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The ecological views of the Balinese toward their subak cultural landscape heritage

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Abstract

UNESCO declared world cultural landscape heritage to an ancient rice terraces system with a diverse of sustainability values and practices in the Bali Island, called the subak system, to be a World Heritage in 2012. This study examines the views of educated Balinese communities toward the subak ecological system, in response to the lack references regarding public perceptions of the Subak World Heritage in Bali. Participants ($n = 912$) completed a questionnaire based on a modification of the new ecological paradigm scale. Their views of subak were neutral with respect to human nor environmental orientation. An exploratory factor analysis failed to differentiate between ecocentrism and egocentrism dimensions, indicating a conflict in the perception of the educated Balinese people between preservation and utilization of the subak system. Since this study has its own limitations, which are carefully examined, further research is suggested.

1 Introduction

Cultural landscapes are cultural properties that represent the combined works of nature and humankind which provide successive generations' social, economy, culture, ecology and educational opportunities helping communities to better understand themselves (UNESCO, 2012a). Built features and land modifications combined with the natural landscape are the cultural landscape expression that holds records of how communities live in time and spacewithin a landscape (Luengo & Ramsay, 2014).

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As an intimate relationship between people and their natural environment overtime, cultural landscape is illustrative evolution of human society and settlement under the influence of their natural environment. They express unique preservation and sustainability issues associated with dynamic spatial, temporal, and intangible heritage qualities, that include not only elite, magnificent, and static sites, but also vernacular and dynamic places (Landorf, 2020; Yang & Greenop, 2020).

While predominant studies on cultural landscape have investigated conservation, restoration and management endeavors (e.g., Amoruso, 2019; Walter & Hamilton, 2014; Wang, 2020), we aim to explore how local ecological paradigm (LEP) scale—as a modification of New Ecological Paradigm (NEP) in addressing a specific environmental issues of subak (Dunlap et al., 2000; Putu, 2017; Surata et al., 2018)—can be utilized to understand ways a society interacts with their cultural landscape, while NEP scale is commonly used to investigate connectedness among society groups to their natural environment rather than cultural landscape (Lwo et al., 2017; Wilhelm-Rechmann et al., 2014). Our inquiry is also a response to several cultural landscape studies, which investigate possibilities in using LEP scale to determine more localized ecological views (Putu, 2017; Surata et al., 2018), by exploring factorial structure in a specific population of the educated Balinese people. We envisage a deeper sense of place to improve conservation strategy regarding an ancient cultural landscape situated in Bali (Indonesia), known as subak cultural landscape.

2 Understanding Subak cultural landscape

The subak cultural landscapes are internationally recognized as an evidence of more than 2000-year-old wet agriculture system. There are hundreds of subak on Bali island. Each subak is an autonomous organization whose members view the irrigation water as a gift from a Goddess and thus must be respected as a shared resource (Lansing & Kremer, 1993). The subak displays a high collective approach of organization and demonstrates a three-dimensional pattern of ecological, social and cultural adaptations (Geertz, 1972). These patterns are imprinted on subak land, where religious, artistic or cultural associations of the natural element are also performed (Domosh, 2001). Hence, the subak and its water temple networks are well known as sustaining factors of beautiful rice terrace landscapes of Bali. The subak system exemplifies a linkage between social and ecological processes that have evolved toward sustainability for centuries (Falvo, 2000; Lansing et al., 2017). It has been named as an excellent example of how humans develop complex adaptive systems to address uncertainties reside within their environmental conditions while preserving cultural and biological diversity (Agnoletti et al., 2015; Yekti et al., 2017).

The subak universal outstanding values have motivated UNESCO (2012b) to declare several subak sites and temples as a World Cultural Landscape Heritage. Unfortunately, these properties are threatened by various issues and challenges, such as conflict over water distribution (Cole, 2012; Strauß, 2011), unsustainable tourism development (Gurira & Ngulube, 2016) and dwindling interest of the younger generation (Surata & Vipriyanti, 2018), reflecting a lack of understanding and interest in conservation. It is unsurprising to find that the subak and other cultural landscapes have gained less preservation-driven efforts due to their uncertain positions within mainstream planning of environment, development and sustainable frameworks (Landorf, 2020). Various studies have highlighted the urgency to conserve the subak landscapes since these landscapes together with creative

culture are two inherent resources for the survival of Bali's tourism (Mudra & Suartika, 2017).

