

Human–Nature Connection as an Operationalization of Environmental Engagement in Guidance and Counseling Services: Development and Psychometric Evaluation of an Instrument among High School Students

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Article Information	ABSTRACT
Received: August 2026	Background: Global environmental problems highlight the need to strengthen environmental engagement among younger generations as part of sustainable education. In educational settings, environmental engagement encompasses not only ecological knowledge but also emotional connectedness with nature and pro-environmental behavior. However, instruments for comprehensively assessing environmental engagement within guidance and counseling services in Indonesia remain limited. Objective: This study aimed to develop and examine the preliminary psychometric properties of a Human Nature Connection (HNC) instrument as an operationalization of environmental engagement among high school students. Methods: The study employed a research and development (R&D) approach comprising construct analysis, blueprint development, item construction, expert validation, and instrument testing. Participants were 70 high school students in Malang City selected through purposive sampling. The instrument consisted of three dimensions: affective, cognitive, and behavioral. Data were analyzed using item validity testing, Cronbach's Alpha reliability analysis, and descriptive analysis. Results: Of the 30 items initially developed, 27 were retained as valid, and 3 were eliminated. The instrument demonstrated very high internal consistency, with a Cronbach's Alpha coefficient of 0.979. Descriptive findings indicated that students' environmental engagement was generally moderate, with the affective dimension appearing more prominent than the behavioral dimension. Discussion: The findings indicate that students' emotional connectedness with nature does not necessarily translate consistently into pro-environmental behavior. This pattern highlights the importance of guidance and counseling services that facilitate the transformation of environmental awareness and emotional connectedness into observable, environmentally responsible actions. Conclusion: The study provides preliminary evidence supporting the reliability and item-level validity of the HNC instrument for assessing environmental engagement among high school students. The instrument may serve as an initial assessment tool for sustainability-oriented guidance and counseling services, although further validation with larger, more diverse samples is needed. Keywords: Environmental Engagement, Human Nature Connection, Environmental Identity, Psychometric Instrument, Sustainability Counseling.
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INTRODUCTION

Current environmental problems have become increasingly complex global issues that require systematic and immediate attention. Phenomena such as climate change, environmental degradation, biodiversity loss, and increasing pollution indicate that human interaction with the environment has not yet been fully sustainable. In this context, education plays a strategic role in shaping individuals' environmental awareness and behavior from an early age (UNESCO, 2017; OECD, 2018). Furthermore, sustainability education is considered an important means of fostering individuals' connectedness to nature and promoting pro-environmental behavior among younger generations (Otto & Pensini, 2017). Young people, particularly high school students, are expected not only to understand environmental issues but also to engage in environmental sustainability actively. Recent research in Indonesian secondary education has also highlighted the importance of contextual and experience-based learning in increasing student engagement and connecting learning with real-life contexts (Suyati et al., 2026). This perspective reinforces the need to understand environmental engagement not merely as the possession of environmental knowledge, but as a multidimensional construct involving students' affective, cognitive, and behavioral relationships with nature.

In recent years, the escalating global environmental crisis has also triggered various psychological responses among adolescents, such as climate worry, eco-anxiety, and uncertainty regarding the future of the environment (Clayton, 2020; Ojala, 2022). This

condition demonstrates that environmental issues are no longer limited to ecological concerns but are also closely associated with psychological aspects and individual development. Therefore, schools, as educational environments, play a crucial role in helping students develop healthy and meaningful relationships with the natural environment. Experiential and context-based learning approaches that involve direct interaction with the surrounding environment can provide students with meaningful learning experiences and facilitate their understanding of environmental phenomena (Sinaga, 2022). Such experiences are particularly relevant to environmental engagement because students' relationships with nature may develop not only through ecological knowledge but also through direct affective and behavioral interactions with the natural environment.

