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# Pro-Environmental Behavior (PEB): How Can Gender and Living Location Affect PEB?

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**ABSTRACT** The natural system in East Kalimantan, Indonesia, is undergoing degradation, which mainly originated from the anthropogenic exploitation of nature. To reduce the harmful effects of the environmental damages, East Kalimantan students must, therefore, be examined on pro-environmental behavior (PEB) as they will be the future guardians, planners, and policymakers. This study investigated the PEB of 410 junior high school students in East Kalimantan and discussed it based on their gender and location categories (rural and urban). The investigation of PEB was conducted using an adapted version of the Two Major Environmental Values model, which includes an additional scale for measuring Appreciation. The PEB questionnaire data was analyzed quantitatively using an independent t-test to compare the means across location categories and gender. Our findings revealed that the PEB of male students (2.44) is higher than female students (2.36). Most female students favored the Utilization of nature more than male students, resulting in lower PEB. Students in rural schools were likely to behave more pro-environmentally than those in urban schools. According to the analysis of each PEB aspect, most students had Utilization preferences toward nature, especially students studying in Urban schools. These results may be valuable in designing behavioral interventions to encourage PEB, especially in East Kalimantan

**Keywords** East Kalimantan, Gender, Junior high school, Pro-environmental behavior, Rural-urban

## 1. INTRODUCTION

Transhumanism, as the impact of revolutionary industry, initiates global environmental practitioners to develop Sustainable Development Goals (SDGs). Additionally, economic growth as the further impact of the revolutionary industry has a long-relationship with energy consumption (Nordin & Sek, 2020). Further to the SDGs implementation in society, psychologists introduced the term pro-environmental behavior (PEB) as positive behavior toward the environment. PEB simply means the volitional behavior to minimize the negative impact on the environment (Kollmuss & Agyeman, 2002). Human behavior is primarily responsible for many environmental problems that threaten environmental sustainability. In order to prevent environmental degradation, factors influencing PEB need to be identified for designing products, educational programs, and policies that meet the needs of society's environmental demands (Li et al., 2019).

However, within the years of exploration of PEB, the factors and barriers of PEB itself are extremely complex. The complexity of pro-environmental behavior (PEB) stems from the interplay of individual, social, and contextual influences. Psychological, cultural, and socioeconomic factors significantly impact PEB and can vary across populations and settings (Kollmuss & Agyeman, 2002). Researchers are still seeking to gain a deeper understanding of PEB and its influencing factors. In social science, sociodemographic factors related to pro-environmental behavior become one of the focus of sociologists' and psychologists' research, including gender (Sulaeman et al., 2023) and residence location (Liu et al., 2018; Nuryadin, *et al.*, 2023; Rahmawati, Nuryadin and Syam, 2023). Many researchers found that gender and residence affect people's PEB, where females and people living in rural areas were found to have higher levels of environmentalism than men and people living in the city, respectively (Berenguer et al., 2005; Evans et al., 2018; Johnson et al., 2004; Xiao & Hong, 2010).

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Regarding location as the sociodemographic factor related to PEB, therefore the difference between tropical and non-tropical landscapes would be interesting to conduct. Kalimantan, the tropical rainforest and the world's third-largest island, is considered the lungs of our planet (Sulaeman et al., 2020). However, Kalimantan and its natural systems suffer from environmental issues because of human actions, such as land clearing from illegal mining and palm plantation, forest fire, and water pollution (Afkarina et al., 2019; Purwanto & Mahadika, 2021; Subagiyo et al., 2019). Reducing the harmful effects of these environmental damages requires understanding the relationship between humans and nature (Zulkarnaen et al., 2022) and improving pro-environmental behaviors (PEB) (Shafiei & Maleksaeidi, 2020).

