpreted as an association rather than a causal effect, as the study did not employ an experimental or quasi-experimental design.

Conceptually, this study reinforces the role of Civic Education as a strategic educational domain closely linked to the development of environmental awareness, civic responsibility, and sustainable citizenship values. It demonstrates how Civic Sustainability principles, when operationalised through innovative instructional design, can meaningfully support the cultivation of Green Citizenship competencies that align with the Sustainable Development Goals and the broader global imperative for ecological citizenship. In practice, the findings suggest that strengthening the quality of implementation of sustainability-oriented civic learning may be associated with higher levels of Green Citizenship awareness among students.

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