

How Do Student Teachers' Beliefs Change when the New Ecological Paradigm is Grounded into a Local Context Related to the Balinese Subak Landscape Heritage?

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ABSTRACT

The objective of this research is to assess global and local environmental views of student teachers using the new ecological paradigm (NEP) and the local ecological paradigm (LEP) scales. Ninety-two undergraduate students from Universitas Mahasaraswati Denpasar, Indonesia were requested to rate and write individual arguments to each item of the NEP and LEP scales. Students' environmental endorsements were present, but they were not strong. Further results and suggestion for future studies are provided.

KEYWORDS

New ecological paradigm, local ecological paradigm, student teachers, individual argument.

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Introduction

For more than three decades, the new ecological paradigm (NEP), originally designed by Dunlap & Van Liere (1978) and revised by Dunlap et al. (2000), has been the most widely used tool for quantitative measurement to predict environmental concern. In a formal education context, the NEP has been commonly used in exploring environmental knowledge, attitudes and behaviors (Rideout et al., 2005; 2014; Atav et al., 2014; Ajaps & McLellan, 2015; Allevato, 2016). The NEP has also been utilized to compare perspectives on human–environment interactions between students from developed and developing countries (Petegem & Blicke, 2006), test the reliability and dimensionality of the revised NEP (Erdogan 2009), and predict students' science achievement

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(Kapurdewan & Keong, 2013). Meanwhile, Manoli et al. (2007) revised and validated the NEP scale for use with upper elementary students, while Kopnina (2011) suggested to combine the NEP scale with qualitative approaches for testing both children's knowledge and affective states.

Although many researchers have noted the extensive applicability of the NEP scale for worldwide views, few studies have investigated the local contexts to the each item on the NEP scale. Otherwise, the local environment is the starting point for enhancing commitment to social service (Sobel, 2004), increasing science understanding (Taptamat, 2011) and developing in students a sense of connectedness to where they live (Meichtry & Smith, 2007).

The primary aims of this study were to measure whether global environmental views of student teachers from unexplored cultural contexts were supported by their concern to local issues relating to the traditional landscape heritage. The finding of this study will enrich our understanding of global and local environmental perspectives in the region outside of Western cultures.

Student teachers were specifically chosen for this study because they are not only teachers of the next generation, but they also are potential future leaders in encouraging pro-environmental attitudes and behavior (Ajaps & McLellan, 2015). This study focused on the Balinese ancient landscape heritage called *subak*. This traditional farming system is well adapted to the characteristics of the Balinese, and it is also a meeting ground between cultural ecology, scientific exploration, political dialogue, community stewardship and the study of nature (Sobel, 2004; Lansing & Miller, 2005; Roth, 2011). The *subak* thus present a remarkable place-based approach of sustainable science that is embedded in a social context (Potschin & Haines-Young, 2012). The *subak* can be a unique model in developing sustainable education that combines a subject of academic study with its real-world surroundings, cultures, actors and activities (Surata, 2013; Smeds, 2015). For example, the *subak* can be used as an outdoor setting in engaging a student exploring community capital, promoting a model of learning across culture, and designing learning materials (Surata, 2013; Surata et al. 2014, 2015).

Methods

Participants

The 92 participants were undergraduate students enrolled in environmental education courses (general ecology and environmental introduction) at the Universitas Mahasaraswati (Unmas) Denpasar Indonesia. The courses were exposed to various indoor and outdoor educational activities related to the *subak*. The age of participants ranged from 20-36 years with a mean age of 21.3 years and a median age of 21.0 years. The participants reflect the composition of typical student teachers in Indonesia, with predominantly females (69.6%). No NEP issues were discussed during these courses, and data were collected after students completed both courses in June 2016.

Instruments

The questionnaire included two sections. The first section was the NEP revised version (Dunlap et al., 2000). The NEP was translated into *Bahasa* (Indonesian Language), and the original wording and meaning of the items on

the NEP scale were kept as accurate as possible. A panel of three experts (i.e., a researcher, lecturer and teacher) read and revised the questionnaire before distributing it to the students. Based on a panel suggestion, NEP 1 was paraphrased and NEP 8 was modified to facilitate an easy and an unbiased interpretation of the statement (see Appendix 1a). The second section, called local ecological paradigm (LEP), was designed to include a local perspectives of students through modified NEP scale addressing specific environmental issues related the *subak* (see Appendix 1b).

A combination of close and open-ended questions was employed both to the NEP and LEP items. Students were requested to rate both scales and supplement their quantitative perception with individual written arguments to justify their beliefs of each item up to 200 words in length.

Data Analysis

The author calculated the mean and standard deviation for all items. Higher mean values reflect higher level of adherence to pro-NEP and pro-LEP perspectives (Coral-Verdugo & Armendariz, 2000). A Pearson correlation was utilized to analyze the level correlation of items and the total score of the NEP and LEP scales. Cronbach's alpha values were 0.62 (NEP) and 0.60 (LEP), indicating an acceptable level of internal consistency.

