Construction and Standardization of a Test of Awareness on Green Environment Practices for Secondary School Students in Kerala

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A B S T R A C T

This study details the development and standardisation of a Test on Awareness designed to assess Secondary School Students' knowledge and attitudes toward Green Environment Practices. The construction followed rigorous psychometric procedures, including content validation, item analysis, and reliability estimation. The resulting instrument demonstrates sound validity and reliability, offering a robust tool for evaluating sustainability education effectiveness in the Indian context. The Test developed is relevant and comprehensive, addressing five critical components: Efficient Use of Resources, Healthy Environment, Sustainable Curriculum, Healthy Nutrition, and Sustainable Community Practices. A draft version with 70 items underwent expert review and pilot testing, resulting in a refined version of 35 items with strong discriminatory power and appropriate difficulty indices. Reliability was established through the Split-Half method, yielding a coefficient of 0.81, indicating high internal consistency. Norms were developed to classify students into high, average, and low awareness categories. This paper describes the systematic process of developing and standardising the instrument, providing a foundation for future research and applications in sustainability education assessment.

Keywords: Environmental Education, Green Practices, Awareness Test, Standardisation, Sustainable Education, Secondary Education

1. Introduction

In the context of education, Green Environment Practices refer to the collective efforts of educational institutions to promote sustainable development through transformative learning experiences. These practices encompass the efficient use of resources, cultivation of a healthy environment, adoption of sustainable nutrition, implementation of sustainability-focused curricula, and facilitation of community engagement toward environmental stewardship. By embedding these practices, schools play a critical role in inspiring students to become responsible global citizens. Awareness constitutes a pivotal dimension of sustainable development. Recent years have witnessed a growing emphasis on fostering Green Environment Practices among Secondary School Students. Adolescence represents a formative period in which individuals develop values and attitudes that shape lifelong behaviors. Consequently, instilling a sense of responsibility and concern for environmental sustainability during this stage is essential to cultivating a generation committed to addressing ecological challenges. One promising approach is the use of standardised assessments that measure knowledge and attitudes. Valid and reliable instruments enable educators to evaluate program effectiveness and identify areas for targeted improvement. The present study elaborates on the construction and standardisation of an awareness test on Green Environment Practices for Secondary School Students in Kerala.

2. Review of Related Literature

The standardisation of instruments to measure environmental awareness has emerged as a key area of research in environmental and educational psychology. Hungerford and Volk's (1990) emphasis on environmental literacy extends beyond factual knowledge to encompass affective and behavioural dimensions, necessitating multidimensional assessment tools. Kollmuss and Agyeman (2002) highlighted the complex interplay of knowledge, emotional involvement, and contextual barriers in driving pro-environmental behaviour, reinforcing the need for robust measurement strategies.

The psychometric development of such instruments draws on classical test theory and item response theory to ensure construct validity and reliability (DeVellis, 2017). Instruments such as the Environmental Attitude Inventory (Milfont &Duckitt, 2010) and the Children's Environmental Attitudes and Knowledge Scale (Leeming et al., 1995) have demonstrated the importance of meticulous item analysis, expert validation, and pilot testing. Eilam and Trop (2012) underscored standardised assessment tools as critical for documenting program impacts and informing policy.

Within the school context, research has shown that experiential learning and whole-school approaches to sustainability education significantly influence student dispositions. Ferreira, Ryan, and Tilbury (2006) documented that immersive sustainability initiatives can enhance awareness, motivation, and self-efficacy. Similarly, Mogensen and Mayer (2005) argued that eco-schools represent critical platforms for developing students' competencies in sustainable practices through experiential learning and community partnerships.

Norm-referenced interpretations require transparent statistical procedures and representative sampling (Crocker & Algina, 2006). The derivation of norms using standard deviations to delineate high, average, and low awareness groups is a widely accepted approach in educational measurement (Aiken & Groth-Marnat, 2006).

Despite the proliferation of environmental awareness measures, there remains a paucity of instruments tailored to specific domains such as sustainable nutrition and community practices within the Indian educational context. This study addresses this gap by constructing and standardising a comprehensive Awareness Assessment Tool for secondary school students in Kerala.

3. Construction of the Test

The construction process comprised five phases:

1. Preparation of a draft test.

2. Preliminary tryout.

3. Item analysis.

4. Selection of final items.

5. Estimation of reliability and validity.

The Test featured objective-type questions and a booklet for distribution. Each question aligned with the study's specific content area and provided a scoring key. There were four options for answers in each closed-ended question..

