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DEVELOPING AND VALIDATING A SUSTAINABILITY LITERACY SCALE – A MULTI-DIMENSIONAL INSTRUMENT

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Abstract- An assessment tool in the area of sustainability literacy stands in a need of a strategic methodology for an exhaustive and logical framework encompassing both theoretical and experiential sub-structure[1]. This study describes the development of a Sustainability Literacy Scale to assess the sustainability literacy of the Secondary School Students in India. The scale is grounded on strong theoretical and conceptual foundations of sustainability literacy rooted in Triple Bottom Line Theory [2]and KAP Model [3]. The instrument focuses upon an integrated span of components encompassing Knowledge, Mindset and Performance [4,2] which is compendious of the economic, social, environmental and cultural aspects [5, 6]. A total of 64 statements are framed giving due importance to all the three components – knowledge, mindset and performance, each integrated with the sustainability domains – Environmental, Social, Economic and cultural. The component knowledge is assessed through a test and the components mindset and performance are assessed through a five-point scale- making the developed tool for assessing sustainability literacy a 'Multi-dimensional Sustainability Literacy Instrument'. After enduring expert validation ensuring face and content validity, the scale has been subjected to a pilot study among 563 secondary school students. Data collection is being done from different zones of the state as southern, northern and central parts which helps in including data from various geographical areas (hilly, costal and plain). This is to ensure an incorporated data from different cultural, social, environmental and economic background which are the key factors of the Sustainability Literacy Scale. Factor Analysis is done to explore and confirm the dimensionality of the scale (with the KMO value of 0.894), while Item Analysis has been executed for construct validation ensuring item effectiveness and refinement. For the test items, validation is been done through ensuring the accepted values of Discriminative Power and Difficulty Index. The final instrument after the validation consists of 56 statements retained. The internal consistency of the developed scale is established with Cronbach's Alpha with a value of 0.814 and the test KR-20 value of 0.761. The outcome confirms The Sustainability Literacy Scale as a significant contribution in the field of sustainability, which can effectively assess the sustainability literacy of individuals considering the global perspective as environmental, social, economic and cultural aspects.

Index Terms- Sustainability literacy, Scale development, Assessment tool.

I. INTRODUCTION

The modern world faces lots of intertwined challenges like climate change, losing biodiversity, environmental damage, social inequalities, economic inequalities, and cultural shifts. These problems make people worry about the future sustainability of our societies. To handle these complex issues, we need to be prepared enough to understand and tackle them. As an initiative does the United Nations Sustainable Development Goals emphasize the need for everyone to have the knowledge, skills, values and behaviour to contribute in making things better [7]. Here, in this context, as a key-driver, Education plays a major role to help achieve sustainability goals and create responsible citizens [6].

Sustainability isn't just about protecting the environment anymore, but a broader idea that includes social well-being, economic success, and preserving culture. John Elkington's Triple Bottom Line, introduced in 1997, significantly noted this understanding by stressing how inter-connected is the environmental, social, and economic aspects, which need to be considered for sustainable development. More recently, experts have highlighted that culture is a critical dimension in helping shape values, identities, traditions, and behaviors, ultimately guiding sustainable living and related decision-making process [8,9]. So, to fully attain sustainability, a comprehensive understanding on the environmental, social, economic, and cultural aspects is needed along with its connective and influencing nature.

As sustainability gets more complex, sustainability literacy is becoming due important in education. This literacy involves knowledge, understanding, and skills that help people make smart choices about the environment. According to Stibbe and Luna [10], sustainability literacy is beyond just being aware, but to be able to think critically and act. Other than the cognitive aspects, it emphasis upon the positive attitude toward eco-friendly living. UNESCO [6] emphasises sustainability education need to foster cognitive, socio-emotional and behvioural outcomes making learners into active contributors in building sustainable communities.