While there is a growing number of research about the subak system that contributes to environmental development and sustainability, it is also important to understand the local public's environmental views toward this cultural landscape. Environmental views have been long recognized assist to form public perceptions regarding complex socioecological issues and challenges, such as climate change (Carlton & Jacobson, 2013), ecosystem services (Van Riper & Kyle, 2014) and biocultural conservation (Gama et al., 2018). These studies have located an assumption that environmental views are positive predictors of pro-ecological attitudes and behaviors (Brink & Wamsler, 2019; Fleury-Bahi et al., 2015; Meloni et al., 2019). In addition, environmental views can also be considered to design effective behavior-change interventions (de Leeuw et al., 2015) and predict people's willingness to pay (Cherry et al., 2019).

3 New ecological paradigm and its application in the Indonesian context

The NEP was first introduced by Dunlap and Vayre (1978). Later, Dunlap et al. (2000) develop a revised version of the scale. The NEPs are designed to capture a set of different but connected beliefs or views regarding human society and environment (Dunlap et al., 2000; Xiao & Buhrmann, 2017). These scales measure the degree in which people are aware of, support and contribute to solve problems in relation to environments (Denis & Pereira, 2014).

Vast array of literature on the environment, development and sustainability have been appraised by using various tools: cross-cultural contexts of environmental attitudes (Ogunbode, 2013; Rachmatullaha et al., 2019); climate change (Barradas & Ghilardi-Lopes, 2020; De Witt et al., 2016; Eizaguirre et al., 2019; Hong & Park, 2018); conservation of endangered species (Pienaar et al., 2013); sense of place related to sustainable farming practices (Lincoln & Ardoin, 2016); relationship between brand loyalty and consumers' environmental viewpoint (Kuchinka et al., 2018); technical efficiency of farmers in relationship with their environmental attitudes (Torres et al., 2019); willingness to pay for renewable energy (Ntanos et al., 2019); and consumers' decision-making for purchasing certified aquaculture products (Yi, 2019).

Studies on validity and reliability of the NEP as a powerful predictor of environmental concern have been established from its unidimensional perspective (Xiao & Buhrmann, 2017; Xiao et al., 2018). Other researchers have yet to find a strong evidence that supports the NEP's unidimensionality, and thus, the meaning of single total NEP scores may become ambiguous (Harrison, 2019; Otto et al., 2018; Reyna et al., 2018; Zhu & Lu, 2017).

In the Indonesian context, most studies using the NEP scale have been devoted for formal classroom settings (e.g., Kusmawan, 2013; Meilinda et al., 2017; Situmorang & Tariganand, 2018; Wardani et al., 2018). In the case of subak, some studies investigated knowledge, attitudes and practices (Surata & Vipriyanti, 2018), and environmental concerns measured by the NEP and LEP scales (Putu, 2017; Surata et al., 2018).

There is little study that has investigated the dimensionality of the NEP and LEP in Indonesia. Prior studies employing the NEP have viewed the measure as a unidimensional structure. In facts, studies suggested to carefully consider the NEP as a single factor due to its lack of internal consistency (Otto et al., 2018; Reyna et al., 2018; Zhu & Lu, 2017).

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To overcome this gap, this study examines the dimensionality of LEP that can be utilized as the next step in designing additional assessments of environmental views and strategies to preserve cultural landscapes. More specifically, the LEP scale is measured for three primary purposes: (1) to identify the level of environmental views toward subak based on the LEP scale; (2) to determine the structure of the LEP by using an exploratory factor analysis; and (3) to assess whether 15 items of the LEP are appropriate to be used in the context of subak cultural landscape.

4 Methods

4.1 Sampling strategy

Following the valuation literature, we conducted a survey of environmental views of educated Balinese people toward their subak cultural landscape. We concentrated on the learned community networks because education is the most powerful indicator of the NEP, providing an effect far more prominent than other indicators (Xiao et al., 2018). Participants were recruited on a voluntary basis using a convenience sampling strategy: a type of non-probability sampling method where participants are selected based on their availability and willingness to participate (Bornstein et al., 2013). The strategy was utilized because of its time convenience, cost adequacy and accessibility of the sample. Participants who were present when the principal author administered learning, lectures and workshop on environmental education, and subak conservation were invited to volunteer in this study. No incentive was offered for their participations.