One concept frequently used to explain individuals' involvement with the environment is environmental engagement. Recent literature has emphasized that connectedness to nature is a psychological integration between the self and nature that influences environmental concern, well-being, and pro-environmental behavior (Lengieza et al., 2021). This concept encompasses not only cognitive aspects related to environmental knowledge but also affective and behavioral dimensions that interact with one another. Individuals with high levels of environmental engagement tend to demonstrate environmental concern, emotional attachment, and a propensity for pro-environmental behavior (Stern, 2000). Recent studies have further indicated that environmental engagement is strongly associated with individuals' nature connectedness and direct experiences with natural environments (Martin et al., 2020; Richardson et al., 2021). Thus, environmental engagement represents a multidimensional construct that is more comprehensive than environmental literacy alone.

Numerous recent studies have shown that individuals with a strong connection to nature are more likely to exhibit pro-environmental behavior (Whitburn & Linklater, 2020). Moreover, a meta-analysis by Mackay & Schmitt (2019) revealed that the human–nature connection consistently correlates with environmental conservation behavior. These findings reinforce the assumption that individuals' psychological relationships with nature constitute an important predictor of sustainable environmental behavior.

Within the school context, the development of environmental engagement can be facilitated through various approaches, including guidance and counseling services. Guidance and counseling play an important role in helping students develop affective aspects, self-awareness, values, and behaviors that support optimal personal development (Corey, 2016). In addition, guidance and counseling function as systematic services that assist individuals in achieving optimal personal, social, academic, and career development (Prayitno, 2017). More recently, sustainability counseling has emerged as a relevant approach for helping individuals establish healthy relationships with the environment and develop ecological responsibility.

Previous studies have demonstrated that mindful learning and reflective educational experiences can strengthen students' connectedness to nature both implicitly and explicitly (Wang et al., 2016). Through guidance and counseling services, students can be encouraged to reflect on their relationship with the environment, develop environmental concern, and internalize sustainability values. Experience-based and emotionally reflective approaches are considered effective in enhancing students' connectedness to nature, particularly during adolescence, which is a critical stage for identity and personal value formation (Barrable & Booth, 2020). Therefore, guidance and counseling services have strategic potential to foster students' environmental engagement more holistically.

Nevertheless, the implementation of environmentally oriented guidance and counseling services still faces several challenges, one of which is the limited availability of instruments that can comprehensively and contextually measure environmental engagement. Most existing instruments primarily emphasize cognitive aspects or environmental literacy, thereby failing to fully capture students' holistic involvement with the environment. Furthermore, instruments developed in international contexts may not align with Indonesia's cultural characteristics and educational context. This condition indicates the need to develop instruments that not only possess strong theoretical foundations but are also relevant to local contexts and school counseling practices.

One theoretical approach for developing environmental engagement instruments is the concept of Inclusion of Nature in Self (INS). This concept emphasizes the extent to which individuals perceive themselves as part of nature, reflected in the psychological relationship between humans and the environment (Schultz, 2002). The INS concept later evolved into a broader framework known as Human–Nature Connection (HNC), which encompasses individuals' connectedness to nature across affective, cognitive, and behavioral dimensions (Mayer & Ą, 2005; Nisbet et al., 2009). According to Lengieza et al (2021), connectedness to nature reflects a psychological sense of oneness between individuals and the natural environment, which develops through emotional, cognitive, and experiential processes. Recent studies have demonstrated that HNC is closely associated with environmental identity, psychological well-being, and pro-environmental behavior (Martin et al., 2020).

From the HNC perspective, individuals' engagement with the environment is viewed not solely in terms of knowledge but also in terms of emotional attachment and concrete actions toward it. The affective dimension reflects feelings of admiration, care, and connectedness to nature. The cognitive dimension relates to awareness and understanding of the relationship between humans and the environment. Meanwhile, the behavioral dimension reflects individuals' pro-environmental actions in daily life. Therefore, HNC can serve as an operationalization of the multidimensional environmental engagement construct and provide a more contextual understanding of individuals' relationships with the environment.

However, the use of HNC as a measurement framework still requires a systematic instrument development process and adequate psychometric evaluation. Validity and reliability are two primary aspects that must be fulfilled to ensure that an instrument

accurately measures the intended construct (DeVellis, 2016). Furthermore, modern instrument development emphasizes the importance of construct validity, internal consistency, and empirical testing of factor structures (Boateng et al., 2018; Flake et al., 2016).