As emphasized increasingly, in various field of research, the nature of sustainability literacy is being complex. Décamps et al. say it includes values, attitudes, behaviors and competencies needed for sustainable development beyond facts [11]. Karimi et al. argues that multiple aspects such as understanding, perceptions and actions should be considered for assessing sustainability literacy [4]. These findings indicate that the sustainability literacy assessment should go beyond knowledge testing to include an affective and behavioral perspective. The Knowledge-Attitude-Practice (KAP) Model offers an integrated framework for the muti-dimensional facets of literacy.

It propose knowledge as a foundational structure that influences attitude, which subsequently shape behaviors and actions [3]. Extensively applied in the educational context, KAP model, enhances the assessment in an integrated manner. When it comes to sustainability literacy, the KAP model exhibit that knowing about sustainability, having the right mindset, and performing sustainable actions are all interconnected and inclusively forms an individual's overall sustainability literacy.

Despite the increasing importance of sustainability literacy, comprehensive assessment instruments remain limited. Most of the existing tools concentrates upon specific domains, such as the environmental awareness, but neglecting the cultural sustainability and interconnectedness of its components. Besides, most assessment instruments focus upon higher education level, leaving a gap for younger students in high school. Since adolescents are at a key age for forming values and habits related to sustainability, the need for a solid instrument to measure their literacy across all those dimensions of sustainability.

This study addresses this gap by developing and validating a Sustainability Literacy Scale based on the Triple Bottom Line Theory and the Knowledge–Attitude–Practice Model [2,3]. The proposed instrument conceptualises sustainability literacy in three component bases as Knowledge, Mindset, and Performance integrating the four areas of sustainability - Environmental, Social, Economic, and Cultural.

By connecting the learners' existing knowledge, the attitude they hold, and their participation methods, it is hoped that the study will create an effective and reliable approach for assessing sustainability literacy among secondary school learners. The objective of the study is to design and validate a comprehensive Sustainability Literacy Scale with an integrated dimensions of knowledge, mindset, and practice regarding sustainability.

II. THEORETICAL OVERVIEW AND RELATED REVIEW

A. Sustainability literacy

Sustainability literacy is an important component of Education for Sustainable Development (ESD) that aims at empowering students to make responsible decisions and take action for social justice, economic viability and environmental integrity [6]. Thus, sustainability literacy is not only cognitive, but also includes emotional and behavioral components that impact sustainable decision-making. Sustainability literacy refers to a broad set of sustainability-related knowledge, attitudes, abilities, and actions that promote sustainable living and responsible citizenship[11].

Sustainability literacy has increasingly been shown in recent research to be multifaceted in character. Sustainability literate individuals are expected to understand the concepts of sustainability and demonstrate positive attitudes and behaviors to promote sustainable development [12]. Sustainability literacy can thus be seen as a dynamic construct that includes behavioral engagement, attitudinal commitment, and cognitive knowledge. This perspective is the basis for the present study and defines sustainability literacy in terms of the interrelated dimensions of Knowledge, Mindset and Performance.

B. Triple Bottom Theory

The theoretical background of sustainability evolved from being solely an environmental issue into an intricate process embracing environmental, social, and economic considerations. This is where the importance of Triple Bottom Line Theory becomes apparent. The Triple Bottom Line Theory claims that sustainability occurs only when there is consideration of all three issues simultaneously, namely, environmental protection, social justice, and economic development.

The environment perspective focuses on resource utilization and conservation, preservation of biodiversity, and ecological integrity. Social perspective concentrates on human wellbeing, equality, inclusiveness, social development, and social responsibility. Economic perspective addresses sustainable economic development and efficiency of resource utilization and economic stability [2]. Overall, the combination of the perspectives allows for an integral picture of sustainability as an integral process and not separate aspects.

It is a well-accepted theory in sustainability education and assessment, as it provides a holistic perception of sustainable development [5]. Thus, for the purposes of this study, the concept of Triple Bottom Line is utilized as a context base in evaluating sustainability literacy. The fundamental domains of sustainability integrated into the design of the instrument are the environmental, social, and economic perspectives.