The questionnaire was administrated to participants on several courses and workshops facilitated by the principal author, from July 2016 to August 2018, in Bali. A total of 912 (of 1027) participants completed the questionnaire. Nineteen incomplete responses were excluded. Participants were predominantly women (57.8%) with ages ranging from 11 to 66 years ($M = 25, SD = 12.032$). The majority of these participants were Hindu (71.5%) and the rest were Muslims (16.2%), Christians (11.6%) and Buddhist (0.7%). Their education levels ranged from high school graduates (39.3%), senior high school students (26.4%), undergraduate students (19.8%) and junior high school students (14.5%).

4.2 Procedures and measurements

The questionnaire was distributed directly to participants at the courses and workshops with an average administration time of 20–30 minutes. The questionnaire consisted of 15 items of the LEP plus sociodemographic descriptors (age, sex, religion, education level and place of residence).

As previously reported (Putu, 2017; Surata et al., 2018), several steps were applied to modify the NEP to be LEP. First, the NEP was translated into Bahasa Indonesia by two translators in English (native Indonesian speakers). Second, the translated document was subject to translation from Bahasa Indonesia to English by two other English specialist translators. The two English versions (original and after an initial translation into Bahasa Indonesia) were compared to adjust the translation if much differences were detected. Third, the word "earth" of the NEP scale was substituted to "subak" and several items were modified in accordance with the subak context. Fourth, a pilot study with 20 junior high school students was conducted to evaluate the LEP items, followed by discussion

between authors. Consequently, the LEP consisted of 15 items scored on a 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree) (Table 1).

4.3 Data analysis

All data analyses were computed using SPSS. In accordance with previous publications, we classified LEP views of participants into strong (mean score around 5), medium (4), neutral (3) and weak (< 3). The LEP items were also categorized into two subscales: eco-centrism (odd-numbered items) to reflect the view that human depend on an ecological balanced and egocentrism (even-numbered items) reflecting views of never-ending growth and progress (Dunlap & Van Liere, 1978; Xiao & Buhrmann, 2017). Ecocentrism or bio-centrism views correlate positively with place loyalty and preference for high preservation (or low utilization) of environment, while egocentrism or anthropocentrism links with high utilization or low preservation (Cui et al., 2019; Manoli et al., 2019).

Pro-LEP views were indicated by agreement with odd-numbered items and disagreement with even-numbered items (Dunlap et al., 2000). The even-numbered items were reverse-coded (5 = strongly disagree to 1 = strongly agree), such that high scores reflect strong anti-egocentrism; otherwise, lower scores link with egocentrism concern. Participants with mean scores at least four were coded as holding a pro-ecological view (Amburgey & Thoman, 2011; Asilsoy & Oktay, 2016).

According to the NEP scale, five dimensions of environmental views were distinguished from the LEP items (Dunlap, 2008; Dunlap & Van Liere, 1978; Dunlap et al., 2000). These were limits of growth (1, 6, 11) indicating the limited resources of the earth; anti-anthropocentrism (2, 7, 12) meaning that nature exists not primarily for human use but has its own inherent values; balance of nature (3, 8, and 13) emphasizing the fragility of nature's balance reflecting the impact of human activities; anti-exemptionalism (4, 9, 14) meaning a rejection of the view that humans are exempt from the constraints of nature; and ecocrisis (5, 10, 15), focusing on the likelihood of potentially catastrophic environmental changes due to human activities.

One-way ANOVA was applied to examine the relationship between LEP and sociodemographic variables. We determined the dimensionality of LEP items with exploratory factorial analysis (EFA) that facilitates the assessment of the strength of context, worldview, culture, society, economics and even politics (Latif et al., 2013). The EFA was performed with several statistical measurements to quantify the strength of these associations. The KMO-U test of sphericity adequacy was used to measure whether the sample is adequate to analyze. Bartlett's test of sphericity and determinant factors were calculated to investigate the correlation between variables without multicollinearity (very low or very high correlation). We excluded variables with a correlation less than 0.5 on the anti-image correlation matrix. The dimensions of the items were extracted by principal component analysis, and the varimax with Kaiser normalization was used to rotate the factors to match each item with a single factor.

