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Development and Validation of Assessment Tool Measuring Knowledge on Sustainable Development: Basis for Instructional Emphasis on Higher Education

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ABSTRACT

The Sustainable Development Goals are universal and intrinsically global goals for all people. Thus, this study aimed to develop and validate an assessment tool measuring knowledge on sustainable development goals, and it seeks to evaluate the value of multiple-choice questions to build a strong question bank for future usage by validating the questions through item analysis and validation. The study follows a descriptive-quantitative approach utilizing two hundred (200) researcher-made questions validated by experts. Three-hundred twenty-three college students were selected using stratified sampling and participated in the study. The discrimination index, difficulty index, reliability index, and content validity are used to identify the appropriateness of items. Results of the study revealed that out of two hundred (200) items, one hundred twenty-five (125) items were retained, eight (8) items were rejected, and sixty-seven (67) were subject to revision following the reliability test. Thus, results showed a reliability index of 97.04% or .97, indicating that the items are standardized and suitable for assessment. After conducting the reliability test, the one hundred twenty-five (125) retained items underwent a content validity test through Lawshe's method to enhance the construct validity of the developed instrument. It was determined that seventy-two (72) items were to be retained, for it had reached the acceptable level of 0.99. Hence, fifty-three (53) items were to be removed for it has CVR lower than 0.99, which is not acceptable for an item to be retained. Following the result, it is recommended that the seventy-two items (72) retained to be used to assess students' knowledge of the 17 sustainable development goals. This study also inferred that future assessments should include questions with a medium degree of difficulty and a high ability to distinguish between different functions.

INTRODUCTION

The 2030 Agenda for Sustainable Development is astonishing in its breadth. At its heart are the 17 Sustainable Development Goals (SDGs), which are a critical call for activity by all nations. Sustainable Development Goals are universal goals set by the United Nations that aim to transform the world by ending poverty and equality, protecting our planet, and ensuring that all people enjoy justice, health, and prosperity by 2030 (United Nations, 2015). Moreover, United Nations (n.d.) highlighted the importance of raising awareness among people and local governments in localizing the implementation of SDG. In addition, Ejechi (2018) considers SDGs critical for establishing engaging classrooms, boosting global awareness, and motivating teachers and students to take action. However, gaps in terms of knowledge (Omisoro *et al.*, 2017; Zamora-Polo *et al.*, 2019) and awareness (Leiva-Brondo *et al.*, 2022; Yuan *et al.*, 2021) in sustainable development goals among certain groups of people are recorded in various literature. Further, the majority of assessment tools used to measure knowledge and awareness of SDGs are in the form of Likert-type questions that dwell on people's perceptions, feelings, and experiences towards 17 SDGs. Thus, the development of valid and reliable multiple choice questions assessment tools measuring knowledge of 17 SDGs will properly address these gaps.

In education, multiple choice questions (MCQ) test is part of the assessment whether in basic education or higher education. Different sectors (either private or public) use this type of test to determine the prior learnings or competencies of takers. Examples of these are the Test of English as a Foreign Language (TOEFL) (Wolfe & Manalo, 2004), Trends in International Mathematics and Science Study (TIMSS) (Martin *et al.*, 2016), Program for International Student Assessment (PISA) (Organization for Economic Cooperation and Development, 2018) are among those sectors who use multiple choices questions assessment. However, multiple-choice questions must be valid and reliable in order to draw valid and reliable conclusions from test results (Considine *et al.*, 2005; Sadaf *et al.*, 2012). To determine how good the developed MCQ is, the discrimination index, item difficulty, reliability test, and content validity test must be conducted. The discrimination index is conducted to determine how well an item in the MCQ differentiates between performing takers to non-performing (Burton, 2001a). The difficulty index is conducted to determine the competency learned by takers by analyzing the degree to which takers get the right answers (Stiller *et al.*, 2016). The item reliability test seeks to uncover how consistent and stable the MCQ test items (Clayson, 2018). Lastly, the content validity test is conducted to determine the appropriateness of items in the MCQ test (Barak *et al.*, 2020). These measures allow

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testing sectors to differentiate good items from bad items and to provide insights into how good the test is.

Various assessment tool was crafted to measure the knowledge and awareness of certain groups of individuals in sustainable development goals. Among these tools are the tools developed by Ahamad & Ariffin (2018) (knowledge, attitude, and practices towards sustainable consumption), Ando *et al.*, (2019) (consciousness and behavior of students towards SDG), Borges (2019) (knowledge, attitudes, and behaviors). However, most of the tools circulated are in the form of Likert-type questions that answers participants' approval of a certain statement. Though these statements address certain gaps in the literature pertaining to SDG but a tool measuring knowledge on SDG in the form of MCQ will also help in addressing certain gaps in the literature. In addition, factual knowledge is also crucial to the development of an individual whether it is for leisure (Roggenbuck *et al.*, 1990), instructional tasks (Förtsch *et al.*, 2018), or at the community level (Malone *et al.*, 2008). Moreover, contextualizing MCQ test items is also helpful in achieving the desired goals or objectives of the evaluators or programs (Chu & Treagust, 2014; Smith, 2018). Thus, it is also crucial to create an assessment tool pertaining to SDGs that highlights the current situation or context to maximize the potentiality of the results for policy recommendation or implementation.