C. Cultural Dimension of Sustainability

While environment, society, and economy are regarded as the primary pillars of sustainability, current discourse on sustainability has identified culture as an important factor for sustainable development. According to Hawkes [8], culture has been recognized as the fourth pillar of sustainability because of its role in determining the values, identities, heritage, and social interactions of humans. Cultural sustainability is about maintaining and advancing cultural heritage and traditions among different generations.

Culture plays an important role in determining how people perceive issues related to sustainability and act towards them, according to UNESCO [9]. Often, cultural values determine how resources are used and how the community interacts within the environment and behaves economically. Therefore, any sustainable development initiative not considering the culture can pose serious challenges in implementation and effectiveness.

Cultural sustainability will expand the scope of sustainability literacy from conventional aspects and make it easier to assess sustainability literacy based on contextual perspectives. Considering India's vast diversity and the role of culture in environmental, social, and economic issues, cultural sustainability has been included as an important component in the Sustainability Literacy Scale developed in this study.

Fig.1
Contextual Architecture of the Proposed Scale

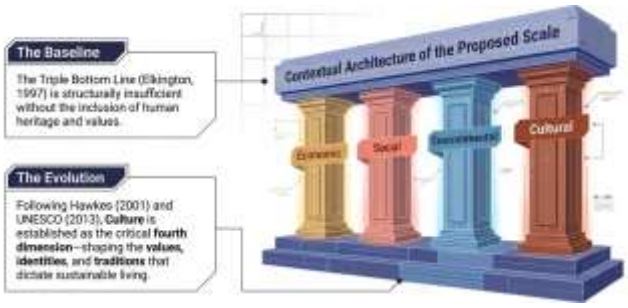

Figure created by the researcher using Google Notebook LM) based on the conceptual framework basement developed for the sustainability literacy scale

D. KAP Model

The underlying psychological construct of the current study is the KAP (Knowledge-Attitude-Practice) Model. According to the findings of the research in the field of behavior and education, the KAP model assumes that knowledge causes an attitude change which subsequently impacts the practice and behaviors of individuals [13]. This theoretical perspective states that people have knowledgeable attitudes based on the information they have acquired and that these attitudes determine their behavioral responses.

Knowledge is the information and understanding a person has regarding a specific phenomenon. Attitude consists of the beliefs, perception, values and dispositions that shape the individual's response to a phenomenon. The practice is defined as the actions taken by a person based on his/her knowledge and attitude.

The KAP framework has been extensively applied to educational, environmental and public health studies to measure the cognitive, affective and behavioral aspects of learning. The KAP model represents a comprehensive framework in the study of sustainability education through examining the impact of sustainability knowledge on people's perspectives and sustainable behaviors. The study uses the KAP theory framework to examine the concept of sustainability literacy as consisting of three components.

E. Review of Existing Sustainability literacy Tools

Academics have attempted to measure sustainability literacy using a variety of instruments and frameworks. One of the earliest in-depth attempts was made by Parkin et al. [12], who defined sustainability literacy as an essential competence of students in higher education. Their framework was based on awareness, understanding and engagement on sustainability issues.

Sulitest (Sustainability Literacy Test) developed by Décamps et al. [11] is one of the most prominent tools for evaluating sustainability literacy worldwide. The tool mainly measures knowledge on sustainability in the environmental, social and economic areas . This measure is very valuable, primarily because it addresses the cognitive aspects of sustainability.

Zwickle et al. [14] presented the framework to assess sustainability literacy, which is a combination of sustainability knowledge and environmental awareness . Their research highlighted the importance of assessing students' understanding of sustainability, but paid little

attention to the behavioral and attitudinal dimensions. Other systems for evaluating sustainability have concentrated mainly on environmental literacy, ecological awareness, or sustainable behaviour, often ignoring the relationship between knowledge, attitudes and behaviour. A survey of the current literature shows two major shortcomings. Many sustainable literacy assessments are knowledge-heavy and pay little attention to attitudinal and behavioral dimensions. In sustainability discussions, the concept of cultural sustainability is increasingly recognised, but still under-represented. Moreover, there are very few approved tools for sustainability literacy for secondary school students, especially in the Indian education system. The identified deficiencies justify the development of the present Sustainability Literacy Scale that includes knowledge, thinking, and performance dimensions across environmental, social, economic, and cultural sustainability domains.