5 Results

Table 1 shows that participants' agreement (strongly agree or agree) was higher than their disagreement (strongly disagree or disagree) on nearly all LEP items. The high-est agreement (90.6%) was obtained on item 6 (limits to growth), while the lowest value

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Table 1 Frequency distribution, mean score and standard deviation of local ecological paradigm

LEP	Statement	Dimensional Scale	Scale AG	US	DA	M	SD
1	The human population growth in Bali is approaching the limit of weight the subak can support	Limits	53.5	23.3	23.3		1.18
2	Humans have the right to modify the subak to suit their needs	Anti-Antro	48.8	21.2	30.0	2.81	1.15
3	When humans interfere with subak, it becomes disastrous	Balance	82.3	8.5	9.2	4.10	1.06
4	With human ingenuity, we guarantee that the subak will survive	Anti-exempt	44.9	28.2	26.9	2.76	1.15
5	Humans are seriously abusing the subak	Eco-crisis	45.9	19.0	35.0	3.04	1.36
6	The subak has plenty of natural resources if we just learn how to develop them	Limits	90.5	6.6	2.9	1.65	0.75
7	Rice, hyad, frogs, mice and other living things give as much rights as humans to exist in the subak	Anti-Antro	87.5	8.5	4.0	4.31	0.86
8	The subak is NOT disturbed by tourism development	Balance	41.3	17.8	40.1	2.94	1.33
9	Despite our special abilities, humans are still subject to the laws of nature in managing the subak	Anti-exempt	85.0	10.9	4.1	4.11	0.82
10	The crisis of subak has been greatly exaggerated	Eco-crisis	34.8	26.5	38.5	3.09	1.19
11	The subaks have very limited land and resources	Limits	58.5	19.6	21.6	3.41	1.32
12	Humans can control conditions of the subak	Anti-Antro	24.1	14.1	61.8	3.62	1.30
13	The balance of subak is very delicate and easily upset	Balance	58.8	21.1	20	3.43	1.06
14	Humans will eventually learn the subak and be able to use it	Anti-exempt	70.3	15.4	14.3	2.27	1.00
15	If development and tourism in Bali continue on its present course, then the subaks will soon be extinct	Eco-crisis	71.3		14.0	3.76	1.12
Total							0.41

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corresponded to item 12 (anti-anthropocentrism) since more than half of participants (61.8%) disagreed with the statement. Meanwhile, the highest standard deviation (item 5) showed that the participant's views to the statement were spread over a large range of values. Item 6 has the lowest score and standard deviation, indicating that participant views were clustered closely around the mean. Overall, there was tendency of participants to endorse ecological views. The mean scores were higher than four for three questions (3, 7, 9) and less than three for four questions (2, 4, 6, 8). More than one-fifth (>20%) of participants expressed "unsure" on five items (1, 2, 4, 10, 13), while Dunlap et al. (2000) only found this result for three items (1, 4, 14).

Table 1 also presents with a total mean score of LEP around three, the ecological views of participants fell into neutrality, largely because of three items that support eco- centrism (3, 7, 9), and five items favorable to egocentrism (2, 4, 6, 8,14). Consequently, participants scored medium on ecocentrism (3.68 ± 0. 62) but weak on anti-egocentrism (2.73 ± 0.49). This apparent contradiction was also represented in five dimensions of LEP: medium on anti-anthropocentrism (3.58 ± 0.72); neutral on the fragility of nature's balance (3.49 ± 0.74); the possibility of an ecocrisis (3.30 ± 0.79); and rejection of exemptionalism (3.05 ± 0.59), respectively. However, the score on limits of growth (2.78 ± 0.64) fell within the category of weak environmental views.

5.1 Sociodemographic attributes

Table 2 presents the descriptive statistic of sociodemographic data. Education level had significant effects on environmental belief ($p = 0.000$), in which high school graduate achieved highest mean score of LEP (3.33 ± 0.37), followed by undergraduate students (3.23 ± 0.34), senior high school students (3.20 ± 0.35), and junior high school students (2.97 ± 0.52). A significant relationship ($p = 0.000$) was also found between environmental views with their religion. Hindu believers got higher LEP score (3.33 ± 0.42) compared to non-Hindu believers (3.07 ± 0.35). However, there was no significant ($p = 0.056$) relationship between female (3.27 ± 0.39) and male (3.20 ± 0.43).