Research on the Human–Nature Connection and environmental engagement has been widely conducted within environmental psychology and educational contexts. Nevertheless, most previous studies have focused primarily on general environmental behavior and utilized instruments developed within Western cultural contexts (Mackay & Schmitt, 2019; Whitburn & Linklater, 2020). Moreover, existing instruments tend to emphasize nature connectedness or environmental identity separately, without fully integrating affective, cognitive, and behavioral dimensions into a comprehensive measurement framework. Within the Indonesian guidance and counseling context, the development of Human–Nature Connection-based instruments specifically designed for high school students remains very limited.

Therefore, the novelty of this study lies in the development of a Human–Nature Connection (HNC) instrument, operationalizing the environmental engagement construct and specifically designed for high school guidance and counseling services in Indonesia. This study integrates affective, cognitive, and behavioral dimensions into an instrument that is relevant to adolescents' developmental characteristics and the school educational context, while also emphasizing psychometric evaluation as the foundation for developing environmental assessment within sustainability-based guidance and counseling services. These findings suggest that reflective and mindfulness-based approaches may become relevant strategies within sustainability counseling to strengthen students' connectedness with nature and environmental engagement (Wang et al., 2016).

Based on the foregoing discussion, it can be concluded that developing an HNC-based environmental engagement instrument within the context of guidance and counseling is both important and relevant. Therefore, this study aims to develop and examine the psychometric properties of the Human–Nature Connection (HNC) instrument as an operationalization of environmental engagement among high school students.

METHOD

This study employed a research and development (R&D) approach to develop and examine the psychometric properties of the Human–Nature Connection (HNC) instrument as an operationalization of the environmental engagement construct among high school students. This approach was selected because it aligns with the purpose of the study, namely, to produce a valid and reliable instrument through a systematic, empirically based development process (DeVellis, 2016). In modern psychological instrument development, the R&D approach is considered effective because it enables the integration of conceptual review, expert validation, and gradual empirical testing (Boateng et al., 2018).

The research design referred to several stages of instrument development, including:

- (1) construct analysis through literature review,
- (2) development of the instrument blueprint,
- (3) item construction,
- (4) expert validation, and
- (5) instrument testing.

These stages were conducted systematically to ensure that the developed instrument possessed a strong theoretical foundation and fulfilled the principles of validity and reliability in psychometric instrument development (Worthington & Whittaker, 2006). Furthermore, the instrument development process considered the principle of construct validity, which refers to the extent to which the items adequately represent the theoretical construct being measured (Flake et al., 2017).

The instrument developed in this study was based on the concept of Human–Nature Connection (HNC), which encompasses affective, cognitive, and behavioral dimensions. A multidimensional approach was adopted because individuals' environmental engagement is not solely related to knowledge but also involves emotional attachment and concrete actions toward the environment (Whitburn & Linklater, 2020).

The participants in this study consisted of 70 high school students. Participants were selected using purposive sampling, ensuring that respondents were at an educational level relevant to the study's objectives. This technique was employed to obtain data that matched the characteristics of the construct being investigated.

Adolescents were selected as participants because adolescence represents an important developmental stage for the formation of identity, personal values, and concern for social and environmental issues (Barrable & Booth, 2020). In addition, previous studies have shown that adolescents' connectedness to nature is significantly associated with psychological well-being and pro-environmental behavior (Tillmann et al., 2018).

The instrument development process was conducted through several stages as follows:

This stage involved a literature review on the concepts of environmental engagement, Inclusion of Nature in Self (INS), and Human–Nature Connection (HNC). The results of the analysis served as the basis for determining the instrument's dimensions and

indicators. Construct analysis is an important stage in instrument development because it determines the alignment between theoretical constructs and empirical indicators to be measured (DeVellis, 2016).

The instrument was developed based on three primary dimensions: affective, cognitive, and pro-environmental behavior. Each dimension was elaborated into indicators relevant to the context of high school students. The blueprint development process was intended to ensure that each item adequately represented the construct and aligned with the measurement objectives (Boateng et al., 2018).

Based on the blueprint, 30 statement items were developed to represent each indicator. The items were constructed as positive statements that were easy for respondents to understand. The use of simple, context-specific language was considered important to minimize interpretive bias among adolescent respondents (Furr & Bacharach, 2008). An example item from the affective dimension is: "I feel connected to nature when I am in a natural environment." Detailed instrument items are presented in Appendix I.

