Ecological Affinity of Student and Teacher:

A Case Study in Senior Secondary High Schools in Tangerang Selatan

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***Abstract*— Ecological Affinity is defined in this paper as relationships conceived by human beings with their surrounding environment for sustainable development. Ecological affinity elucidates beliefs, attitudes, and intentions towards environmental sustainability expressed by human beings. This study features qualitative analyses investigating ecological affinity in the small scale of school environment of students and teachers. Two key questions were addressed in this study, i.e. how does ecological affinity appear in students' and teachers' beliefs, attitudes, and intentions in South Tangerang? How does ecological affinity of the students and teachers intersect or intercrossing? A survey was administered to teachers teaching in state senior high schools and students of the schools. Respondents participating in this study are 250 students and 43 teachers originate from 2 public schools. A descriptive analysis was conducted to explore ecological affinity and its reciprocal relations between the students and teachers. Results of the study indicate that both students and teachers show similarly their positive attitudes towards the environment (F=0.523, p=0.117, M=2,122 - 2,049). This performance correlates positively with their beliefs in the priority of country development (r=2.41, p=0.00). Further analyses indicated that both teachers and students showed conformity in reciprocal ecological affinity. This result was indicated by the insignificance differences between teachers and students (F=2.63 p=011). In terms of relationships between environmental beliefs and students' and teachers' attitudes towards the environment, the study found that attitudes towards the advancement of science and technologies have led to stronger intentions of students. This study recommends that more activities be shared between students and teachers regarding environmental sustainability.**

Keywords*— *Ecological Affinity; Student; Teacher; Senior High School

I. INTRODUCTION

Over generations, countries in the world have been continuously developing science and technology with inappropriate consideration of the consequences to the natural environment of each step in that development [1-6]. Technocrats have valued the consequences for human lifestyles without cognizance of the impact on the natural environment [7-8]. Ref. [9] commented, "The supposed detachment of human relations from scientific development has allowed, for the sake of profit, the development of agriculture technologies that are inhumane". The term "inhumane" corresponds with [8] explanation, suggesting that the progress led by a science-based technology and motivated by economic growth and efficiency is threatening to human survival. However, even though the risks of such progress have been recognized, the tendency still continues based on a techno-centric human belief that the natural environment exists to be subdued [7] and that human domination of nature is legitimate and necessary despite the associated human health risks [10].

Ref. [11] linked these attitudes to human lifestyles. For them, current human attitudes towards urban lifestyle are problematic, because humans have so conquered the natural physical environment that they appear to be essentially removed from its influences, especially in the industrial, urbanized nations [2] [7] [8]. The recognition of the impact of human lifestyles on climate has led to the intense current debate regarding climate change. Some scholars conceive of attitudes as consisting of cognition, affection, and behavior [12]. Some others characterize attitudes as an enduring concept stored in memory to be retrieved accordingly.

However, researches in this area have indicated that attitudes were likely to become a most distinctive and indispensable concept when attempting to understand human behavior [13-15], and that some attitudes are central to a person's self-concept. This concept of attitudes allows the researcher to understand a situation where the person who develops an attitude towards an object may or may not continue or intensify the relationship with the object, depending on how the person constructs the value as to the relationship. Explain this situation by suggesting that, "individuals often search for and select information that confirms their beliefs and attitudes rather than information that may disconfirm them." To some extent, these conceptions of attitudes correspond to the concepts of learning as a process of constructing meaning [16]. This explanation will be explored in the first following subsection regarding learning and attitudes.

Overall, it is obvious that humans' attitudes towards the environment should reveal their central values regarding it. Some are so dominant to the environment as they consider that the values are enduring concepts stored in memory to be retrieved temporarily. While the others conceive harmonious relationships with the environment as they build a process of constructing meaning with it. These both attitudes towards the environment represent humans' affinity towards it.

This study aims at finding two key questions addressed to this study, namely, how does ecological affinity appear in students' and teachers' beliefs, attitudes, and intentions in South Tangerang? How does ecological affinity of the students and teachers intersect or intercrossing?