Table 2 Descriptive data and alpha values of local ecological paradigm between education level, gender and religion of participants

Group	N	Mean	Median	SD	Min	Max	Range	Alpha values
Education								.000
1. JHS	132	2.97	2.96	.52	.00	3.87	3.87	
2. SHS	240	3.20	3.18	.35	2.07	4.00	1.93	
3. UGD	180	3.23	3.25	.34	2.40	4.07	1.67	
4. HSG	358	3.33	3.37	.37	2.33	4.53	2.20	
Gender								.056
1. Male	383	3.20	3.21	.43	1.80	4.47	2.67	
2. Female	525	3.27	3.26	.39	.00	4.53	4.53	
Religion								.000
1. Hinduism	654	3.33	3.30	.42	.00	4.53	4.53	
2. Non-Hinduism	251	3.07	3.09	.35	2.07	4.53	2.47	

High school graduate (HSG); junior high school students (JHS), senior high school students (SHS), undergraduate students (UGD)

The high school graduate got the most elevated mean score on dimensions and ecocentrism view, as seen in Table 3. However, they also obtained the lowest score on anti-egocentrism, indicating that as well as holding the most pro-environment views, high school graduate expressed more benefit-oriented concerns than participants with less education. Interestingly, females scored higher on anti-egocentrism, nature balance and anti-exemptionalism (Table 3). In the context of nature's balance, women considered that when humans interfere with subak the consequences of turning into disastrous inclined. Women also agreed that tourism development would affect the subak because the status of subaks was very delicate and easily upset. Concerning anti-exemptionalism issues, women were more likely to agree that human ingenuity would not guarantee the survival of the subak. They also had concerns regarding issue preservation by disagreeing with a notion of studying the subak only for human benefits. Finally, Hindu participants obtained higher scores on LEP, subscales and dimensions. This is not surprising because the subak is closely related to Balinese Hindu culture.

5.2 Exploratory factor analysis

The KMO test was 0.759 (> 0.5), indicating the reliability of the sample for analysis. Bartlett's test of sphericity was significant (x^2 = 1415.667; df = 105; p = 0.000) with determinant factor of 0.207 (> 0.0001), meaning that there were high correlations between items without multicollinearity. The anti-image correlation analysis procedure shows the correlation coefficient value between items varied from 0.539 to 831 (Table 4). Item 10 was withdrawn from further analysis because its correlation was lower than 0.5 (0.435). Without that item, the KMO test was 0.769, Barlett's test of sphericity (x^2 =1452.769, df=91,

Group	Subscale		Dimension				
	ECO	EGO	LGR	AAT	NBR	EXE	ECR
Education							
JHS	3.19	2.75	2.64	3.57	3.16	2.74	2.68
SHS	3.52	2.79	2.83	3.37	3.36	3.02	3.33
UGD	3.64	2.79	2.49	3.56	3.79	3.15	3.24
HSG	4.00	2.66	2.95	3.73	3.54	3.11	3.52
Alpha values	.000	.000	.000	.000	.000	.000	.000
Gender							
Male	3.68	2.67	2.83	3.56	3.39	2.95	3.30
Female	3.68	2.78	2.74	3.60	3.56	3.11	3.29
Alpha values	.906	.001	0.37	.564	.000	.000	.792
Religion							
Hinduism	3.77	2.80	2.86	3.67	3.54	3.10	3.38
Non-Hinduism	3.55	2.57	2.64	3.31	3.37	3.00	3.29
Alpha values	.000	.000	.000	.000	.014	.036	.000

Table 3 Comparison of mean scores between sociodemographic variables, subscale and dimensions of local ecological paradigm

JHS junior high school students, *SHS* senior high school students, *UGD* undergraduate students, *HSG* high school graduate, *LEP* local environmental paradigm, *ECO* ecocentrism, *AOC* anti-egocentrism, *LGR* limits to growth, *AAT* anti-anthropocentrism, *NBR* nature's balance, *EXE* exemptionalism, *ECR* (ecocrisis

Table 4 Correlation between two variable items of local ecological paradigm detected as anti-image correlation on SPSS software

