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Exploratory Factor Analysis of Environmental Awareness Assessment based on Local Wisdom by Using Summated Rating and Likert Scale

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Abstract

There is no standardized instrument to measure environmental awareness based on local wisdom. Therefore, the purpose of this study is to conduct an Exploratory factor analysis (EFA) on an environmental awareness assessment based on local wisdom. This study has a non-experimental design with the ex-post facto type. The Likert scale environmental awareness is transformed into a summated rating scale. Furthermore, the initial construct validation was carried out using the EFA test. Based on the results of the EFA, it was found that the EA which previously consisted of 18 indicators extracted based on eigen values and fixed factors became 8 factors with 14 indicators.

Keywords: Exploratory Factor Analysis, Environmental Awareness Based on Local Wisdom, Assessment

INTRODUCTION

Indonesia has a lot of local wisdom, moreover Indonesia has 34 provinces that have a variety of ethnic groups. Each province has several local wisdom traditions. Some of them are the ethnobotanical community of Saham Village in West Kalimantan (Kasus et al., 2015), ethnography of the people of Dompu District in West Nusa Tenggara (Nurrahmah et al., 2016), local wisdom in Karimunjawa (Pujiastuti & Sudarmin, 2013), ethnopharmacology and the drug use of the Dayak Tunjung community in East Kalimantan (Setyowati, 2010), ethnobotany carried out by the Moronene community in Northeast Sulawesi (Setiawan & Qiptiyah, 2014), a study of Ammatoa Kajang in South Sulawesi in caring for its environment was carried out (Surtikanti et al., 2017), and so on.

There have been many studies conducted regarding the development of teaching materials or teaching materials based on local wisdom to increase awareness of the environment such as research conducted by (Ardan, 2016). In addition, there have also been those who have developed learning models based on local wisdom as researched by (Ningrum et al., 2018), and implementation of the concept of environmental preservation based on local wisdom of the Baduy community in the learning process (Saefullah et al., 2017). However, there is still limited research that examines measuring tools for environmental awareness based on local wisdom in preserving the environment.

One way to protect the environment is through education (Nuangchalerm et al., 2022 ;Atik et al., 2022). Boca & Saraçli, (2019) stated that environmental education, which is based on a sustainable environment, focuses on knowledge, attitudes (Owojori et al., 2022), and skills (van de Wetering et al., 2022). Further, environmental knowledge refers to erudition and awareness about the problems and their solutions. Environmental awareness is defined as the condition of someone who has knowledge and is aware of the environment in which people live and tends to influence the development of society with environmentally concerned behavior (Susongko & Afrizal, 2018). According to Du et al. (2018), environmental awareness consists of three components: behavior, perception, and attitude and from (Poškus, 2022) environmental awareness consists of three components: knowledge, attitude and behavior. Environmental

management and sustainability are also related to the local wisdom of the local community (Rizal et al., 2022). Local wisdom is a way of life, thinking and acting in a natural balance, and sustainable development (Nuangchalerm & el Islami, 2018; El Islami, Nuangchalerm, & Sjaifuddin 2018; Parmin, Nuangchalerm, & El Islami, 2019; Parmin et al 2020; El Islami & Nuangchalerm, 2020). Promoting environmental awareness requires a deep understanding of environmental issues, which is an effective way to improve environmental behavior and green performance (Darvishmotevali & Altinay, 2022). Being environmentally aware means understanding how our behavior impacts the environment and committing to changing our activities to protect the planet.

Based on research conducted by Altin et al., (2014), Ardan, (2016), Mónus, (2018), (Susilawati et al., 2021) and (Widyatmoko et al., 2022) EA is measured using a Likert which is indeed It is commonly used to measure attitude. So there is option 5 assuming the attitudes of SS and S are categorized as good, R is neutral and TS and STS are categorized as bad attitudes. However, there is a bias in the Likert scale (Pimentel, 2019) so a scaling process is needed, one of which is the summated rating scale. In addition, it was also found that the measuring instrument used did not have standardized process information (Ardan, 2016). Actually Khoiri et al., (2021) have measured environmental awareness but have not tested it with Exploratory factor analysis (EFA), directly using Confirmatory factor Analysis (CFA).

Exploratory factor analysis (EFA) is a multivariate statistical method that has become a fundamental tool in the development and validation of psychological theories and measurements (Watkins, 2018). EFA is very useful in investigating complex concepts that are not easy to measure (Alavi et al., 2020). Therefore the development and validation of an environmental awareness scale based on local wisdom is very important because it is part of research in the fields of health, social and behavioral sciences (Boateng et al., 2018) and (Izquierdo et al., 2014) especially environmental awareness based local wisdom is a new measurement tool. Therefore it is necessary to compare whether the Likert scale or the summated rating scale is better and then continue the EFA test on environmental awareness assessments based on local wisdom.