Many practitioners in environmental education have developed scales measuring environmental attitudes [17-19]; see for examples: [20-21]. The latter scale concerning education for the environment was designed to provide ideas in fundamental contrast to the dominant social paradigm which emphasizes anthropocentric ideas that the natural environment exists solely for the human benefit. This scale as National Environmental Paradigm (NEP), aiming at exposing humans' affinity to the environment [22]. This paper then adapts the NEP scale as a measure of an affinity between human beings and their surrounding ecological environment. The adaptation was previously reported by [1].

English Oxford Living Dictionary has defined affinity as "a natural liking for and understanding of someone or something. Whereas, the term ecology has been defined as a branch of biology that deals with the relations of organisms to one another and to their physical surroundings. It is apparent that both affinity and ecology contain at least two key points, namely closeness of relationship and understanding of such the close relationship. These suggest that the closeness of the relationship between human beings and surrounding environment must be perfected by a quality of understanding regarding such the relationships. As a result, this paper suggests a proposition for Ecological Affinity as ecological relationship conceived by human beings regarding their environment for sustainable development. It describes beliefs, attitudes, and intentions towards environmental sustainability expressed by human beings.

As mentioned above, Ecological Affinity describes beliefs, attitudes, and intentions towards environmental sustainability expressed by human beings. This suggests that such the affinity reveals three aspects of the ecological relationships between human beings and their environment, namely environmental belief, attitudes, and intensions. Therefore, at this stage, a scale designed to measure this affinity include these aspects of the affinity.

The first part of the scale quantifies the extent to which the respondents believe that the topic of environmental sustainability should be taught in the school. For this aspect, we invited them to decide which of the two statements they thought was best for classroom teaching. The statements are "Option 1: Indonesia should concentrate on economic improvement and growth, although for certain matters it can affect the damage to the environment or Option 2: Indonesia should concentrate on environmental protection although in certain cases it can hamper the rate of improvement and economic growth."

The second part of the scale measures to the extent to which human beings shows their attitudes towards the environment that he or she deals with in their daily activities. This scale contains 12 item attitudinal statements which are grouped into three attitudinal clusters indicating three characteristics of attitudes of, respectively, Valuing Science and Technology (SAT), People Dominating Natures (PDN), and Limits of Growth (LOG). Each of those attitudes is shown in the following tables.

TABLE I. ECOLOGICAL AFFINITY SCALE VALUING SCIENCE AND TECHNOLOGY

No.	Left Statement	Right Statement
1	Science and technology have improved our quality of life	Science and technology have worsened our quality of life
2	Modern technology has increased our freedom and independence	Modern technology has reduced our freedom and independence
3	Science and technology will always be able to find solutions to our problems	Science and technology often create more problems than they solve
4	Complex technologies can be made virtually risk-free through continual improvements	Complex technologies will always be risky because of the chance of human error

The above Table I lists items of the scale measuring the extent to which students value the advancement of science and technology. The orientations of attitudes of this scale move from acceptance attitudes (on the left hand-side) to cautious attitudes (on the right hand-side) towards the role of the advancement of science and technology in human life. Responses on the scale items are together considered as attitudes towards the valuing science and technology (SAT).

TABLE II. ECOLOGICAL AFFINITY SCALE – THE LIMITS OF GROWTH

No.	Left Statement	Right Statement
1	Because we are human, we are not subject to the laws of nature as are other species	Despite our abilities, humans are subject to the laws like other species
2	Natural resources should be used for the benefit of future generation	Natural resources should be saved for the benefit of future generations
3	The earth is vast, with almost unlimited room and resources	The earth is like a spaceship, with limited room and resources
4	Nature should be used to produce goods for people	Nature should be preserved for its own sake

Table II lists items of the scale measuring student sensitivity towards the fact that the earth is limited to room and resources. Orientations of the items range from ignorant attitudes to sensitive attitudes towards the environment. Responses on these scale items, as a whole, are considered as attitudes towards accepting the limits of growth.