F. Conceptual Framework Evolution

The Sustainability Literacy Scale developed in this study is based on the integration of the Triple Bottom Line Theory and the Knowledge–Attitude–Practice Model. The Triple Bottom Line framework defines the contextual dimensions of sustainability and the KAP model serves as the psychological framework to assess sustainability literacy. The conceptual framework suggests that sustainability literacy is an outcome of the interaction between cognitive understanding, attitudinal orientation, and behavioral participation in sustainability contexts. The dimensions of environmental, social, economic and cultural sustainability provide the contextual areas for the expression of sustainability literacy. Sustainability literacy is a multidimensional construct comprising three essential dimensions: Sustainability Knowledge, Sustainability Mindset, and Sustainability Performance. The four dimensions include elements of environmental, social, economic and cultural sustainability thus offering a comprehensive assessment of sustainability literacy.

Note: Researcher's own construction. Visual rendering created using Google Notebook LM based on the Triple Bottom Line Theory, UNESCO's Cultural Dimension of Sustainbility and the KAP Model.

Fig. 2
Theoretical Framework for the Sustainability Literacy Scale

III. METHODOLOGY

A. Research Design

The present study used a systematic process of instrument development and validation in qualitative and quantitative methods. The development of the Sustainability Literacy Scale followed the scale development paradigm suggested by Boateng et al. [15], which includes three essential stages: Item Development, Scale Development, and Scale Evaluation. These phases consist of systematic approaches such as domain selection, item generation, expert validation, pilot testing, item refinement, dimensionality testing, reliability testing, and validity testing. The theoretical framework of the study was developed by integrating the Triple Bottom Line Theory, the concept of Cultural Sustainability and Knowledge-Attitude-Practice (KAP) Model. The elements of sustainability (Environmental, Social, Economic & Cultural) provided the contextual framework, while the structural dimensions of the instrument were constructed from the components Knowledge, Mindset & Performance. The Sustainability Literacy Scale was then piloted with 563 secondary school students from different geographical locations of Kerala including the northern, central and south zones. Students from coastal, hilly and plain areas participated in the evaluation. This ensured representation of students from diverse environmental, social, economic and cultural backgrounds and thus added to the comprehensiveness of the evaluation process.

B. Item Generation

Item generation for the Sustainability Literacy Scale was based on the reviews across sustainability literacy, Education for Sustainable Development, Triple Bottom Line Theory, and the Knowledge-Attitude-Practice Model. From the reviews, the researcher came into a conclusion, sustainability literacy as having three integrated components as Sustainability Knowledge, Sustainability Mindset, and Sustainability Performance.

As formal, the researcher developed an instrument with 64 questions in total. The dimension Sustainability Knowledge had 20 objective questions to assess the cognitive efficiency of learners in sustainability-related aspects in four different areas – environmental, social, economic, and cultural. Each

question checked whether the students knew the facts, got the concepts, and could apply that knowledge in real life situations.

The Sustainability Mindset which consisted of 20 statements on a five-point scale, ranging from strongly agree to strongly disagree, aims at checking what students thought and felt about sustainability – their beliefs, attitudes, and values. The items covered both positive and negative attitudes about environmental, social, economics, and cultural domains.

Sustainability Performance is comprised of 24 statements on that same five-point scale system. These were meant to see how students put their beliefs into action. These items were generated giving due importance to each of the domains of sustainability – environmental, social, economic and cultural.