Content analysis was conducted on the students' written arguments to the open-ended questions. It is "a process that typically involves counting the frequency of and/or comparing the co-occurrence of categories" (Messenger 2012: 360). The students' arguments were categorized into three groups: (1) *appropriate*: the argument supports the rating for each item of both scales; (2) *inappropriate*: the argument is irrelevant, inaccurate and/or non-supporting the rating on the item scale; (3) *opposite*: the argument was different or in contrast to the rating scale.

About 25% of the questionnaire was calculated to test intra-rater reliability (or stability) by coding the argument of each item twice during 20 days selected randomly. The level of agreement were founded to be 0.88 (NEP) and 0.85 (LEP). Using the same randomly selected dataset, a second person independently coded the argumentation of each item. The levels of agreement (or inter-rater reliability) between the two raters were adequate (NEP= 0.84; LEP= 0.79).

Results

NEP and LEP Item Scale

The mean, correlation and significant relationship between the NEP and LEP items are listed in Table 1. The total mean for both the NEP and LEP were above three, meaning that pro-environmental beliefs of students exist. It was widely accepted that the NEP score categorized a neutral (if mean score close to 3), a human-centered (<3) and an environment-centered (>3) worldview on a 5-point scale (Ogunbode, 2013; Ajaps & McLellan, 2015; Allevato, 2016). This was true for the following items with higher scores—NEP 3 (When humans interfere with nature it often produces disastrous consequences) or LEP 9 (Despite our special abilities, humans are still subject to the laws of nature in managing the *subaks*)—and were strong enough to cope with issues of NEP 12 (Humans were meant to rule over the rest of nature) and LEP 13 (The balance of *subak* is very delicate and easily upset) but were much less true for the NEP (or LEP) 6: "The

Earth (or *subak*) has plenty of natural resources if we just learn how to develop them.” This result was consistent with prior studies that also found the lowest score for the NEP 6 (Dunlap et al., 2000; Bostrom et al., 2006; Petegem & Blicck, 2006, Atav et al., 2015).

There was a significant relationship between NEP and LEP items, except for items 3 and 6 (Table 1). Cohen (1988) suggests the correlation is high if r ranges from 0.50 to 1, medium if $r=0.30$ to 0.49 and small if $r=0.10$ to 0.29. The overall students’ beliefs toward the global questions had a high positive correlation with their local environmental views (0.65). However, only four items of the NEP and LEP had high correlation (4, 5, 10, and 15); seven items (1, 11, 2, 9, 12, 13 and 14) had a medium correlation; and four items (6, 7, 3 and 8) had a small correlation. Table 1 also displays that the mean average of the total NEP is higher than the LEP, whereas a mean score of four and above is found on five of NEP items (3, 7, 8, 9, and 15) compare with only item of LEP 9. These imply that though positive endorsements of pro-ecological attitudes of the students exist, they were not strong, and they have more positive perspectives toward global environmental views rather than the local context.

NEP and LEP item Arguments

Table 2 presents the frequency of argument belong to the category of *appropriate* on nearly all NEP items (except 1 and 10) tend higher than items of LEP. This indicate that the pro-environmental concern of students toward local issues are not as strong as their global beliefs. Table 2 also shows that a significant portion of students’ arguments of item 1, 5 and 10 do not support their rating to the items. About one-third (30.4%) of students’ arguments on item 1 (The human population growth is approaching the limit of the Earth (or *subak*) can support) belong within the *opposite* category. The majority of students disagreed; however, their arguments tended to support the item statement, as was exemplified by the comment of one student: “The growth of the human population is increasing, but the land area occupied by humans is not increased.” Another student wrote that “many of the *subaks* areas have converted to human settlement.” Otherwise, several students agreed, but their arguments tended to match the *opposite* of the item’s statement. For example, one student describes “there are many islands in Indonesia with a small human population. This show that human growth can still be supported by the earth.” Another student focused on the capacity of the *subak* to support local residence by arguing that “the *subak* resources are still able to meet all the needs of the human population in Bali.” This finding demonstrates that although the majority of students believed in the human and nature relationship, their statement of item 1 may have caused inconsistency in rating the scale.

About one-third of students seem confuse regarding the scaling of the NEP 5 and LEP 5 items: Humans are seriously abusing the environment (or *subak*). For example, one student disagreed, but her argument was *inappropriate* as presented in her comment “because of environment is a place of human to work, play and residence.” Another student also wrote an inappropriate justification to the local context, “human is not entitled to abuse *subak* because it can cause damage and may lead to the extinction of this traditional irrigation system.”

Meanwhile, on item 10 (The so-called “ecological crisis” facing humankind (*subak*) has been greatly exaggerated), nearly half of the participants’

arguments (NEP, 47.3%; LEP, 44.6%) fall into the *inappropriate* category, as exemplified by one student who said, "Environmental crisis is not supposed to be exaggerated ... it's should be addressed in order to create safety for human life." Another student's argument toward the local context was "The crisis of *subak* could endanger human life and the ecosystem of the *subak*." These arguments are not in line with the suggestion meaning of item 10, that is, that the ecological crisis facing humankind is not true, but the issue has been greatly exaggerated.