In scientific research, measurement tools are essential for understanding, predicting, or promoting pro-environmental behavior (Dinurrohmah, Subagiyo, et al., 2022). Measures of PEB include any attempts to quantify observable properties of behaviors that impact the environment (e.g., frequency, latency, temporal extent, or intensity) (Markle, 2013). Recently, various measurement tools have been developed to assess PEB. These include the New Ecological Paradigm (NEP) scale, which focuses on individuals' ecological beliefs (Manoli et al., 2019), and the Connectedness to Nature Scale (CNS), which is designed to assess an individual's emotional connection to the natural environment (Sparks et al., 2022). However, the NEP focuses on ecological beliefs but overlooks specific values influencing PEB, while the CNS emphasizes emotional ties to nature without assessing value orientations, limiting their effectiveness in informing comprehensive interventions. The Two Major Environmental Values (2-MEV) scale has emerged as a widely used tool that assesses PEB through two higher-order factors: Preservation and Utilization (Mónus, 2021b). This scale was developed to provide a more comprehensive understanding of people's perceptions of environmental issues, addressing the limitations of the NEP and CNS scales, which does not fully explore all dimensions of environmental perceptions (Manoli et al., 2019). To further enhance the 2-MEV model, Bogner (2018) introduced a third factor, Appreciation of Nature, highlighting the positive aspects of engaging with nature as a strategy to prevent exploitative behaviors.

Studying students' PEB is essential since they will be the future guardians, planners, and policymakers of environmental problems, where one of the barriers to the environment is the policymakers/government (Świerszcz, 2022). The students are in a critical period for convincing the urgency of the environmental situation and cultivating pro-environmental behavior (Liang et al., 2022). This study was therefore based on a sample of junior high school students in East Kalimantan, Indonesia. The PEB of students was explored based on their gender and location categories (rural and urban) to confirm previous research results (Ichsan et al., 2018; Kennedy & Kmec, 2018; Vicente-Molina et al., 2018) were applied to junior high school students in the investigated location. In addition to corroborating previous research, this study contributes to the literature by investigating pro-environmental behavior among junior high school students in East Kalimantan, a region confronted with distinct environmental challenges, including deforestation and illegal mining, particularly in light of Indonesia's capital relocation to this area. By examining the influence of gender and location on PEB in a tropical rainforest context, this research provides localized insights that can inform specific environmental policies and educational interventions.

## 2. METHOD

### 2.1 Research Background

This research is an exploratory study conducted in East Kalimantan, Indonesia, utilizing a survey methodology to investigate pro-environmental behavior among junior high school students. This specific location is part of the tropical rainforest and the heart of Borneo Island, where extensive oil palm plantations and mines spread across the region. East Kalimantan itself has also been set up as the new capital city of Indonesia. Therefore, its natural systems vitally suffer from environmental issues because of human actions. The research proceeded with quantitative analysis, focusing on analyzing PEB by location (rural and urban) and gender. The PEB itself consists of three main aspects, including Preservation, Utilization, and Appreciation (Bogner, 2018), which are included in the analysis.

### 2.2 Sample

The survey in this study involved 410 ninth-grade students at junior high schools in East Kalimantan, Indonesia. We selected ninth-grade students because this age group is at a crucial developmental phase where adolescents gain increased awareness of social and environmental issues (Oktay et al., 2023). At this stage, students typically encounter environmental concepts through various subjects included in the national curriculum. Central Bureau of Statistics (CBS) reports that the percentage of the total population in east Kalimantan is larger in rural areas than the urban areas (Central Bureau of Statistics, 2024), therefore, 10 schools were selected by stratified random sampling, which included 4 in urban areas and 6 in rural areas. The urban and rural areas were represented by 205 students who were randomly invited and consented to participate in this study. The distribution of the sample is illustrated in Table 1. The classification of the location category in this study is according to the CBS definition of urban and rural villages. The basis for this classification is the population density, the share of households engaged in agricultural labor, and the accessibility of schools and hospitals (Central Bureau of Statistics, 2020).

**Table 1** Sample distribution (n = 410)

| Category | Gender | Number of Students | Total |
|---|---|---|---|
| Urban | Male | 85 | 205 |
| | Female | 120 | |
| Rural | Male | 91 | 205 |
| | Female | 114 | |

### 2.3 Instruments and Procedures

An online structured questionnaire was used to collect data in this study. The questionnaire was adapted from Bogner, named the 2-Major Environmental Value (2-MEV) model, which is widely used as a tool to measure PEB (Bogner, 2018). In total, 21 items were included in the questionnaire, categorized into Appreciation of Nature, Utilization, and Preservation aspects. Each category contained seven statements adapted for the Indonesian circumstances. In this questionnaire, Preservation expressed preferences for environmental conservation, Utilization reflected preferences for exploiting nature, and Appreciation expressed appreciation for the positive aspects of benefitting from nature.