3.1 Purpose of the Test

Awareness refers to the state of being informed, conscious, and cognizant of environmental issues and sustainable practices (U.S. Environmental Protection Agency, 2022). A test on awareness serves as a diagnostic tool for assessing students' knowledge and understanding of sustainability concepts. By identifying gaps in comprehension, educators can design targeted interventions that foster responsible behaviour and encourage collective responsibility for sustainable development.

3.2 Preparation of the Draft Test

The Test on Awareness was prepared based on a detailed blueprint to ensure content validity. The initial version included 70 multiple-choice questions addressing five components:

- Efficient Use of Resources

- Healthy Environment

- Healthy Nutrition

- Sustainable Curriculum

- Sustainable Community Practices

Each item had four response options and an accompanying scoring key.

3.3 Preliminary Try Out and Pilot Testing

The initial draft of the Test had 70 items, which were administered to 30 secondary school students. After trying out the questionnaire, ambiguous questions and confusing sentence structures were taken out or amended based on the feedback from the sample students. The draft test with 62 items was administered to 371 students of secondary schools that follow different curricula and with different types of administration. To avoid eliminating any response sheet and maintain the required sample size, the researcher ensured that the respondents answered all the test items. Response sheets were scored and taken for item analysis. Scoring for each item of the test was done by giving a score of 1 for the correct answer and 0 for the incorrect answer. Therefore, the maximum score was 62 and the minimum score was 0.

3.4 Item Analysis

Item analysis followed the method suggested by Ebel and Friesbie (1991) to calculate the difficulty index and discriminating power of each question. Response sheets were scored and arranged in the descending order of their total scores. The upper 27 percent with high scores and the lower 27 percent with low scores were selected.

The difficulty index (DI) and discriminating power (DP) were computed using the following formulas:

- **Difficulty Index:** $DI = \dfrac{(U+L)}{2N}$

- **Discriminating Power:** $DP = \dfrac{(U-L)}{N}$

Where:

- U = Number of correct responses in the upper group

- L = Number of correct responses in the lower group

- N = Number of students in each group

Items were retained if the Difficulty Index was between 0.4 – 0.6 and Discriminating Power was ≥ 0.3. The difficulty index and discriminatory power of each item is given in Appendix 1.

3.5 Test on Awareness of Green Environment Practices

In the final form of the test, there are 35 items distributed over 5 components of Green Environment Practices namely Efficient Use of Resources, Healthy Environment, Healthy Nutrition, Sustainable Curriculum, and Sustainable Community Practices. After the item analysis, items were retained if their Difficulty Index was between 0.4 and 0.6 and their Discriminating Power was ≥ 0.3.

Table:1

Distribution of Items in the Final Test

Sl. No.	Dimension	Item Numbers	Total Items
1	Efficient Use of Resources	1–8	8
2	Healthy Environment	9–15	7
3	Sustainable Curriculum	16–22	6
4	Healthy Nutrition	23–28	7
5	Sustainable Community Practices	29–35	7
Total			**35**

4. Characteristics of the Test on Awareness of Green Environment Practices

4.1 Validity of the Test

A test's validity lies in its ability to accurately measure its intended objectives. Content and construct validity were established through expert review. Subject specialists evaluated the alignment of the items with the intended constructs of awareness on Green Environment Practices.

4.2 Reliability

Reliability refers to the degree of consistency of measurement that a research tool demonstrates.

The reliability of the Awareness Test on Green Environment Practices was established by Split- Half method. The odd-numbered items were used as one half of the Test, and even-numbered items were used as the other half. They were scored separately, and the correlation of the scores of odd items against the even items was found out and then correlated by the Spearman-Brown Prophecy formula:

Spearman-Brown formula

$$r_{tt} = \frac{2r_h}{1 + r_h}$$

r_{tt} - reliability of the entire test

r_h - correlation between the two halves

The reliability coefficient of the Awareness Test was found to be **0.81**, indicating high internal consistency.

4.3 Objectivity

Objectivity demands definiteness in the answer expected. The Awareness Test on Green Environment Practices for Secondary School Students was highly objective as it contained only multiple-choice questions. The Test was conducted with supervision, and the response sheets were scored according to the scoring key prepared in advance.

4.4 Practicability

The Test duration was approximately one hour, including instructions. The format of multiple-choice questions ensured feasibility in terms of administration and scoring. The use of reusable question booklets and separate response sheets enhanced cost-effectiveness and practicality.