C. Test of Dimensionality

Factor analytic procedures were used to examine the dimensionality of the Sustainability Literacy Scale. The Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy was used to assess sampling adequacy before factor analysis. The KMO statistic was calculated to test the suitability of the collected data for factor analysis. The component Sustainability Knowledge was analyzed using Tetrachoric Factor Analysis. Given the dichotomous scoring of knowledge items, tetrachoric correlations were deemed more appropriate for investigating the latent factor structure and dimensionality of the component. Exploratory Factor Analysis (EFA) was conducted for the components of the Sustainability Mindset and Sustainability Performance in order to explore the underlying structure of the items and examine the contribution of each item to the respective dimension of sustainability literacy. Items that met the acceptable factor loading criterion were retained, whereas those that did not meet the criterion were considered for elimination.

D. Test of Validity and Reliability

The component of Sustainability Knowledge was validated through Difficulty Index (DI) and Discriminative Power (DP) analysis. The Difficulty Index was calculated to find the proportion of respondents who answered each item correctly and thus, to find the difficulty level of individual items. Discriminative Power was calculated to determine the capacity of each item to discriminate between students with high and low levels of sustainability knowledge. The final instrument retained items that met the accepted criteria for both the Difficulty Index and Discrimination Power. Analysis of the components Sustainability Mindset and Sustainability Performance were carried out using the extreme group method. The total scores of respondents were used to divide the upper and lower groups. Discriminative power of each item was determined by independent Sample t-tests. Items with the t-values above critical value of 1.96 at 0.05 level [16] were kept as indicators of Sustainability Performance and Sustainability Mindset.

Two measures of internal consistency established the reliability of the Sustainability Literacy Scale. Kuder-Richardson Formula 20 (KR-20) was used to analyze the internal consistency of the knowledge items as a dichotomously scored test for the Sustainability Knowledge component.

Cronbach's Alpha analysis was performed on the whole of the Sustainability Literacy Scale in order to establish the internal consistency of the instrument as a whole. Reliability coefficients above the accepted criterion were considered as evidence of satisfactory reliability and consistency of the developed scale.

IV. RESULT

The Sustainability Literacy Scale developed by the researchers was subjected to a number of statistical validation procedures, such as Difficulty Index and Discrimination Power analysis for the Sustainability Knowledge component, Exploratory Factor Analysis and Item Analysis for the Sustainability Mindset and Sustainability Performance components, and reliability testing using KR-20 and Cronbach's Alpha. The results of these analyses are reported in next section.

A. Validation of the Instrument

The Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy was used to assess the sample's adequacy prior to dimensionality testing. According to Kaiser [17], the obtained KMO value of 0.894 indicated a commendable degree of sampling adequacy. The outcome supports the multidimensional structure of the Sustainability Literacy Scale and validates that the data obtained are appropriate for factor analysis.

Table I

KMO value of the components Mindset and Performance

Statistical Technique	Value
Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy	0.894

The intercorrelations between the items are enough for factor analysis if the KMO value is higher than the suggested threshold of 0.80 [17].

B. Validation of Sustainability Mindset and Sustainability Performance

Exploratory factor analysis and item analysis were used to the twenty statements of the component Sustainability Mindset and 24 items of Sustainability Performance.

Table II

Factor Loading Range of the items assessing Sustainability Mindset and Sustainability Performance

Component	No. of Items	Measure	Value
Sustainability Mindset	20	Minimum Factor Loading	0.302
		Maximum Factor Loading	0.716
Sustainability Performance	24	Minimum Factor Loading	0.258
		Maximum Factor Loading	0.596

The Sustainability Mindset component's factor loading values varied between 0.302 and 0.716. All the items are retained since it shows sufficient representation of the attitude construct, surpassing the minimum loading threshold of 0.30 suggested by Hair et al. [18]. The Sustainability Performance component's factor loading values varied from 0.258 to 0.596. Most of the items contributed sufficiently to the behavioral aspect of sustainability literacy and 21 items that surpassed the minimum retention threshold are retained. The obtained factor loadings provide a satisfactory representation of sustainability-related practices and support the multidimensional structure of the Sustainability Literacy Scale.