The limits of growth are the attitude scale where a person rates their views in relation to living alongside the environment, appreciating that this earth has limited room and resources, and their sense of the importance of living in harmony with the environment. These attitudes are linked to an understanding of sustainable changes in the economic and social environment.

TABLE III. ECOLOGICAL AFFINITY SCALE – PEOPLE DOMINATING THE NATURE (PDN)

No.	Left Statement	Right Statement
1.	Nature should be changed to meet people's needs	People should adapt to the environment whenever possible
2.	The balance of nature is strong enough to cope with the impacts of industrial countries	Modern industrial countries are very seriously disturbing the balance of nature
3.	Economic growth should be given priority over environmental protection	Environmental protection should be given priority over economic growth
4.	People must learn to control nature in order to survive	People must learn to live in harmony with nature to survive

Table III lists items of the scale measuring the extent to which respondents recognize the need to maintain the balance of the natural environment. Responses on these scale items as a whole indicated their agreement to protect the balance of the environment, as opposed to exploiting the environment. This scale refers to the attitudes that a person has towards becoming responsible towards the environment.

The third part of this ecological affinity scale measures the ideas of reciprocal attitudes of students and teachers who are among one of the others interact intensively in their school-day lives. The basic assumption for these reciprocal attitudes is that students see and demonstrate their teacher's exemplary behavior towards the environment. Similarly, the teachers observe and evaluate the performance of appearing students' attitudes toward the environment. This scale, therefore, aims at revealing teachers' and students' beliefs towards each other regarding how each of them reacts to the environment. This scale contains 10 item statements as indicated in Table 4.

Finally, the scale measures intention. It examines to what extent respondents believe that they are willing to participate in environmental actions for sustainability and to improve their knowledge in order for being part of environmental actions.

TABLE IV. RECIPROCAL ATTITUDE SCALE

No.	Statements to students	Statements to teachers
	Do you agree that your teachers demonstrate the following activities?	***Do you agree that your students demonstrate the following activities?***
1	Selecting products that are safe for the environment	Selecting products that are safe for the environment
2	Deciding to recycle used product rather than throw it to the environment	Deciding to recycle used product rather than throw it to the environment
3	Invite other teachers who act to harm the environment to act better to the environment.	Invite other students who act to harm the environment to do better to the environment.
4	Participate in the cleanliness of the school environment together with other teachers	Participate in the cleanliness of the school environment together with other students
5	For the environmental sustainability, teachers tend to avoid excessive use of water	For the environmental sustainability, students tend to avoid excessive use of water
6	Teachers seek to enrich knowledge related to the environment	Students seek to enrich knowledge related to the environment
7	Teachers participate in reforestation activities (reforestation) in the school environment	Students participate in reforestation activities (reforestation) in the school environment
8	For the environmental sustainability, teachers tend to avoid the use of pesticides	For the environmental sustainability, students tend to avoid the use of pesticides
9	For the environmental sustainability, teachers tend to use natural fertilizer rather than artificial fertilizer for gardening	For the environmental sustainability, students tend to use natural fertilizer rather than artificial fertilizer for gardening
10	Teachers tend to avoid using products containing Aerosol elements	Students tend to avoid using products containing Aerosol elements

II. RESULT AND DISCUSSION

A. Instrument Validity and Reliability

Prior to discussion on the results of the survey, this section describes the results of reliability and validity testing of the survey instrument. Implied that reliability and validity constitute a tool to represent the degree of consistency and authenticity of an instrument. As mentioned in the methodology section above, the instrument of this study was composed of rating scale items (scaling in four categories).

This study used SPSS v.23 to gain reliability coefficients of internal consistency for the instrument. For this purpose, a value of Cronbach's Alpha was determined based on item-total correlational testing to reveal if any item in the set of instruments was inconsistent with the averaged responses of the others. Using this method of reliability testing, it was found that Cronbach's Alpha value of the instrument was 0.431. This demonstrated a moderate level of internal consistency for the instrument. As for critical r_Table (2-tailed) at 0.05 level of significance with the amount of data (N) = 307 was 0.112, then it was found that the Alpha value of 0.431 was higher than r_Table value of 0.112. Therefore, the overall research questionnaire was considered reliable.