Further, embedding SDGs into the curriculum in either basic education or higher education is also beneficial to the community. Education institutions can help the implementation of SDGs in the form of knowledge transfer (Leite, 2022; (Schreiber & Torabian, 2023), competency development (Alm *et al.*, 2021), and productivity (Nhamo & Mjimba, 2020). The next generation of workers, policymakers, and community members are in the hands of educational institutions, thus, it is very important to embed the 17 SDGs for faster and more sustainable information dissemination. In addition, in order to achieve meaningful learning of the SDGs, the promotion of active participation among students is needed for transformative learning experiences Cottafava *et al.* (2019). Education institutions play a key role in training young professionals who require a broad vision of sustainability that is both theoretically and practically grounded, as well as the knowledge and experience necessary to develop appropriate research and implementation plans (Alvarez-Risco *et al.*, 2021). Moreover, monitoring of students' progress in the acquisition of 17 SDGs principles is also part of the curriculum implementation. Therefore, a valid and reliable assessment tool measuring the learning acquisition of 17 SDGs is necessary.

In line with this, this study aimed to develop an assessment tool, specifically multiple choice questions, to measure knowledge on sustainable development. Additionally, it seeks to evaluate the value of multiple-choice questions in order to build a strong question bank for future usage. This study would be beneficial to different educational

institutions in local, national, or international settings since the questions that are identified as valid and reliable can be used to test the knowledge of their learners in the 17 SDGs. Plans and programs can be developed by education institutions based on the results of their assessment. Moreover, this study can also contribute to the literature pertaining to the assessment of 17 sustainable development goals.

Research Objectives

The goal of this research was to develop and validate an assessment tool for testing knowledge about sustainable development goals. Furthermore, this research aimed to see how accurate and trustworthy the designed questionnaire is for measuring students' understanding of the SDG. This study aims to look into the following points in particular:

1. To determine the level of difficulty index of the constructed items.
2. To determine the level of discrimination index of the constructed items.
3. To determine the reliability of the constructed items.
4. To determine the level of content validity of the constructed items.

METHODOLOGY

Design

This study used a descriptive quantitative approach to gather data about the students' knowledge of 17 SDGs and to determine the final items included after the reliability and content validity test. Frequency distribution was used to determine the number of respondents as well as the distribution of items in the difficulty index, discrimination index, reliability index, and content validity.

Respondents

This study was conducted at the University of Mindanao - Digos College located in the southern part of the Philippines, Mindanao. The respondents were chosen in accordance with the inclusion criteria of being bona fide college students in the institution that is currently enrolled in the school year 2021–2022. Prior to the selection of respondents for this study, a letter was sent to the college dean, research and publication office, and registrar of the University of Mindanao - Digos College indicating the purpose of the research and other necessary documents to conduct this study were submitted for final approval. Once approved, samples were calculated using Slovin's formula with a 95% confidence level (Murthy, 1967). From this calculation, the result of three-hundred twenty-three (323) respondents would be the sample of this study. The researchers employed a stratified random sampling technique, which divides samples into smaller groups called strata. In stratified random sampling, the strata are created based on the shared traits or characteristics of the respondents (Nguyen *et al.*, 2021). The respondents were divided into two strata: the first stratum was classified according to their departments,

and the second stratum was classified according to their year level. Then, a random sample is used to pool the stratum subsets. Table 1 shows the distribution of respondents per stratum. The Department of Teacher Education (DTE) (n=97, %=30.03) has the highest number of respondents followed by the Department of Criminal Justice Education (DCJE) (n=80, %=24.77), Department of Business Administration (DBA) (n=72,

%=22.29), Department of Arts and Sciences (DAS) (n=27, %=8.36), Department of Accounting Education (DAE) (n=27, %=8.36), and Department of Technical Programs (DTP) (n=20, %=6.19) respectively. Moreover, in terms of respondents per year level, the 1st-Year level has the highest number of respondents (n=138, %=42.72), followed by 3rd-year (n=90, %=27.86), 2nd-Year (n=57, %=17.65), and 4th-year (n=38, %=11.76) respectively.

Table 1: Profile of respondents (n=323)

Department	1st Year (n)		2nd Year (n)		3rd Year (n)		4th Year (n)		Overall Frequency (n)	
	n	%	n	%	n	%	n	%	n	%
Department of Teacher Education (DTE)	30	9.29%	19	5.88%	35	10.84%	13	4.02%	97	30.03%
Department of Criminal Justice Education (DCJE)	49	15.17%	9	2.79%	18	5.57%	4	1.24%	80	24.77%
Department of Business Administration (DBA)	25	7.74%	17	5.26%	20	6.19%	10	3.10%	72	22.29%
Department of Arts and Sciences (DAS)	13	4.02%	4	1.24%	7	2.17%	3	0.93%	27	8.36%
Department of Accounting Education (DAE)	13	4.02%	4	1.24%	5	1.55%	5	1.55%	27	8.36%
Department of Technical Programs (DTP)	8	2.48%	4	1.24%	5	1.55%	3	0.93%	20	6.19%
Total	138	42.72%	57	17.65%	90	27.86%	38	11.76%	323	100.00%