C. Item analysis

Using the upper and lower group technique, the Independent Sample t-test was used to assess the items of Sustainability Mindset and Sustainability Performance for its capacity for discrimination. All items of Sustainability Mindset achieved statistical significance at the 0.05 level, with t-values ranging from 6.225 to 14.522. Every items of Sustainability Performance were statistically significant at the 0.05 level, with t-values ranging from 3.360 to 9.745. The results show that the performance items successfully distinguish between students who demonstrate different degrees of sustainability-related behaviors. Gravetter and Wallnau [16] state that items with substantial t-values (above 1.96 at 0.05 level) have sufficient discriminative power and enhance construct validity.

D. Validation of the Sustainability Knowledge

Difficulty Index (DI), Discriminative Power (DP), and Tetrachoric Factor Analysis were used to validate the twenty objective exam items that make up the component Sustainability Knowledge.

E. Discriminative Power and the Difficulty Index

The knowledge items had Difficulty Index values between 0.439 and 0.739 and Discriminative Power values between 1.245 and 1.830. The results show that every item had a satisfactory level of difficulty and discriminative ability. Items with intermediate difficulty and sufficient discrimination efficiently contribute to test quality, according to [19]. As a result, the instrument kept all twenty of the knowledge items.

Table III
Range of Discriminative Power and Difficulty Index Values

Measure	values
Discriminative Power	1.245 – 1.830
Difficulty Index	0.439 – 0.739
Total No. of items	20
Items Retained	20

The results show that the knowledge items were suitable for inclusion in the final scale and successfully differentiated students with different levels of sustainability literacy.

F. Tetrachoric Factors Analysis

Tetrachoric Factor Analysis was used to investigate the dimensional structure of the Sustainability Knowledge component since its items were dichotomously scored. The factor loadings above the acceptable threshold of 0.30, ranging from 0.421 to 0.591 are retained [20]. The items that filed to satisfy the acceptable factor loading value were omitted. The results show that the knowledge component of sustainability literacy is sufficiently represented by the retained items.

Table IV
Tetrachoric factor loading range of Sustainability Knowledge scores

Measure	Value
Minimum Factor Loading	0.421
Maximum Factor Loading	0.591
No. of Items Retained	16

G. Conclusive Framework of the Sustainability Literacy Scale

The combined outcomes of the Difficulty Index,

Discrimination Power, Tetrachoric Factor Analysis, Exploratory Factor Analysis, and Item Analysis culminated in the preservation of 61 questions in the final Sustainability Literacy Scale. The scale comprises three dimensions- Sustainability Knowledge, Sustainability Mindset, and Sustainability Performance, which encompass environmental, social, economic, and cultural sustainability domains.

Table V
Final structure of Sustainability Literacy Scale

Component	No. of Items
Sustainability Knowledge	16
Sustainability Mindset	20
Sustainability Performance	24
Total No. of Items	56

H. Analysis of Reliability

The internal consistency of the final draft of Sustainability Literacy Scale was determined using KR-20 and Cronbach's Alpha.

Table VI
Reliability Coefficients of Sustainability Literacy Scale

Reliability Measure	Value
KR -20	0.761
Cronbach's Alpha	0.814

The Sustainability Knowledge dimension was rated with a KR-20 score of 0.761, indicating reliable data. The Cronbach's Alpha value for the Sustainability Literacy scale was 0.814, indicating higher than the acceptable level of 0.70 [21]. These findings confirm that the designed scale is reliable and internally consistent.

V. DISCUSSION

The present research has helped develop a multi-dimensional Sustainability Literacy Scale of 56 questions across three dimensions – Sustainability Knowledge, Sustainability Mindset, and Sustainability Performance. Several validation measures have been employed to validate the instrument including difficulty index and discrimination power, Tetrachoric Factor Analysis, Exploratory Factor Analysis, item analysis, and reliability test. The outcomes of the statistical measures indicate that the tool is valid and reliable enough to measure the sustainability literacy of the secondary school students.