Table 1. Instrument Blueprint

Dimension	Number of Items	Example
Affective	10	Feelings toward nature
Cognitive	10	Environmental understanding
Behavioral	10	Pro-environmental behavior

The instrument was administered to respondents to examine the items' validity and reliability and to obtain a descriptive overview of students' environmental engagement. The pilot testing stage also aimed to identify items with low discriminative power so that they could be eliminated or revised before further use (Worthington & Whittaker, 2006).

Data Collection Technique

The research data were collected using a questionnaire constructed in the form of a five-point Likert scale consisting of the following response options:

- (1) strongly inappropriate,
- (2) inappropriate,
- (3) undecided,
- (4) appropriate, and
- (5) strongly appropriate.

The Likert scale was selected because it is considered effective for measuring individuals' attitudes, perceptions, and behavioral tendencies toward a psychological construct (Furr, 2021). Respondents were asked to select the response that best reflected their personal condition.

The instrument used in this study was developed based on the Human–Nature Connection (HNC) construct, encompassing three primary dimensions: affective, cognitive, and behavioral. The initial instrument consisted of 30 statement items that were subsequently tested to evaluate their psychometric properties.

Data analysis was conducted quantitatively using Microsoft Excel. The stages of analysis included the following:

Item validity testing was conducted using item-total correlation analysis. An item was considered valid if it had a correlation coefficient ≥ 0.30 . Items that did not meet this criterion were eliminated from the instrument. Item validity testing aimed to ensure that each item consistently represented the construct being measured (DeVellis, 2016).

Reliability testing was conducted using Cronbach's alpha to assess the instrument's internal consistency. The instrument was considered reliable if it achieved a Cronbach's Alpha value of ≥ 0.70 (Tavakol & Dennick, 2011). According to Furr & Bacharach (2008), high reliability indicates that the items within an instrument consistently measure the same construct.

Descriptive analysis was conducted to determine the mean and standard deviation (SD) of each item. The results were then categorized into specific levels to describe students' environmental engagement.

In addition to validity and reliability analyses, modern instrument development studies also recommend using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to examine an instrument's factor structure more comprehensively (Boateng et al., 2018). However, the present study focused primarily on initial validity testing and internal consistency analysis as the preliminary stage of instrument development.

The use of the research and development approach in this study was based on the need to produce an instrument that could be practically implemented within guidance and counseling services. This approach enables the systematic integration of theoretical review and empirical testing, ensuring that the resulting instrument not only possesses a strong conceptual foundation but is also empirically feasible for use in real educational contexts (DeVellis, 2016; Sugiyono, 2019). Furthermore, this approach provides flexibility to revise and refine the instrument based on pilot testing results, thereby enabling the instrument's quality to improve progressively.

RESULTS AND DISCUSSION

Results

Item validity testing was conducted using the item-total correlation technique with a minimum correlation coefficient criterion of ≥ 0.30 . The analysis results indicated that out of the 30 developed items, 27 items were declared valid, while 3 items were eliminated, namely INS-A8, INS-K7, and INS-P8, because their correlation coefficients were below the predetermined criterion. After the elimination process, the final instrument consisted of 27 items deemed appropriate for measuring environmental engagement.

Table II. Results of Instrument Validity Testing

Category	Number of Items
Valid	27
Eliminated	3
Total	30

The results indicate that the majority of the items adequately represented the construct being measured. Reliability testing was conducted using Cronbach's alpha to assess the instrument's internal consistency. The analysis revealed a Cronbach's alpha of 0.979, indicating very high reliability. This result indicates that the instrument possesses excellent internal consistency, suggesting it measures the construct with stability and reliability.

Table III. Results of Instrument Reliability Testing

Component	Value
Number of Items	27
Cronbach's Alpha	0,979
Category	Very High

Descriptive analysis was conducted to determine the level of students' environmental engagement using the mean and standard deviation (SD). The results showed that most items were categorized as moderate, while several fell into the high and low categories. The item with the highest mean score was Item 4 ($M = 4.37$), followed by Item 21 ($M = 4.30$), whereas the lowest mean score was found in Item 14 ($M = 1.53$).