Research Instrument

In this study, the researchers developed a survey questionnaire that consisted of two sections. The first section contains information about the student’s demographic profile, such as the department and their year level, while the second section contains multiple-choice questionnaires assessing the knowledge of students on Sustainable Development Goals. Before gathering the data, the researchers formulated a Table of Specifications (TOS) of the two-hundred (200) items questionnaire to determine the areas of achievement being assessed and to make sure a fair and representative sample of questions is included on the test. In this study, following the Revised Blooms Taxonomy developed by Krathwohl & Anderson (2010), the TOS being used focuses only on the Remembering (Rem) and Understanding (Und) levels (see Table 2). Krathwohl & Anderson (2010) described remembering (Rem) as the

ability to remember/recall/recognize information from memory, while understanding (Und) refers to the ability to construct meaning or explanation from written materials, graphic sources, or spoken. With remembering and understanding, an individual can process basic thinking skills as well as can explain ideas or concepts. In addition, to have a representation of items in the overview of SDG and the 17 goals, the researchers created thirty (30) items for the overview while there are ten (10) items per goal of the 17 SDG; thus, a total of two-hundred (200) items were created (see Table 2). Three (3) experts in the field of education validated the constructed items along with the table of specifications. Minor revisions were carried out based on the expert’s recommendation. After the approval of experts, the questions were then encoded in Google form since, during the conduct of this study majority of areas in the Philippines were on lockdown due to the Covid-19 pandemic.

Table 2: Table of Specifications

Objectives	Topic/S	Level	Assessment Task	Distribution		Item Numbers
				%	Items	
Recognize the issues and topics related to the 17 SDGs.	General Overview Of 17 SDG	Rem	MCQ	15%	15	1,2,3,4,5,6,7,8,9,10,11,13,14,15,16
		Und	MCQ		15	12,17, 18, 19, 20,22,23,21,24,25,26,27,28,29,30

Recognize the issues and topics related to SDG 1.	Sdg 1- No Poverty	Rem	MCQ	5%	5	32,33,35,37,40
			MCQ		5	31,34,36,38,39
Identify the issues and topics related to SDG 2.	Sdg 2 – Zero Hunger	Rem	MCQ	5%	5	41,43,45,47,49
		Und	MCQ		5	42,44,46,48,50
Recognize the issues and topics related to SDG 3.	Sdg3 – Good Health And Well-Being	Rem	MCQ	5%	5	51,52,53,54,55
		Und	MCQ		5	56, 57,58 59,60
Identify the issues and topics related to SDG 4.	Sdg4 – Quality Education	Rem	MCQ	5%	5	62,63,65,66,68
		Und	MCQ		5	61,64,6769,70
Recognize the issues and topics related to SDG 5.	SDG 5- GENDER EQUALITY	Rem	MCQ	5%	5	71,73,74,75,77
		Und	MCQ		5	72,76,78, 79,80
Recognize the issues and topics related to SDG 6.	Sdg 6- Clean Water And Sanitation	Rem	MCQ	5%	5	81,83,87,88,89
		Und	MCQ		5	82,84,85,86,90
Recognize the issues and topics related to SDG 7.	Sdg 7-Affordable And Clean Energy	Rem	MCQ	5%	5	91,93,94,97,98
		Und	MCQ		5	92,95,96,99,100
Identify the issues and topics related to SDG 8.	Sdg 8- Decent Work And Economic Growth	Rem	MCQ	5%	5	103,105,108,109, 110
		Und	MCQ		5	101,102,104,106,107
Recognize the issues and topics related to SDG 9.	Sdg 9- Industry, Innovation And Infrastructure	Rem	MCQ	5%	5	112,113,115,116,117
		Und	MCQ		5	111,114,118,119,120
Recognize the issues and topics related to SDG 10.	Sdg 10- Reduced Inequalities	Rem	MCQ	5%	5	121,124,125,126,127
			MCQ		5	122,123,128,129,130
Identify the issues and topics related to SDG 11.	Sdg 11- Sustainable Cities And Communities	Rem	MCQ	5%	5	131,133,134,135,139,140
		Und	MCQ		5	132,135,136,137,138
Recognize the issues and topics related to SDG 12.	Sdg 12- Responsible Consumption And Production	Rem	MCQ	5%	5	141,142,143,145,146
		Und	MCQ		5	144,147,148,149, 150
Identify the issues and topics related to SDG 13.	Sdg 13- Climate Action	Rem	MCQ	5%	5	151,152,153,156,157
		Und	MCQ		5	154,155,158,159,160
Recognize the issues and topics related to SDG 14.	Sdg 14- Life Below Water	Rem	MCQ	5%	5	161,164,165,166,167
		Und	MCQ		5	162,163, 168,169,170
Recognize the issues and topics related to SDG 15.	Sdg 15- Life On Land	Rem	MCQ	5%	5	171,173,177,178,179
		Und	MCQ		5	172,174,175,176,180
Recognize the issues and topics related to SDG 16.	Sdg 16- Peace, Justice, And Strong Institutions	Rem	MCQ	5%	5	181,183,184,185,186
		Und	MCQ		5	182,187,188,189,190
Identify the issues and topics related to SDG 17.	Sdg 17- Partnerships To Achieve The Goal	Rem	MCQ	5%	5	191,192,193,194,195
		Und	MCQ		5	196,197,198,199,200