A Likert-type scale was used to collect students' preferences toward environments, which ranged from 1 for totally disagree to 5 for totally agree—respondents filled out the final online questionnaire through Google form. Preliminary data from the Google Form is presented in Microsoft Excel for differential analysis calculation, before proceeding to further analysis. A diagram of the overall flow of this study can be found in Figure 1.

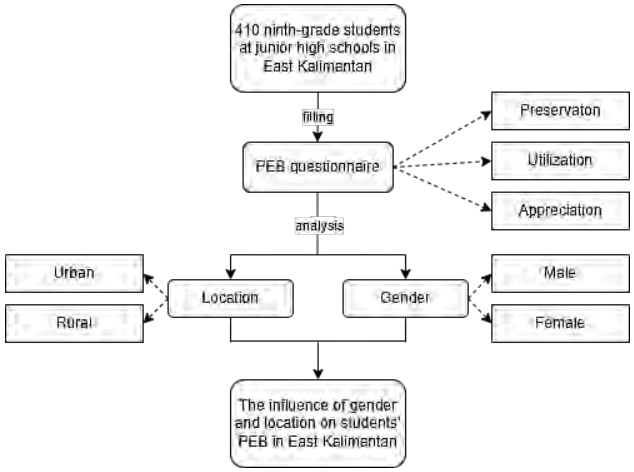


**Figure 1** The overall flow of the conducted study. The PEB questionnaire was utilized to examine the influence of gender and location (urban vs. rural) on students' pro-environmental behavior (PEB).

### 2.4 Data Analysis

Analysis of the collected data through the PEB questionnaire was quantitatively carried out using an independent t-test to compare the means of each location category and gender. The analysis was conducted using Microsoft Excel for data tabulation and IBM SPSS Statistics version 26 for the independent t-test. This analysis was assisted by Microsoft Excel for tabulation and IBM SPSS Statistics version 26 for independent t-test analysis. The graphs in this study were created using Origin (2016). The overall PEB score was obtained based on the average value of the total response scores in each aspect.

## 3. RESULT AND DISCUSSION

### 3.1 PEB by Gender

The average PEB scores of the students of different genders in this study are depicted in Figure 2. From the Likert scale (1-5), the collected data analysis showed that male students' average PEB scores (2.44) were slightly higher than female students (2.36). According to Table 2, the differences between male and female students' PEB scores were significant, indicated by sig 2-tailed values below 0.05.

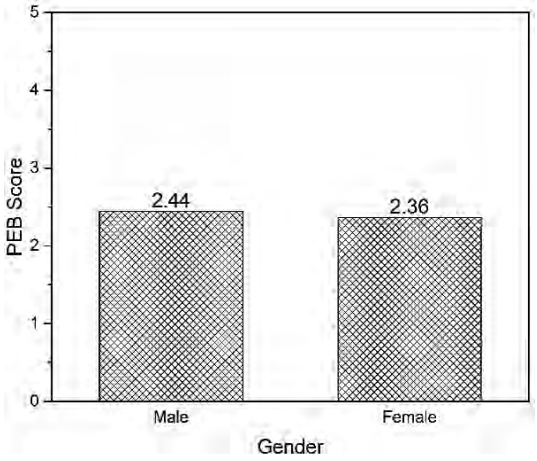


**Figure 2** Pro-environmental behavior (PEB) scores by gender. The results showed that males have higher PEB scores compared to females.

Taking care of the Earth and those harmed by environmental problems is the basis of environmentalism, a characterization that aligns with traditional feminine gender roles because caretaking is an integral part of traditional stereotypes and roles of females (Swim et al., 2020). However, the finding of this study contradicts most researchers' findings, which showed that males have relatively stronger environmental concerns and behavior than females (Hunter et al., 2004; Vicente-Molina et al., 2018).