METHOD

This research is ex post facto non-experimental research, that is, the researcher identifies variables and looks for relationships between these variables but does not change these variables. Ex post facto research is research conducted to examine events that have occurred and then trace back to find out the factors that can cause these events. Ex post facto research aims to trace back, if possible, what are the factors that cause something to happen (Danuri & Maisaroh, 2019).

Participants

The survey was conducted at a high school in Selomerto, Wonosobo, Central Java, Indonesia with 186 students. There were 131 respondents who filled out the survey. This sample size fulfilled the minimum sample, namely the Slovin formula. The minimum participants based on Slovin formula are 126. (Khoiri et al., 2021).

Environmental Awareness Likert Scale

The data used is data obtained in real terms with the secondary data category which can be downloaded via the Figshare Dataset page. 2021. (Khoiri, 2021) and was uploaded by the contributor. The process of collecting questionnaire data was adjusted to a 5-point Likert scale, namely: strongly agree, 5; agree, 4; neutral, 3; disagree, 2; and strongly disagree, 1. The instrument used for data collection consisted of 18 questions about environmental problems faced by the community. The questionnaire was filled in directly by students via the Google Form link (https://bit.ly/2MXA4HY) during a 2-month research period, from April 8 to June 8 2020.

The student's EA profile is determined based on the six EA indicators developed in the instrument; each indicator has three sub-indicators. EA assumptions are based on the conscious mind to regulate reason, which is part of the attitude that naturally shapes social problems.

Data Analysis

Data from the Likert scale is then carried out by a scaling process using the summated rating scale. The data was then analyzed using the SPSS program to find out the exploratory factor results (EFA) (Watkins, 2018) which were formed from the Likert scale and after the summated rating scale was carried out. Exploratory factor analysis is a multivariate statistical technique used to extract indicators from environmental awareness instruments (Tucker & MacCallum, 1997). EFA steps using SPSS In the SPSS dialog box, (1) Analyze, (2) Dimension Reduction Factor, (3) Factor Analysis includes (a) descriptives, (b) extraction (if the

number of factors is clear, the number can be selected fixed factor, if you haven't used eigen value 1.0; (c) rotation; (d) factor score and options; (e) options (Gie Yong & Pearce, 2013). In this study the extraction stage was carried out twice, namely using eigenvalue and fixed factor so that it can be known which is the best result from the data analysis process (Beavers et al., 2013).

RESULTS AND DISCUSSION

The initial EFA tests were the KMO and Bartlet tests as shown in Table 1 for the Likert scale and the summated rating scale. Table 1 shows that the KMO > 0.5 with a significance price of <0.05 so that it meets the requirements for the EFA test (Beavers et al., 2013).

Then an extraction test was carried out using the eigenvalue both on the Likert scale and the summated rating to get 8 factors. However, the summated rating cannot produce the results.

Meanwhile, the results for the Likert scale are presented in Table 2. The next process is to carry out the extraction process using a fixed factor using either a Likert scale or a summated rating. The results are as follows as shown in Tables 3 and 4.

Based on Tables 3, 4, and 5 the results are compared to determine which is the best result in EFA.. Thetable 5 is a comparison of the results of factor extraction to determine the number of aspects that are most suitable for EFA.

Table 1. KMO and Bartlett's Test

Types of test		Likert scale	Summated rating scale
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500	.502
Bartlett's Test of Sphericity	Approx. Chi-Square	211.574	217.545
	df	153	153
	Sig.	.001	.000

Table 2. Results for the Likert Scale

	Factor							
	1	2	3	4	5	6	7	8
EA1B	.996							
EA1A	.390							
EA3A		.985						
EA1C								
EA4B			.873					
EA2C				.658				
EA3B				.307				
EA4A								
EA6A					.610			
EA5C					-.465			
EA6B						.669		
EA6C								
EA2A							.586	
A2B							.459	
EA5A								
EA5B				.345				.427
EA3C								.395
EA4C								.359

Table 3. Rotated Factor Matrix[a] Skala Likert Fixed Factor

	Factor					
	1	2	3	4	5	6
EA1B	.886					
EA1A	.475					
EA2B		.997				
EA2C			.671			
EA2A			.434			
EA3C			-.347			
EA5A						
EA1C				.468		
EA3A				.413		
EA5B						
EA5C					.612	
EA6A				.356	-.394	
EA6C						
EA6B						
EA3B				-.310		.482
EA4C						.385
EA4A						
EA4B						