Further detail analyses presented in Table III show the results of the item-total correlation computation for each item of the instrument. It is apparent in the table that all the Alpha values are higher than r_Table, suggesting that none of the items of the instrument set were inconsistent with the total averaged responses. The results signified that all items of the instrument have strong validity.

TABLE V. RESULTS OF ITEM-TEST VALIDITY

No. Item	Category of Scale	Corrected Item-Total Correlation (r_Alpha)	r_Table (*N*=307)	Decision
1	Belief	0.235	0.112	Valid
2	SAT-1	0.312	0.112	Valid
3	LOG-1	0.212	0.112	Valid
4	PDN-1	0.189	0.112	Valid
5	SAT-2	0.538	0.112	Valid
6	LOG-2	0.296	0.112	Valid

No. Item	Category of Scale	Corrected Item-Total Correlation (r_Alpha)	r_Table (*N*=307)	Decision
7	PDN-2	0.151	0.112	Valid
8	LOG-3	0.160	0.112	Valid
9	PDN-4	0.253	0.112	Valid
10	SAT-3	0.172	0.112	Valid
11	SAT-4	0.155	0.112	Valid
12	PDN-3	0.234	0.112	Valid
13	LOG-4	0.229	0.112	Valid
14	Recipr 1	0.144	0.112	Valid
15	Recipr 2	0.140	0.112	Valid
16	Recipr 3	0.125	0.112	Valid
17	Recipr 4	0.127	0.112	Valid
18	Recipr 5	0.121	0.112	Valid
19	Recipr 6	0.146	0.112	Valid
20	Recipr 7	0.191	0.112	Valid
21	Recipr 8	0.144	0.112	Valid
22	Recipr 9	0.146	0.112	Valid
23	Recipr 10	0.312	0.112	Valid
24	Intent 1	0.212	0.112	Valid
25	Intent 2	0.189	0.112	Valid
26	Intent 3	0.538	0.112	Valid
27	Intent 4	0.296	0.112	Valid

B. Environmental beliefs, attitudes, and intentions

As [10] [23] mentioned, human beings have a tendency to continue, based on a techno-centric human, to believe that the natural environment exists to be subdued. In the case of students' and teachers' beliefs in this study, as shown in Table VI, a relative contrast situation existed in which both of the respondents believed that environmental protection needed to be put as a priority in comparison with economic development. This positive situation has no significant differences between the students and teachers (F= 0.27, p=0.61, M=1.79-1.81).

TABLE VI. TEACHERS' AND STUDENTS' BELIEFS

Respon-dents	Beliefs		Total
	Economy development	*Environment protection*	
Teachers	9	34	43
Students	48	202	250
Total	57	236	293

With regards to attitudes between those students and teachers is shown in Table VII. A similar situation with their beliefs, students' and teachers' attitudes was also insignificant different. Their attitudes have moderately positive towards the environment.

TABLE VII. TEACHERS' AND STUDENTS' ATTITUDES

Attitudes	F Value	*P* value	Mean Diferences (MD)
SAT	0.178	0.674	2.19 – 2.28
PDN	1.158	0.283	2.13 – 1.96
LOG	1.897	0.169	2.05 – 1.92

A slightly different situation existed in their atention. Students have shown thier stronger intention than teachers in thier intention to both contribute to environmental protection and discussion among them in and out of thier classroom (F=3.659, p=0.00, M=2.01tch – 2.48std).

C. Relationship between beliefs, attitudes, and intentions

The following discussion deals with the correlations between their beliefs and attitudes and intention. The relationship, in this section, is based on the assumption that intention constitutes the goal towards which beliefs and attitudes need to be directed [19]. Assessment of this assumption is represented by further exploration using a radar type of chart showing relative positions of the aspects of beliefs and attitudes to intention based on their mean values.