LEP	LEP														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.782ᵃ	.034	−.047	.034	−.085	−.028	−.056	.153	.007	.012	−.087	.030	−.117	−.019	−.082
2	.034	.555ᵃ	−.003	−.145	.001	−.049	−.025	−.066	−.048	.015	−.003	−.165	.023	−.048	.003
3	−.047	−.003	.813ᵃ	−.045	−.163	.097	−.049	−.007	−.205	.018	.010	−.092	−.148	−.034	−.225
4	.034	−.145	−.045	.646ᵃ	−.067	−.015	−.030	−.076	.017	−.004	.054	−.007	−.048	−.116	−.047
5	−.085	.001	−.163	−.067	.780ᵃ	−.036	−.117	.017	.075	.031	−.169	.047	−.033	−.033	−.197
6	−.028	−.049	.097	−.015	−.036	.726ᵃ	.271	.006	.123	−.034	−.036	.004	−.019	−.109	.014
7	−.056	−.025	−.049	−.030	−.117	.271	.773ᵃ	.013	−.245	−.032	.040	−.057	−.054	.040	−.095
8	.153	−.066	−.007	−.076	.017	.006	.013	.529ᵃ	.064	−.055	−.014	−.002	−.046	−.021	−.059
9	.007	−.048	−.205	.017	.075	.123	−.245	.064	.757ᵃ	−.050	−.115	.000	−.056	.092	−.010
10	.012	.015	.018	−.004	.031	−.034	−.032	−.055	−.050	**.452ᵃ**	−.039	−.033	.008	−.078	−.001
11	−.087	−.003	.010	.054	−.169	−.036	.040	−.014	−.115	−.039	.768ᵃ	.023	−.127	−.008	−.102
12	.030	−.165	−.092	−.007	.047	.004	−.057	−.002	.000	−.033	.023	.682ᵃ	−.004	.094	−.100
13	−.117	.023	−.148	−.048	−.033	−.019	−.054	−.046	−.056	.008	−.127	−.004	.831ᵃ	−.027	−.201
14	−.019	−.048	−.034	−.116	−.033	−.109	.040	−.021	.092	−.078	−.008	.094	−.027	.629ᵃ	.046
15	−.082	.003	−.225	−.047	−.197	.014	−.095	−.059	−.010	−.001	−.102	−.100	−.201	.046	.810ᵃ

Data less than 0.5 (bold) are excluded from further analysis

ᵃMeasures of sampling adequacy

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$p = 0.000$), determinant factor (0.200), and correlation of items ranged from 0.528 to 0.823. Thus, factor analysis was appropriate to draw meaningful conclusions.

The total explained variance with EFA was 48.030. A Cronbach's alpha was 0.540, indicated a low relatedness between items (Tavakol & Dennick, 2011). The distribution of items' factors loading from 0.44 to 0.80 with five dimensions of LEP scale were distributed on four factors, meaning that LEP was not a single dimension (Table 5). Six items of ecocentrism (1, 3, 5, 11, 13, and 15) loaded heavily on the first factor, while the remaining two items (7, 9) loaded on other factors. However, items of anti-egocentrism (2, 4, 6, 8, 12, 14) were distributed into three factors, except the first factor. These results indicate that the LEP may be able to identify ecocentrism but not anti-egocentrism. Table 5 presents an imperfect grouping of five dimensions of LEP items, only two of three items were related to the possibility of an ecocrisis (5, 15), the fragility of nature's balance (3, 13) and limits to growth (1, 11) loaded in the first factor, rejection of exemptionalism (4, 9) on second factor, and anti-anthropocentrism (2, 12) on fourth factor. Hence, the distribution of LEP items that were extracted by factor analysis was not consistent with the theoretical structure of the NEP scale, whether as a single scale, two subscales or five dimensions.

6 Discussion

The overall ecological views of the Balinese toward their subak cultural heritage landscape were neutral ($M = 3.23$; SD = 0.41), neither ecocentrism nor egocentrism predominated. It highlights previous finding: although participants are conscious that the subak has limited resources, and human interference on the subak is mainly negative, there is still a belief that human being is able to dominate the subak resource, once they know how to handle it (Barradas & Ghilardi-Lopes, 2020; Putu, 2017; Surata et al., 2018). The result suggests that different groups of educated Balinese people consider their subak cultural landscape heritage as somewhat meaningful or somewhat meaningless. They are

Table 5 Principle component analysis of local ecological paradigm items with varimax rotation