Tabel 4. Rotated Factor Matrix[a] summated rating

	Factor					
	1	2	3	4	5	6
EA2A	.959					
EA2B						
EA5B		.979				
EA4C						
EA5C			.653			
EA6A			-.500			
EA6B			.308			
EA6C						
EA1B				.706		
EA1A				.518		
EA3B					.612	
EA2C					.484	
EA4A						
EA3C						
EA5A						
EA4B						
EA1C						.504
EA3A						.437

Table 5. Comparison of the extraction results of the Likart Scale and the Summated Rating Scale with the extraction of eigen values and Fixed Factor

Factor	eigenvalue		fixed factor	
	Likert	Summated rating	Likert	Summated rating
Faktor 1	EA1C	unidentified	-	
Faktor 2	-		-	EA2B
Faktor 3	-		-	EA3C
Faktor 4	EA4A		EA4A	EA4A
	-		EA4B	EA4B
	-		-	EA4C
Faktor 5	EA5A		EA5A	EA5A
	-		EA5B	-
Faktor 6	-		EA6B	-
	EA6C		EA6C	EA6C

Based on Table 6 a comparison of factor extraction based on eigenvalue and fixed factor, it was found that the most profitable for the analysis process was the Likert scale with eigenvalue because only 4 indicators had to be dropped, while the one using the summated rating stated that 8 factors were formed, but it just couldn't be defined more further in the analysis process. When using the fixed factor on the Likert scale there are 6 indicators

that must be dropped, whereas in the summated rating there are 7 indicators that must be dropped. Indicators that must be dropped using both eigen values and fixed factors are EA4A, EA5A and EA6C, while EA1C is only found on the Likert scale extracted using eigen values. Therefore, what will be discussed next is EFA environmental awareness on a Likert scale with extraction using eigenvalue 1.0.

Based on Table 6, there are 4 indicators that are dropped and rotation occurs so that the results after EFA Environmental awareness are 8 aspects and 14 indicators. The category structure after EFA is different from the original formulation. However, the distribution of new items and related environmental awareness features is more balanced, so environmental awareness is rearranged according to the results of the EFA (Capella-Peris et al., 2020). More details can be seen in Table 6.

Table 6. Environmental Awareness Assessment after the EFA has been carried out

Aspect	Final Factor	Indicator
Care	EA 1A	Care about environmental damage
	EA 1B	Care about the dangers of environmental damage
Curiosity	EA2	Have an idea to protect the environment
Critical	EA3	Critical in efforts to preserve the environment
Dependability	EA4A	Can solve problems related to environmental damage
	EA4B	Contribute in preserving the environment
Responsibility	EA5A	Preserving the local potential of the environment
	EA5B	Realizing the danger of environmental damage
Local Wisdom	EA6	Aware of local potential
knowledge	EA7A	Looking for information on how to preserve the environment
	EA7B	Exploring knowledge about environmental health
problem solving skills	EA8A	Solving environmental problems
	EA8B	Have a very good attitude towards environmental preservation
	EA8C	Responsive to the preservation of environmental health

Environmental awareness can influence students' attitudes, it is directly related to environmental knowledge, attitudes, and actions or knowledge, (Dimopoulos et al., 2009). It is also related to critical thinking (Wals, 2011). Therefore, environmental awareness is not only concern in terms of attitude, but students also have knowledge about the environment and local wisdom and must be implemented in the form of skills to protect their environment.

Based on the results of the Likert scale EFA with eigenvalue extraction, there are 8 factors/aspects on local wisdom-based environmental awareness which include knowledge, attitudes, and skills (Cruz & Tantengco, 2017). As stated by Mei et al., (2016) that environmental awareness and behavior is very important, so caring for the environment is not only awareness but also shown through behavior. Knowledge of environmental aspects 6 and 7, namely local wisdom and knowledge. As stated by Surtikanti et al., (2017) that the the environmental knowledge will make community to care about the environment.

CONCLUSION

In this study, the Likert scale with extraction using eigenvalue is recommended. EFA test on the Likert scale and summated rating scale environmental awareness assessment based on local wisdom produces 8 factors and 14 indicators by extraction using eigen value. These factors include Care, Curiosity, Critical, Dependability, Responsibility, Local Wisdom, knowledge, problem solving skills.

In future research, it is better to continue with the CFA test using a larger number of research respondents and also using local wisdom in other regions.

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