5. Norms for Interpretations

Norms were established using the conventional sigma distance method. The Awareness Test Scores were classified into three groups: High, Average, and Low Awareness, based on Standard Deviation distances from the Mean. Assuming a normal distribution of Test Scores, the conventional procedure of using sigma distances for dividing the sample was used. Considering the baseline of the normal curve representing the distribution to extent from -3s to +3s i.e. over a range of 6s, a range of 2 was allotted to each group. Thus, students whose Awareness Test Scores fall between (M+ s and M - s) were classified as Average- Awareness Group (abbreviated as AAG), those students whose scores were below (M - s) were considered as Low- Awareness Group (abbreviated as LAG), while Students whose scores were above (M + s) were classified as High- Awareness Group' (abbreviated as HAG). For the distribution of generalised awareness scores, Mean was 15.86 and Standard Deviation was 6.08. Therefore, students whose Awareness Group Scores were 21.87 or more (rounded value of M + s) were considered as High- Awareness Group, whose scores were less than 9.84 (rounded value of M - s) were taken as Low- Awareness Group , and the remaining students were classified as Average- Awareness Group.

Table: 2

Norms Derived for the Test

Awareness Level	Score Range
High Awareness Group	≥ 21.87
Average Awareness Group	$9.84 – 21.87$
Low Awareness Group	≤ 9.84

These norms provide a framework for interpreting student scores relative to the distribution of awareness in the sample population. The norms derived for the test is attached as Appendix 2

6. Conclusion

Rigorous construction and standardisation of measurement instruments are foundational to high-quality educational research. The Test on Awareness developed in this study demonstrates strong validity, reliability, objectivity, and practicability. It provides educators and policymakers with a reliable tool for assessing secondary school students' understanding of Green Environment Practices. Such standardised instruments are essential for evaluating the effectiveness of sustainability education interventions and guiding evidence-based strategies to promote sustainability literacy among adolescents.

The Difficulty Index and Disriminatory Power of Each Item

Q. No	U+L	U-L	DP	DI	Remarks
1	133	11	0.11	0.67	R
2	182	14	0.14	0.91	R
3	177	17	0.17	0.89	R
4	87	41	0.41	0.44	S
5	72	30	0.30	0.36	R
6	138	22	0.22	0.69	R
7	105	35	0.35	0.53	S
8	33	1	0.01	0.17	R
9	94	26	0.54	0.61	S
10	84	30	0.30	0.42	S
11	80	37	0.37	0.40	S
12	102	42	0.42	0.51	S
13	129	37	0.37	0.65	S
14	108	42	0.42	0.54	S
15	132	24	0.24	0.66	R
16	88	16	0.16	0.44	R
17	124	50	0.50	0.62	S
18	81	32	0.32	0.41	S
19	107	35	0.35	0.54	S
20	138	18	0.18	0.69	R
21	152	34	0.34	0.76	S
22	165	35	0.35	0.83	S
23	134	46	0.46	0.67	S
24	62	2	0.02	0.31	R
25	117	33	0.33	0.59	S
26	38	8	0.08	0.19	R
27	132	34	0.34	0.66	S
28	118	44	0.44	0.59	S
29	135	45	0.45	0.68	S
30	60	-8	-0.08	0.30	R
31	89	31	0.31	0.45	S
32	118	38	0.38	0.59	S

33	96	20	0.20	0.48	R
34	129	45	0.45	0.65	S
35	104	8	0.08	0.52	R
36	116	12	0.12	0.58	R
37	103	35	0.35	0.52	S
38	115	21	0.21	0.58	R
39	109	23	0.23	0.55	R
40	44	2	0.02	0.22	R
41	106	24	0.24	0.53	R
42	16	-2	-0.02	0.08	R
43	72	8	0.08	0.36	R
44	149	33	0.33	0.75	S
45	86	30	0.30	0.43	S
46	139	33	0.33	0.70	S
47	103	34	0.34	0.52	S
48	58	10	0.10	0.29	R
49	42	14	0.14	0.21	R
50	82	32	0.32	0.41	S
51	22	6	0.06	0.11	R
52	97	33	0.33	0.49	S
53	77	21	0.21	0.39	R
54	87	36	0.36	0.44	S
55	82	32	0.32	0.41	S
56	87	35	0.35	0.44	S
57	41	3	0.03	0.21	R
58	87	31	0.31	0.44	S
59	54	20	0.20	0.27	R
60	102	40	0.40	0.51	S
61	85	35	0.35	0.43	S
62	93	21	0.21	0.47	R

The Difficulty Index and Disriminatory Power of Items

	High-Awareness (HAG)	Average Awareness scale(AAG)	Low - Awareness scale(LAG)
Mean	15.86		
SD	6.08		
Norms	M + s	M -s to M + s	M -s
Scores	21.87	9.84 to21.87	9.84

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