Data Analysis

This study utilizes four (4) techniques in the analysis. First is the formula for the difficulty index, $p = H + L / N \times 100$, where H is the number of students who got the right answers in the top 27 percent or higher group, L is the number of students who got the right answers in the bottom 27 percent or lower group, N is the total number of students in the two groups. It was used to gauge the test questions' degree of difficulty. It can also range from 0% to 100%; the higher the value, the easier the item

is. p can range from 0.00 (no examinees got the correct answer) to 1.00 (all examinees got the correct answer) (Aiken, 1979). Generally, Items with a p-value of 30% to 70% are regarded as acceptable. Items with a p-value of between 50 and 60 percent are ideal. Items that have a p-value of less than 30% (too difficult) and more than 70% (too easy) need to be changed, and their language may need to be examined, or their contents may need to be retaught (D'Sa & Visbal-Dionaldo, 2017). Second, is the formula for discrimination index $d = H - L / N$ where; H

- top 27 percent or higher group, L - bottom 27 percent or lower group, and N - is the total number of students in the two groups. It was used to gauge how well the item might distinguish respondents who were acquainted with the 17 SDGs from those who weren't. Item discrimination analysis deals with the fact that several test-takers frequently provide diverse responses to a test item. It discusses the reliability of test items and how well they capture the qualities the test was designed to measure. Generally, a good "d" value is between 0.20 and 0.35. Items with a DI greater than 0.35 are regarded as excellent, and those with a DI less than 0.20 are regarded as poor (Burton, 2001b).

Third, the Kuder-Richardson Formula 20 (KR-20) was used to evaluate the internal consistency and reliability of the test questionnaires. The Kuder-Richardson Formula 20 is as follows: $KR-20 = (k/(k-1)) * (1 - \sum p_j q_j / \sigma^2)$ where k is the total number of questions, p_j is the percentage of students who correctly answered question j, q_j is

the percentage of students who incorrectly answered question j, and σ^2 is the variance of students' scores. Quaigrain & Arhin (2017) have proposed four reliability cut-off points: excellent reliability (0.90 and above), high reliability (0.70-0.90), moderate reliability (0.50-0.70), and low reliability (0.50 and below) (0.50 and below). Fourth is Lawshe's Method using the formula $CVR = (n_e - N/2) / (N/2)$, where CVR is content validity ratio, n_e is the number of panel members indicating "essential," N is the total number of panel members, and CVR is the content validity ratio (Wilson *et al.*, 2012).

The number of panels affects the final assessment of whether to retain the item based on the CVR. The numeric value of the content validity ratio is determined by Lawshe's Table based on Khazaee-Pool *et al.* (2022), as seen in Table 3. In this study, there are six (6) experts who validated the items after the reliability test; thus a CVR of 0.99 is expected per item in order for those items to be retained.

Table 3: Table of Minimum Acceptable CVR Values is Designed Based on the Number of Experts Participating in the Process of Validating the Questionnaire

Number of Experts	Minimum Value of CVR	Number of Experts	Minimum Value of CVR
5	0.99	13	0.54
6	0.99	14	0.51
7	0.99	15	0.49
8	0.78	20	0.42
9	0.75	25	0.37
10	0.62	30	0.33
11	0.59	35	0.31
12	0.56	40+	0.29

RESULTS AND DISCUSSIONS

Difficulty Index

The distribution of the items' difficulty indices is shown in Table 4. From the total of three-hundred twenty-three (323) respondents, twenty-seven (27% (n=87)) of the respondents were classified as belonging to the upper group and twenty-seven (27% (n=87)) as belonging to the lower group based on their scores. The difficulty index was then calculated using the responses from the upper and lower group who obtained the correct answer. Based on D'Sa & Visbal-Dionaldo (2017) difficulty indices, the table reveals that the total number of items having a difficulty index of very easy is only one (1(1%)), easy is twenty-six items (26 (13%)), moderately difficult is one-hundred nine (109 (54%)), difficult is fifty-nine (59 (30%)), and very difficult is five (5 (3%)). In general, items

with easy and difficult indices are regarded as acceptable, while items with moderately difficult indices are regarded as ideal or excellent. However, very difficult and very easy items are needed to be changed. Thus, most of the developed items were excellent, with one-hundred ninety-four (194) items falling in either difficult, easy, or moderately difficult, while only six (6) items needed to be deleted or removed from the questionnaire. Moreover, items that needed to be removed from the pool of questions based on the difficult index can be found in Overview (n=1), Goal 2 (n=1), Goal 4 (n=1), Goal 9 (n=1), Goal 13 (n=1), and Goal 16 (n=1). Thus following this analysis, twenty-nine (29) items from the overview are retained, nine items were retained from Goal 2, Goal 4, Goal 9, Goal 13, and Goal 16, while the other indicators (Goals), all of their items were retained (see Table 4 for the details).