The crossed-points connecting all aspects of beliefs and attitudes to intention, as indicated in the chart, were plotted by recounting results of the original mean values of the aspects after subtraction from the original mean value of the intention. This process results in a new score of the intention of 0 (zero) that, in the chart, has a position at the center for other surrounding aspects, namely, aspects of environmental beliefs and three aspects of environmental attitude. The principle for understanding the points in the chart is as follows: The closer the variables are to the center, the stronger the relationship of the variables with intention.

In general, the relationships between environmental beliefs and students' and teachers' attitudes towards the environment indicates that attitudes towards the advancement of science and technologies have led to stronger intentions of students. This situation is indicated in Figure 1, showing the blue curve of students that is more stretched into the center of the graph.

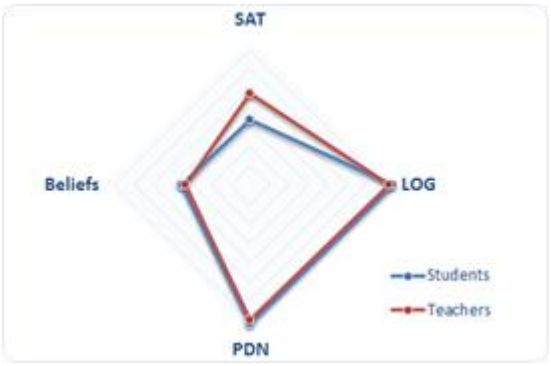

Fig. 1. Relative positions of student beliefs and attitudes with intentions (Center of the web)

Finally, this study demonstrates reciprocal relationship between students and teachers. Figure 2 indicates that among the ten attitudes, there were two attitudes which show different tendency regarding relative positions between the respondents, namely those were coded as Recip-3 and Recip-5. These two

attitudes were about asking people to act in positive ways to the environment including in using water. In this case, the teachers were considered lack of exemplary action for their students in these two aspects.

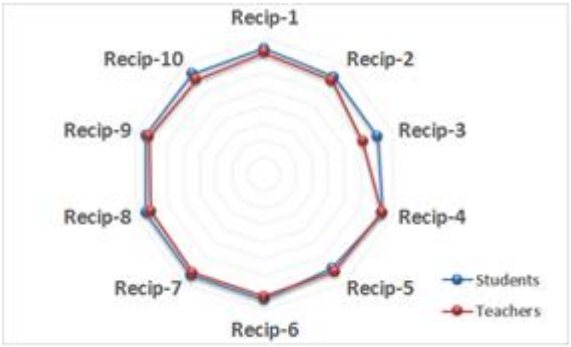

Fig. 2. Relative positions of student beliefs regarding their teachers' attitudes towards the environment

III. Conclusion

As mentioned in the beginning of this paper, this study has dealt with two issues, i.e. how does ecological affinity appear in students' and teachers' beliefs, attitudes, and intentions in South Tangerang? How does ecological affinity of the students and teachers intersect or intercrossing?

As for the first question, it is obvious that attitudes towards the environment should reveal central values regarding it. It may be someone who is so dominant to the environment as they consider that the values are enduring concepts stored in memory to be retrieved temporarily. With regards to this preposition, at school settings, this study found that both teachers and students have relatively been positive in their beliefs in considering the priority of country development.

This belief has to some extent related to their moderate attitudes towards the environment. Both teachers and students considered that the advancement of science and technologies was important, but as the citizen of this Earth, they admitted that they must be living in a harmony with the environment. This has led to their relative positive intention to act in positive ways towards environmental protections. Students, in this case, have more positive intention as they have a stronger attitude towards the environment.

As for the issue of students and teachers intercrossing attitudes, this study found that teachers have demonstrated lack of exemplary actions regarding environmental protections. The students, in this case, have lack of confidence that the teachers tended to be stronger in their attitudes towards the environment.

Above all, the ecological affinity of students and teachers has not been a significant difference. They shared their beliefs in the necessary environmental protection that their attitudes grew relatively in coherent. Intercrossing attitudes has necessarily critical to enable maintaining constructive attitudes and stronger intention to act positively in environmental protection.

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