Concerning the relationship between female (oriented to caring for others) and male (oriented to chivalry and dealing with things) behavior (Eagly & Revelle, 2022) and the concept of PEB as intentional behavior according to personal will. The males' strong environmental concerns and actions are attributed to their strong commitment to making decisions that do not harm nature. Cultural explanations which are addressed by their alignment with the living location might also be the factors that affect the PEB (Hanani & Nelmaya, 2022; Milfont & Schultz, 2016).

As a result, people might behave differently toward the natural environment based on their living location.

**Table 2** T-test for equality of means of PEB by gender

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| Equal variances assumed | 0.01 | 0.973 | 2.34408 | | 0.019 | 0.089 |
| Equal variances not assumed | | | 2.34375.040 | | 0.020 | 0.089 |

### 3.2 PEB by Location (Rural and Urban)

The place of residence is one of the factors affecting environmental behavior that needs to be explored (Berenguer et al., 2005). In this study, the PEB of students studying in rural and urban schools were compared, as shown in Figure 3. The results showed that students in rural schools scored higher in PEB than those in urban schools. The analysis of the t-test for equality of means of PEB by location category is shown in Table 3. The table shows that the mean PEB scores differed significantly between urban and rural students (sig 2-tailed < 0.05).

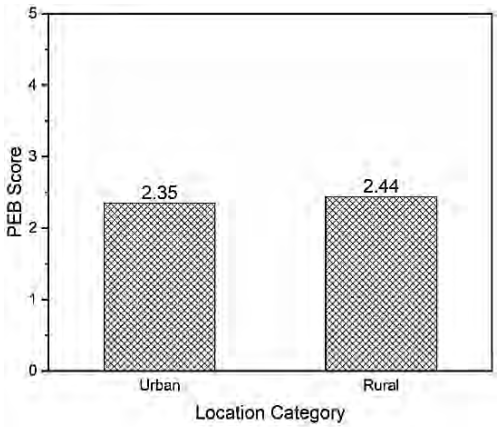


**Figure 3** Pro-environmental behavior (PEB) scores by location category. Students in rural areas have higher PEB scores compared to those in urban areas.

Despite the emotional aspect causing significant differences in PEB, urbanization also plays a role in the human relationship with nature (Celik & Aydin, 2024; Verma & Raghubanshi, 2018). These results prove that living in rural areas seems to be positively related to students' PEB, resulting in students behaving more pro-environmentally. To previous researchers, this study assumes that children living in rural areas have a higher level of contact with nature than children living in urban areas and that these natural experiences increase their responsibility (Duron-Ramos et al., 2020; Rosa et al., 2019). Place attachments that lead to habitual social actions both in urban and rural areas play a vital role in environmental behavior (Nuryadin et al., 2023b; Ones et al., 2015). Thus, students in different places/locations with different habitual actions (especially in the utilization aspect) would potentially show different intentions in environmental behavior (Cheewajaroenkul et al., 2022).

**Table 3** T-test for equality of means of PEB by location category

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| Equal variances assumed | 0.068 | 0.794 | 2.42408 | | 0.016 | 0.091 |
| Equal variances not assumed | | | 2.42407.930 | | 0.016 | 0.091 |

### 3.3 PEB Aspects by Gender

In more detail of PEB aspect by gender, Figure 4 showed that female and male students scored higher on Utilization, which is related to humans' tendency to utilize natural resources. This indicates that they failed to control their risk-taking behavior (Bogner, 2018). However, they scored low both on Preservation and Appreciation, supporting the previous finding that Utilization is unrelated to Preservation and Appreciation (Mónus, 2021a). The analysis of the t-test for equality of means of PEB aspects by gender is shown in Table 4. The table shows that the mean PEB aspects scores differed significantly in the Appreciation of nature aspects between male and female students (sig 2-tailed < 0.05).