Table 4: Difficulty Index of Developed MCQ item

SDG Indicators	No. of Items	Very Easy	Easy	Moderately Difficult	Difficult	Very Difficult
Overview	30	1	6	17	6	-
Goal 1	10	-	-	9	1	-
Goal 2	10	-	2	4	3	1
Goal 3	10	-	1	6	3	-

Goal 4	10	-	1	6	2	1
Goal 5	10	-	-	7	3	-
Goal 6	10	-	4	5	1	-
Goal 7	10	-	-	8	2	-
Goal 8	10	-	-	6	4	-
Goal 9	10	-	-	4	5	1
Goal 10	10	-	2	4	4	-
Goal 11	10	-	2	4	4	-
Goal 12	10	-	-	5	5	-
Goal 13	10	-	2	4	3	1
Goal 14	10	-	2	5	3	-
Goal 15	10	-	1	4	5	-
Goal 16	10	-	1	5	3	1
Goal 17	10	-	2	6	2	-
Total	200	1	26	109	59	5
%	100%	0.5%	13%	54.5%	29.5%	2.5%

Discrimination Index

The frequency distribution of the items' discrimination indices is shown in Table 5. From the total of three-hundred twenty-three (323) respondents, twenty-seven (27% (n=87)) of the respondents were classified as belonging to the upper group and twenty-seven (27% (n=87)) as belonging to the lower group based on their scores. Based on the result, one hundred-thirty-one (131 (66%)) items had excellent discrimination indices, forty-five (45 (22%)) items were considered moderately discriminating, eighteen (18 (9%)) as very discriminating, and six (6 (3%)) as questionable items. Burton (2001b) noted that items with a DI > 0.35 are considered excellent.

Thus, following the analysis result, one-hundred ninety-four items (194) have passed the item discrimination test, while six (6) items need to be removed from the developed questionnaire.

Moreover, items that needed to be removed from the pool of questions based on the discrimination index can be found in Overview (n=2), Goal 2 (n=1), Goal 5 (n=1), and Goal 9 (n=2). Thus following this analysis, twenty-eight (28) items from the overview are retained, eight (8) items from Goal 9 are retained, and nine (9) items were retained from Goal 2 and Goal 4, while the other indicators (Goals), all of their items were retained (see Table 5 for the details).

Table 5: Discrimination Index of Developed MCQ item

SDG Indicators	No. of Items	Discriminating	Moderately Discriminating	Very Discriminating	Questionable
Overview	30	19	4	5	2
Goal 1	10	4	4	2	-
Goal 2	10	4	4	1	1
Goal 3	10	8	1	1	-
Goal 4	10	8	2	-	-
Goal 5	10	5	4	-	1
Goal 6	10	2	7	1	-
Goal 7	10	6	2	2	-
Goal 8	10	7	3	-	-
Goal 9	10	6	2	-	2
Goal 10	10	7	2	1	-
Goal 11	10	9	1	-	-
Goal 12	10	8	2	-	-
Goal 13	10	8	2	-	-
Goal 14	10	8	2	-	-
Goal 15	10	7	1	2	-

Goal 16	10	7	1	2	-
Goal 17	10	8	1	1	-
Total	200	131	45	18	6
%	100%	66%	22%	9%	3%

Reliability Index

Table 6 shows the internal consistency and reliability of the two hundred (200) developed items, measured by Kuder-Richardson Formula 20 (KR-20). Based on the analysis, the developed items obtained a reliability index of 97.04% or .97. This result has demonstrated excellent reliability, reaching the cut-off point of 0.90 (Quaigrain & Arhin, 2017). This means that the developed questionnaire is reliable and can be used to test knowledge on sustainable development goals. Moreover, the result further revealed that out of the two hundred (200) developed items, one hundred twenty-five (125

(62.5%) needed to be retained, sixty-seven (67 (33.5%)) items were subject to revision, and eight (8 (4%)) items should be discarded (rejected). Further analysis revealed that fifteen (15) of the indicators had retained fifty percent (50%) of its items without revisions (Overview (n=18), Goal 1 (n=10), Goal 3 (n=8), Goal 4 (n=8), Goal 5 (n=5), Goal 6 (n=6), Goal 7 (n=8), Goal 8 (n=8), Goal 9 (n=5), Goal 11 (n=5), Goal 13 (n=5), Goal 14 (n=6), Goal 15 (n=8), Goal 16 (n=7), Goal 17 (n=8)) while three (3) of the indicators retained less than fifty percent (50%) of its items (Goal 2 (n=4), Goal 10 (n=4), Goal 12 (n=4)) (see Table 6 for the details).

Table 6: Reliability Test Result

SDG Indicators	No. of Items	Retain	Revise	Reject
Overview	30	18	9	3
Goal 1	10	10	-	-
Goal 2	10	4	5	1
Goal 3	10	8	2	-
Goal 4	10	8	2	-
Goal 5	10	5	4	1
Goal 6	10	6	4	-
Goal 7	10	8	2	-
Goal 8	10	6	4	-
Goal 9	10	5	2	3
Goal 10	10	4	6	-
Goal 11	10	5	5	-
Goal 12	10	4	6	-
Goal 13	10	5	5	-
Goal 14	10	6	4	-
Goal 15	10	8	2	-
Goal 16	10	7	3	-
Goal 17	10	8	2	-
Total	200	125	67	8
%	100%	62.5%	33.5%	4%

Reliability Index = 97.04%, Number of Samples = 323, Number of Items = 200

Content Validity

After conducting the reliability test, the 125 retained items underwent a content validity test through Lawshe's method to enhance the construct validity of the developed instrument (Khazaee-Pool *et al.*, 2022). The numeric value of the content validity ratio is determined by Lawshe's Table, as seen in Table 3. The study has 6 experts, which indicates that the CVR of at least 0.99 is an acceptable level for an item in the instrument to be accepted, and if an item does not reach this level, it will automatically

be deleted from the final instrument. Table 7 shows the validators' tally of scores, demonstrating the number of items indicated as essential, useful but not essential, and not necessary by the 6 experts. After tabulating and calculating the content validity ratio (CVR), it was determined that 72 items out of 125 were retained, as seen in Figure 6, for they had reached the acceptable level of 0.99. Hence, 53 out of 125 items were deleted for it has CVR lower than 0.99, which is not acceptable for an item to be retained.