In the current research, the concept of sustainability literacy is viewed as a multifaceted one, including knowledge, mindset, and performance, which reflects existing notions of sustainability education. According to UNESCO, sustainable achievements involve both cognitive and socio-emotional and behavioral factors [6]. The definition of sustainability literacy by Stibbe and Luna is described as a composite of information, values, and behavior that allows individuals to contribute substantially to sustainable development [10]. In other words, the current study adheres to these approaches and takes into account cognitive, socio-emotional, and behavioral factors within the framework of assessment.

The quality of psychometric properties of the created scale (Sustainability Knowledge) was good in terms of the following indicators: Difficulty Index, Discrimination Power, and Tetrachoric Factor Analysis. The values of difficulty and discrimination obtained were within an acceptable range, indicating that the knowledge items could effectively discriminate students with different levels of understanding of sustainability. The tetrachoric factor loadings also provide evidence for the appropriateness of the retained items to measure knowledge on sustainability. These results are consistent with the results of Zwickle et al. who emphasized the importance of knowledge assessment as a core component of sustainability literacy measurement [14]. However, existing assessments of sustainability literacy often focus on knowledge only, whereas the current study extends the assessment to attitudinal and behavioural dimensions. Sustainability Mindset component was a major dimension of Sustainability Literacy Scale. The factor analytic results and the item analysis statistics indicate that the mindset items are a good representation of students' attitudes, beliefs and value orientations towards sustainability. This finding is consistent with the Knowledge – Attitude – Practice (KAP) model, where attitudes are considered as an important mediator between knowledge and behavioural outcomes [3]. As is well known, the sustainability mindset recognizes that sustainability literacy is not only about understanding sustainability issues but also about developing positive dispositions towards sustainable living . Similar findings have been reported in studies of sustainability education that emphasise the role of values and attitudes in promoting sustainable behaviour [6].

The Sustainability Performance component adds to the multidimensionality of the developed instrument. Factor loadings and discriminant abilities of the retained performance items were acceptable, indicating their utility in evaluating sustainability practices and behavior. Including performance as an additional dimension reflects the increasing awareness that sustainability literacy should be exhibited in actions and sound judgment rather than theory alone. As Décamps et al. pointed out when creating the framework for Sulitest, there was a need to measure sustainability competencies and not knowledge alone [11]. We take this idea further by including behavioral indicators in our discussion.

This current study contributes greatly to the synthesis of sustainability domains under the Triple Bottom Line Theory with the Knowledge–Attitude–Practice model. Traditionally, the approach of Triple Bottom Line has highlighted environmental, social, and economic sustainability as interconnected elements of sustainable development. Within the current study, this concept was expanded through the incorporation of cultural sustainability as another aspect. This was done based on the identification of culture as the fourth pillar of sustainability made by Hawkes and the influence of culture in promoting sustainable development according to UNESCO [8, 9]. The Sustainability Literacy Scale can be used to measure sustainability literacy in a

broader sense since the scale covers the aspects of environmental, social, economic, and cultural sustainability.

VI. CONCLUSION

The Sustainability Literacy Scale proves to be an effective tool that can help educators, researchers, curriculum designers, and policy makers evaluate the efficacy of sustainability education initiatives. It will allow them to determine both the strengths and weaknesses of their target group and help them make the necessary decisions. The development of the instrument is also very valuable as it paves the way for further research into the topic of sustainability literacy.

This study proves that the Sustainability Literacy Scale can be considered a valid and reliable instrument to measure sustainability literacy as a whole. The instrument developed within the framework of this study constitutes a significant step towards advancing sustainability education because it successfully combines theory and practice. It should be noted that these two aspects were the main focus of all the recent efforts aimed at shaping a sustainability-conscious citizenry.

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