The lowest mean score of item 14 was far below average (see Table 1), indicating that students still have a strong anthropocentrism or egocentric attitude by agreeing to the statement that "Humans will eventually learn enough about how nature (or *subak*) works to be able to control it." Interestingly, nearly half of the participants' arguments on these items (NEP=47.2%; LEP=45.5%) tended to support environmental conservation. This viewpoint is illustrated, for example, by the following comments: "Human will learn the nature and use it as well as possible after they reaped the disaster" and "people learn the *subak* as effort to maintain it sustainability and beauty."

These results indicated that although items 1, 5, 10 and 14 seemingly caused multiple or missed interpretations, because the majority of students' arguments were *appropriate* with most of the NEP (LEP) items, these scales are still beneficial for measuring both global and local environmental concerns of the cultural region.

Discussion and Conclusion

This study found pro-environmental views of student teachers were present, but they were not strong, which agrees with previous studies in different cultural contexts (Corral-Verdugo & Armendariz, 2000; Dunlap et al., 2000; Sudbury-Riley et al., 2014). Otherwise, weak endorsement of pro-ecological ideologies were also found in other studies (Rideout et al., 2005; Watson & Halse, 2005; Wu, 2012; Ogunbode, 2013; Denis & Pereira, 2014). Meanwhile, Petegem & Blicek (2006: 631) found that "the Belgian children are more in favour of the NEP worldview than the children in Zimbabwe". Another study found that Australian sample was more pro-environmental than the Indonesian and Maldivian samples (Watson & Halse, 2005). Watson and Halse (2005: 69) identified "problems with aggregating data when using the NEP questionnaire to determine environmental attitudes in non-western cultures". While Denis & Pereira (2014) mentioned that the NEP scale should be used carefully when applied outside the United States since alpha levels are rather low. Hence, this study assessed individual written arguments to gain deeper understanding into students' reasoning for their ratings regarding their perceptions of the NEP and LEP scales.

The high correlation between the NEP and LEP items reflect that most students may consider the broader issues of the NEP relevant to their local culture, even though on several items the global views of students was not sufficiently supported by their local context. This is in agreement with Ünal (2008), who found that Turkish elementary education pre-service teachers mostly gave more importance to global rather than local environmental issues. The finding in this study might also indicate that the *subak* as a case study in the courses above (general ecology and environmental introduction) has a

limited impact on local perspectives. Both courses were likely not capable of pushing past dominant anthropocentric philosophies to embrace an ecological paradigm as a necessary paradigm for sustained ecological change to occur (Barrett et al., 2015). Consequently, it needed to reorient these courses to include a comprehensive environmental perspective and infuse environmental education (Goldman et al., 2014). This study highlights help students embrace emerging global ethics as their main function to preserve and reproduce existing cultural traditions (Savelava et al., 2010). This is because modern science as mainstream institutional knowledge has the ongoing tendency to reject the cosmological and cultural traditions of traditional knowledge (Kahn, 2010). As a consequence, learners may miss recognition of their sustainable culture and practice heritages and inspiration and motivation in solving novel problems without losing their core identity.

Even though several items of the NEP scale may be less suited for testing environmental concerns, because the majority of students' arguments were *appropriate* with most items' statements, this study supports the finding of Cordano et al. (2010: 234) that the NEP can be used as a durable tool for analysis when translated into new languages. Furthermore, Hawcroft and Milfont (2010) mentioned to continue using the NEP scale until a standard environmental assessment has been widely accepted.

However, the NEP needs to be adapted to serve socio-culturally specific settings and should be supported by in-depth ethnographic studies to reduce the confusion of quantitative tools for evaluating environmental attitudes (Kopnina, 2011, 2012). The importance of modifying the NEP to a more local context and including a supportive qualitative approach was demonstrated on item 6 (the Earth has plenty of natural resources if we just learn how to develop them). As was mentioned above, most previous studies found that item 6 had the lowest score of all the NEP items. Hence several researchers (Erdogan, 2009; Taskin, 2009; Atav et al., 2005) advised to revise or remove this item due to the participants' difficulties understanding the item statement. Interestingly, although this study also found a low score for item 6, the majority of students' arguments were *appropriate* with item statements, as is explained by a student's comment, "Our Earth, especially Indonesia is rich with natural resources that spread across various islands. The biggest one is mining and petroleum. In addition there is agriculture land that can be exploited and processed by humans to meet his lifespan." Another student commented that "there are a lot of natural resources in the *subak*, for example various plants in the *subak* can be used as a medical herb, vegetable, and so forth." This shows that there was no difficulty understanding the statement and that the students still have a weak perception of the environmental issues that limit human growth and development.

Hence, further studies using the NEP scale should be conducted with fewer items and adapted with specific cultural contexts to determine environmental beliefs in non-western cultures. Integrating quantitative techniques with qualitative approaches would be helpful in understanding how interaction among people may enhance concerns about environmental problems, increase the sense to protect the environment, increase the willingness to accept limitations on property rights, and enhance intentions to engage in pro-environmental behavior. Longitudinal studies are needed both to examine how these phenomena may or may not persist after student participation has ended

and also to gain a better understanding of the influence of environmental perceptions toward participants' behaviors in conserving their local environment.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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