The Effect of Demographic Factors on Environmental Knowledge of University Students in Indonesia

by Marheny Lukitasari

The effect of demographic factors on environmental knowledge among university students

Akhmad Sukri[1], Muhammad Arief Rizka[2], Hadi Gunawan Sakti[3], Marheny Lukitasari[4], Elly Purwanti[5]

[1]Department of Biology Education, Faculty of Applied Science and Engineering, Universitas Pendidikan Mandalika, Mataram, Indonesia
[2]Department Nonformal Education, Faculty of Education and Psychology, Universitas Pendidikan Mandalika, Mataram, Indonesia
[3]Department of Educational Technology, Faculty of Education and Psychology, Universitas Pendidikan Mandalika, Mataram, Indonesia
[4]Department of Biology Education, Faculty of Natural Science Education, Universitas PGRI Madiun, Madiun, Indonesia
[5]Department of Biology Education, Faculty of Teacher Training and Education, Universitas Muhammadiyah Malang, Malang, Indonesia

Article Info

ABSTRACT

This study explored and revealed the demographic factors that influence students' environmental knowledge (EK) in Indonesia. This survey research involved 1.345 students from 15 universities across Indonesia. The research employed a validated questionnaire on EK and was modified to match the circumstances in Indonesia. The instrument consisted of six statements with five scales namely 1=strongly disagree, 2=disagree, 3=indifferent, 4=agree, and 5=strongly agree. Five demographic variables were tested together to determine their effect on students' EK. Descriptive analysis, analysis of variance (ANOVA), and multiple linear regression were used to test the independent variables. The result of the study revealed that gender, study program, grade point average (GPA), and parents' occupation variable have an effect simultaneously on students' EK ($p<.05$) with a contribution of 6.2% (R square=.062), while the students' grade variable has no effect on EK ($p>.05$). Female students have better EK than male students ($p<.05$). The trend showed that the higher the GPA, the higher the EK of the student ($p<.05$). Hence, the trend showed that students whose parents have lower income tend to have better EK than those whose parents have higher income. Students in science education and computer course have better EK than science, non-science education, and social humanities study programs. This study implicated the importance of introducing environmental insights through education to increase students' EK in higher education.

Corresponding Author:

Akhmad Sukri
Department of Biology Education, Faculty of Applied Science and Engineering,
Universitas Pendidikan Mandalika
Dasan Agung Baru, 83125 Mataram, Kota Mataram, Nusa Tenggara Barat, Indonesia
Email: akhmadsukri@undikma.ac.id

1. INTRODUCTION

As time goes on, environmental problems continue to emerge and become challenges at regional and even international levels. Some environmental damages that need urgent attention and action are water pollution by agricultural waste and microplastics, climate change, soil erosion, population growth, illegal logging, and biodiversity loss [1]. In Asia, four environmental issues become the primary concern: climate change, air pollution, water availability and quality, and land-use change because they negatively impact the environment [2]. Environmental damage does affect not only the environment itself but also a source of

disease, disrupting the life of organisms in the biosphere [3], causing health problems, and having an impact on long-term livelihoods or socio-economics [4], [5].

Environmental damage is caused by two factors, namely human injury and natural damage [6]. Among these two factors, humans are the leading cause of environmental damage [7]. Industrialization, deforestation, and overpopulation are some of the human activities that cause environmental damage. In contrast, natural environmental damage is caused by several factors such as fires, floods, hurricanes, and droughts [6]. Environmental problems that occur today are a shared responsibility. As the leading cause of environmental damage, humans have an enormous obligation to restore environmental balance. Therefore, steps are needed to increase human awareness of the surrounding environment to reduce environmental damage to the lowest level [7].

Environmental knowledge (EK) is needed to solve environmental problems. EK underlies behavior [8] and is very important because it can influence pro-environmental behavior [9]. General knowledge about the relationship between the environment and ecosystems, especially regarding the facts and concepts, is called EK [10]. EK is related to the knowledge and awareness of environmental problems and solutions in solving these problems [11]. According to Frick, Kaiser, and Wilson [8], EK is divided into system knowledge, action-related knowledge, and declarative knowledge. System knowledge is defined as "knowing what", while action-related knowledge relates to behavioral choices and possible actions on environmental problems. Meanwhile, declarative knowledge relates to the knowledge about the effectiveness of actions taken in overcoming environmental problems.