Table 7: Validators’ Tally

Validator	Essential	Useful, But Not Essential	Not Necessary
A (1)	95	30	0
B (2)	89	36	0
C (3)	116	9	0
D (4)	91	34	0
E (5)	92	33	0
F (6)	88	37	0

Table 8: Lawshe’s Method Result

Total Number of Items	Remarks
72	To be Retained
53	To be Removed

CONCLUSION

The main purpose of this study was to develop and validate an assessment tool for testing knowledge about sustainable development goals among students in Higher Education Institutions. Using validity and reliability tests, the developed 200-multiple-choice questions (MCQ) test underwent a difficulty index test, discrimination index test, reliability index test, and content validity test using Lawshe’s method. Following the study’s results, one hundred ninety-four (194) items passed the difficulty index and discrimination index test. However, only one hundred twenty-five (125) items passed the reliability test and were deemed reliable. The items that passed the reliability test further underwent content validity using Lawshe’s method. From this analysis, only seventy-two (72) MCQ items were retained, while fifty-three (53) items were subject to deletion. From these rigorous analyses, the final seventy-two (72) MCQ items deemed reliable and valid can be used to test students’ knowledge about sustainable development goals. Moreover, before conducting any form of assessment among students, it is necessary to look for the Table of Specifications (TOS) and the type of indicator/s wanted to measure. This should be done to ensure that the assessment serves its purpose in order to generate concrete results that can be used to support the institution’s plans and programs.

RECOMMENDATION

The researchers recommend that the seventy-two (72) retained items be used as an assessment tool to measure students’ competency toward the 17 Sustainable Development Goals (SDGs). It can be used to improve the curriculum and to evaluate how effectively the 17 SDGs are taught and integrated into different dimensions of the curriculum. Furthermore, future research may add more test items to the questionnaires, given that they should undergo other validity tests, reliability tests, and item analyses.

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Appendix 1. Items Retained (Reliable and Valid)

Item No.	Item	SDG Indicator
4	The Sustainable Development Goals are intended to apply to which countries? A. Low- and middle-income countries, not high-income countries B. Only countries where more than 50% of the population lives below the poverty line C. Only in the Asian countries D. All countries	Overview
5	What can individuals do to contribute to achieving the Sustainable Development Goals? A. Create their projects and partnerships, as well as participate in existing initiatives, to aid in the achievement of one or more of the objectives. B. Use their social positions — as educators, decision-makers, consumers, role models, and ordinary citizens to support the implementation of SDGs. C. Hold governments and the private sector to account and encourage respected civil society organizations. d. All of the above	Overview
7	What does it mean to be “sustainable”? A. The use of environmentally beneficial technologies B. Finding a balance between current and future needs. C. The usage of renewable energy sources D. A process of making something useful	Overview
9	Who are those “left behind” mentioned in the 2030 Agenda for Sustainable Development? A. The vulnerable groups. B. Those who do not have access to certain rights, goods, and services. C. The minorities D. Those who lived in third-world countries	Overview
10	In the 2030 Agenda for Sustainable Development, how are the Sustainable Development Goals (SDGs) described? A. They are objectives to be implemented in certain countries. B. They indicate a set of development models that are both required and global C. A call for action to the third world countries D. They are universal, applicable to all countries while respecting national contexts	Overview
11	Do governments have exclusive jurisdiction over the SDGs’ Voluntary National Reviews? A. No, they must incorporate other stakeholders. B. Yes, they are. C. Yes, although there may be consultations with other actors D. None of the above	Overview
12	Why is education for sustainable development relevant? A. It enhances careers prospects B. it strengthens political beliefs C. It empowers people to reflect on their actions. D. It promotes a better understanding of the environment	Overview
21	What qualities do people need to be change-makers to ensure long-term sustainability? A. Knowledge about SD B. Skills to encourage SD C. Values and attitudes that support SD D. All of the above	Overview

22	<p>What is ESD?</p> <p>a. Education for Sustainable Development b. Education for Social Diplomats c. Easy Sustainable Development d. Education for Social Development</p>	Overview
26	<p>Which of the following is true, if we only accomplished two out of three pillars of Sustainable Development?</p> <p>A. Social + Economic Sustainability = Equitable B. Social + Environmental Sustainability = Bearable C. Economic + Environmental Sustainability = Viable D. All of the above</p>	Overview
27	<p>What is sustainable development?</p> <p>A. Development that satisfies current demands without compromising future needs. B. Conserve natural resources and explore alternative energy sources while reducing pollution and environmental impact. C. It is the process of developing land and construction projects in such a way that they have a lower environmental impact by allowing them to generate energy-efficient self-sufficiency models. D. All of the above</p>	Overview
33	<p>The cause of poverty is/are _____.</p> <p>A. Increasing population\ B. Low rate of growth C. Underemployment D. All of these</p>	Goal 1
34	<p>The following are characteristics of poor people, EXCEPT?</p> <p>A. Poor health B. Hunger starvation C. Have access to basic health services D. Limited income opportunities</p>	Goal 1
36	<p>Whose well-being is most crucial in the event of a natural disaster? Who is the most affected?</p> <p>A. The rich B. The middle class C. The millennial D. The poor</p>	Goal 1
37	<p>What or who is the world's largest employer?</p> <p>A. Family Agriculture B. The mobile phone industry C. The textile Industry D. The Showbiz Industry</p>	Goal 1
38	<p>How can access to information assist people in their efforts to escape poverty?</p> <p>A. promotes economic growth and development B. It enables communication and exchanges C. allow us to receive easily accessible and user friendly information D. all of the these</p>	Goal 1
51	<p>What is the goal of SDG 3?</p> <p>A. To eradicate poverty B. To end hunger C. To promote well-being and ensure healthy lives for all D. To have an inclusive education</p>	Goal 3
52	<p>Having all dimensions of health and equally balanced is called _____.</p> <p>A. Wellness B. Physical health C. Social health D. Mental health</p>	Goal 3