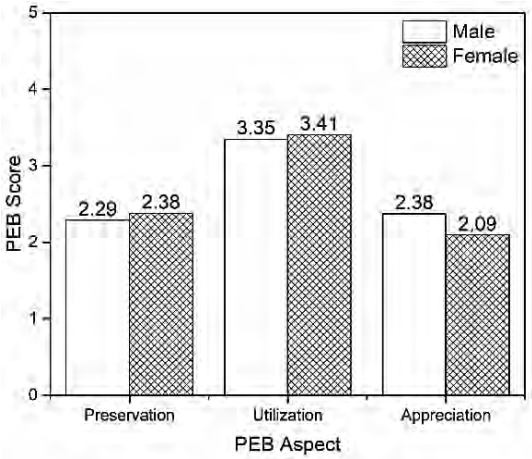


**Figure 4** Pro-environmental behavior (PEB) scores by gender for each aspect. The results indicate gender-based differences in preservation, utilization, and appreciation. Females exhibit higher scores in preservation and utilization, whereas males show higher scores in appreciation.

**Table 4** T-test for equality of means of gender

| Aspect | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig.(2-tailed) | Mean Difference |
| Appreciation | Equal variances assumed | 0.733 | 0.393 | 4.17 | 408 | 0.000 | 0.288 |
| | Equal variances not assumed | | | 4.14 | 364.04 | 0.000 | 0.288 |
| Utilization | Equal variances assumed | 4.482 | 0.035 | -1.07 | 408 | 0.285 | -0.060 |
| | Equal variances not assumed | | | -1.04 | 333.35 | 0.299 | -0.060 |
| Preservation | Equal variances assumed | 0.020 | 0.887 | -1.36 | 408 | 0.175 | -0.083 |
| | Equal variances not assumed | | | -1.35 | 370.26 | 0.177 | -0.083 |

In the discussion of each PEB aspect, the gender differences found here only significantly affect the Appreciation of nature aspect of students in East Kalimantan, in which males are more likely to appreciate nature based on the t-test. Both females and males have the same preference for conserving nature and utilize for environmental sake, and they are different in appreciating nature. The significant difference in appreciation aspect is related to an emotional response to nature that cannot easily change (Del Giudice, 2015). Therefore, this result represents the differences between female and male students' connection and engagement with nature. The findings informed the emotional aspect that affected PEB, which needs to be explained in future research.

### 3.4 PEB Aspects by Location (Rural and Urban)

Figure 5 shows the PEB scores by location category for each aspect. The descriptive analysis revealed that the average score for the Utilization aspect outnumbered the Appreciation and Preservation aspects, indicating that most students have utilitarian preferences toward nature. The interaction between location categories (urban and rural) and PEB aspects of Preservation and Appreciation was also calculated. However, the results showed no significant differences between these groups, as seen in Table 5. According to Utilization scores, urban students averaged 3.52, higher than rural students, who averaged 3.24. From the analysis, it is evident that the similarity of Appreciation and Preservation aspects of rural and urban students indicates the appreciation and protection of nature are under their volitional behavior.

The Utilization preferences might be nurtured in urban students as they are more familiar with Utilization phenomena in their daily lives, and their concern for their own sake is an egoistic preference (Abdullah et al., 2023; Dinurrohmah, Sulaeman, et al., 2022). Cities in developing

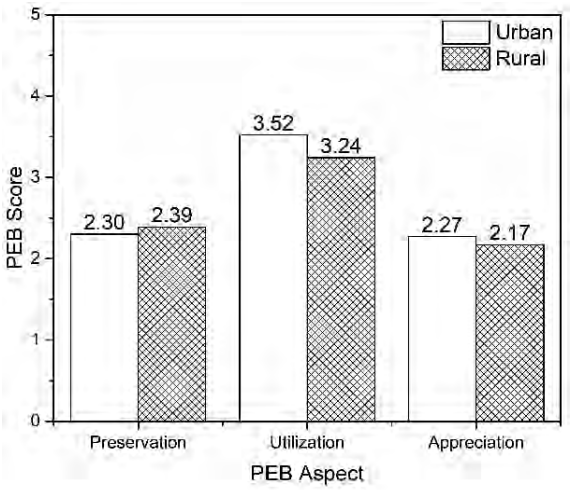


**Figure 5** Pro-environmental behavior (PEB) scores by location category for each aspect of PEB. The analysis reveals differences in preservation, utilization, and appreciation between rural and urban students. Urban students exhibit higher scores in appreciation and utilization, while rural students have higher scores in preservation

countries provide inhabitants easy access to fossil fuels and many other resources and products, which rely on a continuous input of resources predominantly originating from the rural areas, resulting in high consumption behavior in the city (Girardet, 2020). However, the significant difference in utilization experiences or phenomena between urban and rural students affected their utilization preferences.