EK is essential because it is a variable that underlies a positive attitude towards nature that serves as a motivation to engage in an ecologically responsible lifestyle [12]. Several studies have been conducted to measure EK on both the general public and students [13]–[15]. In Indonesia, the environmental damage is massive, while public environmental awareness is deficient [16]. Therefore, EK needs to be improved, and studies on the factors that influence it need to be carried out. Not many researchers have studied the factors that affect college students' EK, especially in Indonesia. Demographic factors such as education level and type of parents' occupation affect the EK of junior and senior high school students [17]. Meanwhile, no information that reveals the influence of demographic factors on EK at the university level in Indonesia. Although, this information is important to determine strategic steps in increasing student EK.

Demographic factors can affect aspects of student EK. Kollmuss and Agyeman [18] revealed that gender factors directly relate to students' attitudes and behavior towards the environment. Further stated that women have lower EK than men but are more concerned about environmental damage than men. In addition, women have better environmental attitudes than men and have a tendency to change compared to men [19]. This research indicates the importance of revealing the influence of demographic factors on students' EK. Nevertheless, Indonesian students have good EK [20]. However, it is not clear what factors influence this high level of knowledge; how is the level of EK of students of different genders?; and the influence of other factors such as majors, grade point average (GPA), parents' occupations, and grade/semester on students' EK. Therefore, research to reveal the influence of demographic factors on students' EK needs to be done. This study aimed to examine the effect of demographic factors on college students' EK.

2. RESEARCH METHOD

This was survey research [21] involving 1,345 students from 15 universities throughout Indonesia conducted in the 2020/2021 academic year. The universities were chosen randomly, representing all Indonesian students in the western, central, and eastern regions. The research instrument used is an EK questionnaire adopted from Raymond *et al.* [22] and adapted to the current circumstances in Indonesia. The instrument consists of six statements: EK 1 (throwing garbage in rivers can damage marine ecosystems); EK 2 (using an air conditioner can cause the thinning of the ozone layer); EK 3 (exhaust gas from motor vehicles can cause air pollution, and climate change); EK 4 (excessive use of detergent can result in the death of aquatic animals); EK 5 (illegal logging can result in loss of clean water sources and natural disasters); and EK 6 (overpopulation resulted in many natural areas being destroyed for development). The instrument uses 5 scales, namely: 1=strongly disagree; 2=disagree; 3=indifferent; 4=agree; and 5=strongly agree.

Five demographic variables, namely gender, study program, GPA, parent's occupation, and grade, are tested together to determine their effect on students' EK. Gender variables are divided into male and female. The study program variables are divided into four, namely science education, science, social humanities, and computer science. The GPA level is divided into three, namely low (GPA<3), medium (GPA=3.00 to 3.49), and high (GPA>3.5). Students' grade level is divided into four: freshman, sophomore, junior, and senior. Meanwhile, the variables of parent's occupation are divided into five, namely civil servants, private company employees, entrepreneurs, farmers, and freelancers.

The data analysis uses descriptive statistics to calculate the frequency, mean, sum, and deviation standard. Meanwhile, to determine the effect of demographic variables on students' EK, multiple linear regression analysis is carried out [23]. An analysis of variance (ANOVA) analysis is carried out to ascertain the significance of each sub-variable followed by a post hoct test [24]. The data analysis is assisted using statistical product and service solutions (SPSS) for Windows software [25].

3. RESULTS AND DISCUSSION

To determine the effect of gender, study program, GPA, grade/semester, and parents' occupation variables on students' EK, multiple regression analysis is conducted. The regression analysis results show that the effect of the tested independent variables could be predicted by the regression model ($p<.05$). Taken together, these variables affect students' EK with a contribution of 6.2% (R square=.062). The results of the regression analysis are shown in Table 1.