54	The life skill that will help you to deal with your emotions and problems in an effective way is _____. A. Assessing your health B. Socializing C. Cleaning D. Coping	Goal 3
55	Why is it essential to attend sport in a daily basis? A. It enhances sleep quality and decreases anxiety and tension. B. It lowers the chances of developing chronic and cardiovascular diseases C. It is beneficial to everyone's physical well-being D. All of these	Goal 3
56	In developing countries what is primary cause of child mortality? A. Malnutrition B. War C. Infectious diseases D. Abortion	Goal 3
59	Which measure has proven to be effective and long lasting in the fight against malaria? A. Distribution of mosquito nets in risk areas B. Preventive administration of medication C. Genetic modification of female mosquitoes D. none of these	Goal 3
61	Several schools teach children with special needs or disabilities. Is there a right to inclusion for all children? A. No, children in poor countries are not aware of their rights B. Yes, but is not realized everywhere C. Maybe, it depends on the country D. Not only children, but all individuals in the world also have the right to inclusion	Goal 4
62	What is the goal of SDG 4? A. To eradicate poverty B. To ensure inclusive and quality education C. To maintain good health for all D. To end hunger	Goal 4
63	Education is a tremendous leveler and the most effective means of attaining social and economic mobility, inclusion, and _____. a. Discrimination b. Equality c. Inequality d. Disparity	Goal 4
69	Aim of Education for Sustainable Development? A. saving earth B. thinking and acting responsible C. international understanding D. none of these	Goal 4
70	What is the goal of allowing individuals to reflect on themselves, their environment, art, and the diversity of ways of life and expression? A. political education B. cultural education C. out of school education D. physical education	Goal 4
71	What is the goal of SDG 5? A. Eradicate poverty B. End hunger C. Maintain well-being D. Achieve gender equality	Goal 5

73	The unequal treatment between women and men. A. Gender equality B. Gender inequality C. Discrimination D. Bullying	Goal 5
81	What is the goal of SDG 6? A. Achieve gender equality B. End hunger C. Ensure sustainable management of water and sanitation D. Eradicate poverty	Goal 6
82	Is the clean and water sanitation crisis affecting the world? A. Yes B. No C. Maybe D. Both a & b	Goal 6
88	What is the primary purpose of the water taken from aquifers, lakes and rivers? A. For crop irrigation B. for making clothes C. for washing D. for drinking	Goal 6
92	What does it mean to say that something is energy efficient? A. When you don't have to worry about how much electricity you're using. B. When a gadget or structure consumes a small amount of energy to operate. C. When a bulb's light is extremely brilliant D. When we turn on the television every time	Goal 7
93	Which of the following is unable to provide clean energy? a. Waves b. Sun c. winds d. Oil, coal, nuclear	Goal 7
95	Is it possible to convert waste into energy? A. Yes B. No C. Maybe D. None of the choices	Goal 7
96	Why some energy is considered renewable? A. Because it is clean B. Because it is new C. Because it can be rapidly replenished by nature D. Because it is a finite resources	Goal 7
99	Which of the following are the negative effects of burning fossil fuels? A. They lead to pollution and environmental devastation. B. They harm local communities C. They contribute to human health complications. D. All of the above	Goal 7
100	Which of the following is not considered a renewable energy source? A. Wind B. Hydropower C. Natural gas D. Solar	Goal 7
102	Which of the following does not refer to the word "decent work"? A. Families deserve social safety and a fair wage. B. Workplace security C. Appropriate remuneration D. The right not to work	Goal 8