Table IV. Summary of Descriptive Analysis

Category	Number of Items
Very High	2
High	6
Medium	13
Low	7
Very Low	1

Discussion

The findings revealed that the developed Human–Nature Connection (HNC) instrument demonstrated good psychometric properties, as indicated by high validity and reliability. However, the findings not only indicate the instrument's technical feasibility but also provide insights into the dynamics of students' relationships with the environment in the context of educational and guidance and counseling services.

The validity test results indicated that most of the items adequately represented the environmental engagement construct. These findings suggest that the affective, cognitive, and behavioral dimensions employed in this study are consistent with the conceptual framework of Human–Nature Connection (HNC). This finding aligns with the view that the relationship between humans and the environment is a multidimensional construct that cannot be explained solely through environmental knowledge (Whitburn & Linklater, 2020).

Nevertheless, several items failed to meet the validity criteria and were therefore eliminated. This condition indicates that theoretically derived items do not always guarantee empirical suitability in practice. In the context of modern psychometrics, theoretically relevant items may fail empirically when they are ambiguous, overly general, or inconsistent with respondents' experiences (Flake et al., 2016). Thus, the findings suggest that the development of environmental engagement instruments requires sensitivity to adolescents' developmental characteristics and local cultural contexts.

Interestingly, several items exhibited high mean scores but low item-total correlations. This phenomenon indicates the possibility of social desirability bias, in which students provide responses perceived as socially acceptable regarding environmental concern. Such conditions are commonly found in environmental behavior research, particularly among adolescent respondents who

have been normatively exposed to environmental education values (Otto & Pensini, 2017). Therefore, future instrument development should consider incorporating more reflective and contextual items to minimize social response bias.

The Cronbach's Alpha coefficient of 0.979 indicates that the instrument possesses very high internal consistency. Generally, this finding suggests that the items within the instrument are strongly interrelated in measuring the same construct (Tavakol & Dennick, 2011). However, from the perspective of modern psychometrics, excessively high reliability values should also be critically examined because they may indicate redundancy or similarity among items (Furr & Bacharach, 2008).

The possibility of item similarity suggests that several indicators may measure highly overlapping psychological aspects. If this occurs, the instrument may lose sensitivity in capturing broader variations in students' behaviors and experiences. Therefore, future studies should conduct exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to more comprehensively identify the underlying construct structure and ensure that each dimension demonstrates clear conceptual differentiation.

Furthermore, the very high reliability may also indicate that students tend to exhibit homogeneous response patterns regarding environmental issues. This condition may be influenced by the increasing exposure to sustainability issues through formal education and social media, resulting in relatively similar value frameworks concerning environmental preservation.

The descriptive analysis revealed that students' affective dimension tended to be higher than the behavioral dimension. This finding is an important aspect of the study because it demonstrates that students already possess an emotional attachment to the environment but have not fully translated that attachment into concrete actions.

In the adolescent context, this condition may be influenced by various external factors, including social norms, family support, school facilities, and environmental habits within the surrounding community (Mackay & Schmitt, 2019).

These findings indicate that strengthening environmental engagement cannot rely solely on increasing awareness or emotional concern. Educational approaches that excessively emphasize environmental knowledge and moral values often result in symbolic concern without producing actual behavioral change. Therefore, more participatory and experience-based approaches are needed to provide students with opportunities to apply environmental values in their daily lives.

Moreover, the dominance of the affective dimension suggests that emotional relationships with nature constitute an important foundation for the development of environmental identity. Martin et al. (2020) found that individuals who feel emotionally connected to nature tend to exhibit higher levels of psychological well-being and pro-environmental behavior.

Relevance of HNC in the Context of Guidance and Counseling

This study demonstrates that the concept of Human–Nature Connection (HNC) is highly relevant to school guidance and counseling services. To date, guidance and counseling services have primarily focused on academic, social, and personal development aspects, whereas issues concerning individuals' relationships with the environment have rarely been systematically integrated.