Despite the significant difference in utilization aspect, interesting findings showed that the score for each item was significantly higher than others. Both students who live in rural and urban areas strongly agree that nature can recover on its own after being damaged. That statement clarified the connection between human behavior and human movement. The urge to utilize nature is always

**Table 5** T-test for equality of means of location

| Aspect | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig.(2-tailed) | Mean Difference |
| Appreciation | Equal variances assumed | 3.764 | 0.053 | -1.45 | 408 | 0.148 | -0.101 |
| | Equal variances not assumed | | | -1.45 | 403.04 | 0.148 | -0.101 |
| Utilization | Equal variances assumed | 4.098 | 0.044 | -5.26 | 408 | 0.000 | -0.283 |
| | Equal variances not assumed | | | -5.26 | 390.28 | 0.000 | -0.283 |
| Preservation | Equal variances assumed | 7.993 | 0.005 | 1.48 | 408 | 0.141 | -0.089 |
| | Equal variances not assumed | | | 1.48 | 398.57 | 0.141 | -0.089 |

prevailing and consistent. Humans are always encouraged to do it to avoid being left behind (da Costa, 2011). Since human utilization behavior could affect nature (Soorangkattan et al., 2021), thus, providing individuals with educational resources on sustainable utilization of nature holds significant value, as it empowers them with practical knowledge and skills to make conscientious choices regarding their interaction with the natural environment.

Regarding the result of the previous study and the constancy of scoring environmental behavior and its aspect over the years (Bogner et al., 2015), the environmental behavior of students in rural and urban areas needs to be considered. The findings in this study show the significant difference in PEB by gender and rural-urban location, which align with three critical dimensions of human existence cultural and social dimensions (Leszniewski, 2022). However, there were no significant differences for all PEB aspects. Some aspects of PEB are not significantly different, supporting the statement and phenomenon that humans (including students) are moving towards becoming more homogeneous (Ghazali, 2019). Still, encouraging other psychological aspects needs to be conducted to prepare students as future guardians, planners, and policymakers toward the environment.

To effectively stimulate students' pro-environmental behavior (PEB) in East Kalimantan, it is crucial to establish targeted educational activities in both rural and urban areas. The disparities in PEB levels observed in our study highlight the need for tailored interventions that address the unique environmental contexts of each setting. Supporting environmental development in East Kalimantan requires a robust commitment from the educational sector, which can be achieved by designing projects that integrate environmental content into the curriculum. Such initiatives can foster awareness and engagement among students, encouraging them to adopt sustainable practices. Additionally, schools can leverage frameworks like UNESCO's Education for Sustainable Development Goals (ESD), which offer valuable resources and strategies for embedding sustainability into educational programs. By implementing these approaches, educators can empower students in East Kalimantan to cultivate pro-environmental attitudes and behaviors, ultimately contributing to more sustainable communities.

## 4. CONCLUSION

The PEB of students was explored based on their gender and residence categories (rural and urban). Our results show that male students' PEB (2.44) is higher than female students (2.36). Female students tend to score lower on Appreciation and Utilization aspects, despite having higher Preservation preferences than male students. Students in rural schools scored higher in PEB than those in urban schools. Students living and studying in rural areas have a high level of contact with nature and likely promote students' pro-environmentalism. Overall results showed that most students have Utilization preferences toward nature, predominantly seen higher in students studying in Urban schools. According to descriptive analysis, the aspects of Preservation and Appreciation of nature between urban and rural areas showed insignificant differences. Our findings highlight the need for targeted interventions to enhance environmental appreciation and utilization among female students and strengthen connections to nature for urban students through outdoor education and community projects, especially in East Kalimantan. Policymakers should incorporate these insights into inclusive environmental education curricula, while future research should explore socio-cultural influences on PEB to inform effective strategies.

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