108	Which industry or sector of the economy has been impacted by the COVID-19 pandemic? A. The meat processing sector B. The construction sector C. The media and culture sector D. All of the above.	Goal 8
109	Which type of holiday is most in line with SDG 8? A. Skiing in Canada B. Bathing holiday on the Canary Islands C. Cycling tour in your own country D. Attending concert in Korea	Goal 8
113	What is green or eco-design exactly? A. Economy-friendly design B. Design that takes into account the environment from the beginning of a project C. The design that saves the most money and reduces costs. D. Design that follows the trend	Goal 9
115	What is the characteristic of a sustainable company? A. It operates on a logic of sustainable development B. It has been operating for a long time C. It is insolent to the environment D. It produces goods and services that last over time	Goal 9
118	What do we need to accomplish in order to fulfill SGD number? A. Start developing economies in third-world countries. B. Improve infrastructure in rural areas C. Create sustainable infrastructure D. All of the above	Goal 9
120	How would this goal affect the economies of third-world countries if achieved? A. It would provide a stable source of income while also improving infrastructure. B. It would provide the government with funds. C. It would help the environment D. It would create a fully sustainable economy	Goal 9
121	What is income inequality? A. Decreases poverty and promotes economic growth B. Poverty reduction and economic growth C. Has a negative impact on economic growth and poverty D. Evenly distribute the income throughout the population	Goal 10
131	The pressures of rapid urbanization driver is A. Economic growth B. Water supply systems C. Fresh water reserves D. Quality of life	Goal 11
133	A “resilient” town means? A. A town that changes water, gas or electricity supplier B. A town reluctant to change C. A town capable of resisting and adapting to the changes it undergoes D. A town that is vulnerable in adapting new environment	Goal 11
137	In order to design a sustainable building, what factors must be considered? A. Large garden B. Digital equipment C. Financial capability D. Ecological and regional building materials	Goal 11
138	Which of the following does NOT help cities to strengthen their resilience? A. Urban mining B. Urban gardening C. Urban expanding D. All of the above	Goal 11

141	Which of the following sectors is the most responsible for global warming through emitting greenhouse gases? A. Industry B. Construction C. Transport D. Science	Goal 12
145	How long does it take for plastics to decompose? A. 50 years B. 100 years C. 250 years D. 450 years	Goal 12
151	What is the goal of SDG 13? A. Eradicate poverty B. End hunger C. Combat climate change's impacts D. None of these	Goal 12
153	What is greenhouse effect? A. The effect of having a green house B. Painting your house color green C. When the gases trap heat in the atmosphere and block it to prevent it from escaping the planet D. None of these	Goal 13
154	What can we do to fight climate change? A. Vote for political candidate who advocates climate-related legislation and improvements B. Engage in science behind climate change C. Invest in clean energy D. All of the above	Goal 13
158	Since the start of the 21st century, how many years have been classified as the hottest on record? A. 3 years B. 5 years C. 9 years D. 16 years	Goal 13
161	What is the goal of SDG 14? A. Conserve and use the oceans and marine resources sustainably B. Eradicate poverty C. End hunger D. None of these	Goal 14
164	Which of the following is a fact about the ocean? A. The biggest source of zinc B. Contains around 200,000 species C. The biggest source of gold D. All of the above	Goal 14
165	Forests and ____ are considered lung of the Earth. A. The oceans B. The Himalayas C. The volcanoes D. The rocks	Goal 14
167	The disappearance of marine species is due to: A. Global warming B. Sea pollution C. Overfishing D. All of these	Goal 14

173	<p>What is deforestation?</p> <p>A. Protecting the plants and trees</p> <p>B. Planting trees</p> <p>C. Cutting a wide area of trees</p> <p>D. All of the above</p>	Goal 15
176	<p>Which of the following is the role of forests in combating climate change?</p> <p>A. trees produce oxygen</p> <p>B. they provide spaces to walk in</p> <p>C. people need timber for construction</p> <p>D. none of these</p>	Goal 15
177	<p>Biodiversity is _____.</p> <p>A. all plants, flowers, and trees in our forests</p> <p>B. all living things on Earth</p> <p>C. organic products in shops</p> <p>D. all of these</p>	Goal 15
181	<p>What is the goal of SDG 16?</p> <p>a. Promote peaceful societies and inclusive institutions</p> <p>b. Eradicate poverty</p> <p>c. End hunger</p> <p>d. All of the above</p>	Goal 16
182	<p>What often causes violence?</p> <p>A. Peace</p> <p>B. Justice</p> <p>C. Terrorism</p> <p>D. All of the above</p>	Goal 16
183	<p>For making and reforming law, what part of government is responsible?</p> <p>A. Executive</p> <p>B. Legislative</p> <p>C. Judiciary</p> <p>D. All of the above</p>	Goal 16
184	<p>When is the World Peace Day?</p> <p>A. December 30</p> <p>B. February 14</p> <p>C. January 1</p> <p>D. September 21</p>	Goal 16
186	<p>A democracy is a country governed by _____.</p> <p>A. A president for life</p> <p>B. A rich and educated group of people</p> <p>C. Representatives elected by inhabitants</p> <p>D. None of these</p>	Goal 16
188	<p>What does fair trade offers?</p> <p>A. Fair prices and decent salary</p> <p>B. Right to sell their produce abroad</p> <p>C. Same fixed prices everywhere in the world</p> <p>D. High prices</p>	Goal 16
189	<p>What is a tax haven?</p> <p>A. A small island</p> <p>B. A public garden</p> <p>C. A place where people pay little/no taxes</p> <p>D. A small restaurant</p>	Goal 16
194	<p>What nations is the SGD supposed to affect?</p> <p>A. Europe</p> <p>B. Europe</p> <p>C. Africa</p> <p>D. Whole world</p>	Goal 17

196	Who can work to achieve the SDGs? A. Governments B. Non-governmental organizations C. Companies D. All of these	Goal 17
198	Of the following proposals, which could help finance sustainable development and poverty reduction? a. Fighting corruption b. Fighting the appropriation of lands and natural resources c. Fighting tax evasion in tax havens d. All of these	Goal 17