However, the emergence of global environmental issues suggests that individuals' relationships with nature are linked not only to ecological behavior but also to psychological well-being, self-identity, and adolescent mental health (Clayton, 2020; Ojala, 2022). Therefore, environmentally oriented guidance and counseling approaches have the potential to be integrated into a more holistic developmental counseling framework.

The findings also indicate that the HNC instrument can function not only as an assessment tool but also as a foundation for developing sustainability-based guidance and counseling interventions. In this context, assessment is used not only to classify students but also to help counselors identify which aspects need strengthening, whether affective, cognitive, or behavioral.

The dominance of the affective dimension may suggest that reflective and mindful educational experiences foster students' emotional connectedness with nature. Wang et al. (2016) found that mindful learning significantly increased both implicit and explicit connectedness to nature among students.

Most previous environmental instruments have primarily emphasized environmental knowledge or literacy dimensions. Such approaches tend to assume that increasing knowledge will automatically lead to pro-environmental behavior. However, the findings of this study indicate that affective aspects more strongly influence students' environmental engagement than cognitive aspects.

These findings reinforce criticism of environmental education paradigms that are excessively knowledge-centered. Environmental knowledge is indeed important, but it is not always sufficient to produce consistent behavioral change (Whitburn & Linklater, 2020). Therefore, the Human–Nature Connection approach becomes relevant because it integrates emotional experiences, self-reflection, and concrete actions into a more comprehensive conceptual framework.

Theoretically, this study strengthens the position of the Human–Nature Connection as a multidimensional approach relevant to operationalizing the environmental engagement construct in educational contexts. The study also demonstrates that individuals' relationships with the environment should be understood as complex psychological relationships influenced by interactions among emotions, understanding, and social experiences. Nevertheless, this study has several limitations, particularly the relatively small number of participants and the

absence of factor analysis to examine the construct structure more comprehensively. Therefore, future studies are recommended to employ larger, more diverse samples and to conduct exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to strengthen the instrument's dimensional structure.

In addition, future research should examine the relationship between HNC and other variables such as environmental identity, eco-anxiety, psychological well-being, and students' sustainability behavior. Consequently, the developed instrument may function not only as a descriptive assessment tool but also as a foundation for developing environment-based intervention models within guidance and counseling services

CONCLUSION

Based on the findings of this study, the developed Human–Nature Connection (HNC) instrument, operationalizing the *environmental engagement* construct among high school students, demonstrated good psychometric properties. The validity test results indicated that most items adequately represented the construct being measured, with 27 items declared valid and 3 eliminated for not meeting the empirical criteria. In addition, the reliability test results revealed a Cronbach's Alpha coefficient of 0.979, indicating that the instrument possesses very high internal consistency and is suitable for use as an assessment tool within educational, guidance, and counseling contexts.

This study further demonstrates that students' *environmental engagement* is not solely associated with environmental knowledge but also involves emotional connectedness and behavioral tendencies toward the environment. The findings revealed that the affective dimension was more developed than the behavioral dimension. This condition suggests that students already possess environmental concern and emotional attachment to nature; however, they have not fully translated these attitudes into consistent pro-environmental actions.

Theoretically, this study strengthens the position of *Human–Nature Connection* (HNC) as a multidimensional framework for operationalizing the *environmental engagement* construct. In practice, the developed instrument may serve as an assessment tool to support sustainability-based guidance and counseling services in schools, particularly for designing more context-specific interventions aimed at developing students' sustainability character.

Nevertheless, this study has several limitations. The relatively small number of participants requires that the findings be generalized with caution. Furthermore, this study did not examine the construct structure using *exploratory factor analysis* (EFA) or *confirmatory factor analysis* (CFA), indicating that further construct validation is still necessary in future research. Therefore, future studies are recommended to employ larger, more diverse samples and investigate the relationship between Human–Nature Connection and other variables, such as *environmental identity*, *eco-anxiety*, psychological well-being, and students' sustainability behavior.

Thus, this study not only produced a valid and reliable instrument but also contributed conceptually and practically to the development of environment-based guidance and counseling research. In the future, integrating psychological assessment, environmental education, and guidance and counseling services is expected to provide a more comprehensive approach to fostering healthy, responsible relationships with the environment among younger generations.

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