Item	Dimensions	Factor			
		1	2	3	4
LEP5	The possibility of an ecocrisis	**.650**	.060	.117	−.031
LEP15	The possibility of an ecocrisis	**.648**	.260	.106	.156
LEP13	The fragility of nature's balance	**.617**	.165	.105	.022
LEP11	Limit to growth	**.575**	−.035	−.093	−.041
LEP1	Limit to growth	**.565**	−.059	−.344	−.040
LEP3	The fragility of nature's balance	**.535**	.416	.121	.139
LEP6	Limit to growth	.050	**−.759**	−.014	.099
LEP7	Anti-anthropocentrism	.239	**.689**	.043	.053
LEP9	Rejection of exemptionalism	.206	**.636**	−.071	.079
LEP4	Rejection of exemptionalism	−.096	.051	**.655**	−.004
LEP8	The fragility of nature's balance	.138	−.013	**.625**	.177
LEP14	Rejection of exemptionalism	.143	−.395	**.432**	−.178
LEP12	Anti-anthropocentrism	.052	.136	−.119	**.787**
LEP2	Anti-anthropocentrism	−.014	−.072	.261	**.690**

Loadings of 0.3 and above are in bold

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likely involved in a conflict between goals that imply acting pro-environmentally versus acting in a non-pro-environmentally sound manner (Lindenberg & Steg, 2007; Steg et al., 2014). This conflict is clearly demonstrated by the contrast between the highest scores on item 7 (rice, hyacinth, frogs, mice and other living things have as much right as humans to exist in the subak), that is closely related to high preservation, and the lowest score on item 6 (the subak has plenty of natural resources if we just learn how to develop them), that was linked with high utilization. As a note, item 6 has appeared to function in a manner that is consistent with criticisms of NEP in which both pro-ecocentric and pro-egocentric beliefs can lead respondents to the same response on the agreement scale (Harrison, 2019).

In regard to sociodemographic variables, participants with higher education showed more pro-ecological scores than those with lower level education. This result is consistent with other studies (Balador et al., 2020; Kuchinka et al., 2018; Reyna et al., 2018). But it should be considered with caution because high school graduate received the lowest scores on anti-egocentrism, indicating a preference for lower preservation or higher utilization, comparable with other education levels.

The finding that Hindu participants held more pro-ecological views toward the subak system compared with other participants is consistent with the results of other studies showing the positive effect of religious attitudes toward nature (Cox et al., 2014), ecological rationality (Otsuki, 2013) and ecosystem functions and benefits (Joa et al., 2018). As the subak system upholds global sustainable values, concept and practices, pro-ecological views toward the subaks should be promoted for all communities regardless of differences in religion, ethnicity, nation and generation.

Interestingly, women scored higher on anti-egocentrism, nature balance and anti-exemptionalism than men, as other studies have found (Denis & Pereira, 2014; Wald & Jacobson, 2014; Wallhagen & Magnusson, 2017). They may see themselves as inseparably connected to the subak in order to maintain the balance of the system, in comparison with men.

Overall, these results highlight the importance of exploring sociodemographic variables in the study of environmental beliefs as a step in designing specific strategies for increasing pro-ecological knowledge, attitude and behaviors.

An EFA shows that most ecocentrism items were heavily loaded in the first factor, indicating that they may correlate positively with place loyalty (Cui et al., 2019). However, all anti-egocentrism items were loaded in three other factors, meaning that there is not a two-dimensional model of the LEP scale. It is a contrary to previous studies that found strong differentiation between preservation and resource utilization (Milfont & Duckitt, 2004; Ogubonde, 2013; Xue et al., 2016).

The outcome of four dimensions of LEP is consistent with prior studies about the multi-dimensionality of the NEP scale (Hosseinnezhad, 2017; Manoli et al., 2019). It may occur because of differences in context, worldview, culture, society, economics and even politics (Dunlap et al., 2000). In addition, Hawcroft and Milfont (2010) found that variation in sample type, number of item and scale length have significant effects on the NEP scores. Nevertheless, a large body of survey results argues for retaining the scale for comparative studies (Bernstein & Szuster, 2018).

7 Implications of the study

This study found that the LEP scale is not satisfactory to be used as a predictor of environmental views toward the Balinese subak cultural landscape due to its low internal consistency. There were only 6 out of 15 items which are grouped in the same factor, while other items spread over three different factors. The scale is unable to differentiate environmental perceptions toward subak system between high preservation and low utilization, or low preservation and high utilization.

Thus, the finding has a significant theoretical implication. Interpretation of environmental views with a tension between high preservation and low utilization, or vice versa, is predominantly based on the Western context references. In other cultures, community perception of pro-environmental views in couples with pro-anthropomorphic concerns might exist (Xue et al., 2016). This argumentation is supported by our finding that 82.3 percent of the participants belief that "when human interferes with subak it becomes disastrous (item 3)" and 70.3 percent of the participants who argued, "humans will eventually learn the subak and be able to use it (item 14)." In this sense, environmental view tools that can be used to identify the probability of existence of pro-environmental and pro-utilitarian views might emerge, as suggested by some researchers (Bogner, 2018; Manoli et al., 2019).

Our finding of less pro-ecological views indicate that the universal outstanding values of this system are missing from the local community perceptions as they have not sufficiently integrated in the formal education system. Our finding clearly demonstrates that well-educated participants with the highest score on ecocentrism have the lowest score on anti-egocentrism compared to the less educated participants. Hence, it might be urgent to interpret global education programs of UNESCO in preserving the world landscape heritage into local cultural context (Berglund et al., 2019). More importantly, the dynamic of certain cultural landscape should be interpreted, negotiated, valued and applied on diverse educational activities, such as incorporating cultural heritage into school curriculum, camping, visiting cultural landscape, participating in farming practices, photography or video competition, and cultural-art event (Landorf, 2020). These activities require dedicated trained teachers to facilitate innovative teaching and learning strategies, and work collaboratively with local community groups and other valuable resources. In responding to this issue, it is useful to consider Malandrakis' (2018) suggestion about resolving gaps in teaching and training domain within teacher preparation programs to assist prospective teachers building their pro-ecological views.

7.1 Limitations and future studies

We offer several insights for future research reflecting upon the limitations of this study. Our study applied the local context of the NEP scale, instead of its original or revised versions. We believe future studies should re-examine the structure of environmental views using the LEP scale that comes with both versions of the NEP.

Although this study has included people from diverse education levels, the sample was not representative of the Balinese population. More educated participants were represented in our sample. There was no attempt made to include less educated participants. Further research is suggested to determine opportunities to generalize this result, particularly in relation to people with less education.

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This study is based on a convenience sampling method due to time, human resources and financial considerations. Its results may possess generalizability only to the sample itself; thus, it is difficult to generalize them to the reference population (Bornstein et al., 2013; Reyna et al., 2018). Future research should be extended with a good probabilistic sampling to increase the reliability of research findings, and the possibility of making inferences about the population.

Our finding on low internal validity and multidimensional aspects of the LEP demonstrated the limitations of the scale in replicating the NEP as a predictor of ecological belief related to the subak system. We support longitudinal studies to pair the LEP, as well as the NEP, with other instruments that might capable to identify coexisting probability between preservation and utilization views (Bogner, 2018; Manoli et al., 2019).

Interpretation of factor analysis in this study was merely based on EFA. In reality, researchers often use more than one method based on theoretical and practical reasoning. It might be interesting to carry out other factor analysis using a similar or more structure targets in the near future.

8 Conclusion

This paper reports environmental views of the educated Balinese people toward their subak cultural landscape by using a modified version of New Ecological Paradigm scale, called local ecological paradigm (LEP). Their views toward the landscape were not strong enough following conflict between preservation and utilitarian belief. An exploratory factorial analysis classified the LEP scale into four factors with most of ecocentrism items that were grouped in the first factor, while all egocentrism items spread over three different factors. Therefore, the LEP scale should be considered carefully when it is treated as a single dimension. This aspect might be important for further works, both for theoretical reasoning in environmental view studies, and policy purposes in facilitating education program to preserve cultural landscape heritage.

Declarations

Conflict of interest The authors declare no conflict of interest.

Informed consent Informed consent was obtained from all individual participants included in the study.

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Article Error You may need to use an article before this word. Consider using the article **a**.

Article Error You may need to remove this article.

Confused You have used either an imprecise word or an incorrect word.

Proper Nouns You may need to use a capital letter for this proper noun.

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Frag. This sentence may be a fragment or may have incorrect punctuation. Proofread the sentence to be sure that it has correct punctuation and that it has an independent clause with a complete subject and predicate.

Sentence Cap. Review the rules for capitalization.

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Article Error You may need to use an article before this word. Consider using the article **the**.

Prep. You may be using the wrong preposition.

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Possessive

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Verb This verb may be incorrect. Proofread the sentence to make sure you have used the correct form of the verb.

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