Table 1. Regression analysis result

Model	Sum of squares	df	Mean square	F	Sig.	R	R square	Adjusted R square	Std. Error of the estimate
Regression	14271.884	5	2.854.377	17.822	.000a	.250a	.062	.059	12.65539
Residual	214452.654	1339	160.159						
Total	228724.538	1344							

a. Predictors: (constant), parents' occupation, study program, GPA, grade, gender; b. Dependent variable: EK

The results of the analysis in Table 1 were analyzed further to find out how each variable affects students' EK therefore a regression coefficient analysis was carried out, and the results are shown in Table 2. Table 2 shows that the variables of gender, study programs, GPA, and parents' occupations affect students' EK ($p<.05$), while another variable, grade, does not affect students' EK ($p>.05$). Three variables, namely gender, study programs, and parents' occupations, have negative coefficient values, indicating that the influence of these three variables is negative. For example, the gender variable has a coefficient value of -4.118; this indicates that every 1% addition of gender, can increase students' EK by -4.118. Of course, in this research, it becomes irrational so that this negative value can be ignored. Therefore, some researchers suggest controlling the sign and value of the regression coefficient to produce a meaningful result [26]. To obtain a more detailed analysis of how the demographic variables affect students' EK, descriptive analysis and ANOVA are carried out for each of these variables.

Table 2. Regression coefficient analysis result

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	86.150	2.564		33.596	.000
Gender	-4.118	.771	-.145	-5.340	.000
Study program	-1.204	.401	-.082	-3.006	.003
Grade	.283	.366	.021	.774	.439
GPA	3.362	.644	.140	5.220	.000
Parents' occupation	-.576	.257	-.060	-2.241	.025

3.1. The influence of gender on EK

The regression analysis results show the influence of gender variables on students' EK. Post hoct analysis on gender variable results indicates that those female students have better EK than male students, see Table 3. The results of this study contradict the results of several previous studies. The research results with the subject of elementary, junior high, and high school students found that gender did not affect students' EK [27], [28]. This means that both male and female students have the same EK. It also contradicts other studies which show that men have better EK than women [19], [29], [30]. This study does not even support those two hypotheses that find those female students have better EK than male as seen in Table 3.

Table 3. Post hoct analysis on gender variable

Variable	N	Mean	Std. Deviation	Std. Error	Sig.
Female	941	87.0988	11.42391	.37241	.000
Male	404	81.9721	15.64336	.77829	

The results of this study are in line with the research [31] which found that female students' EK was higher than that of male students. The difference in the results obtained in this study may be caused by the EK instrument used. This instrument has been adapted to Indonesia's circumstances and environmental issues, so it has a different context than what is happening in other countries. Therefore, this study shows that new findings describe contextual EK in Indonesia. To determine the ability of male and female students in each aspect of EK, a descriptive statistical analysis is carried out, which is shown in Figure 1.

Figure 1 describes the number of respondents with the terms disagree, indifferent, and agree for each aspect of EK. The term 'disagree' is a combination of respondents who answered 'strongly disagree' and 'disagree,' while the term 'agree' shows the number of respondents who answered 'agree' and 'strongly agree.' Figure 1 is proof that female students' knowledge is better than male students. In the first EK aspect (EK1), which is "throwing garbage in the rivers can cause damage to marine ecosystems," there are more female respondents who choose 'agree' than male respondents. This indicates that female students have a better understanding than males of the impact of throwing garbage in the river. In the second aspect (EK2), which is "the use of air conditioning can cause the thinning of the ozone layer", female students also have a deeper understanding than male students. This can be seen from the large number of female respondents who answered agree to the statement. The same trend also occurs in EK3 (motor vehicle exhaust can cause air pollution and climate change), EK4 (excessive use of detergent can result in the death of aquatic animals), EK5 (illegal logging can result in the loss of clean water sources and natural disasters), and EK6 (overpopulation resulted in many natural areas being destroyed for development). Figure 1 also shows that both male students and female students have a low understanding of EK, as evidenced by respondents who answered that they disagreed and were indifferent to the statements given.
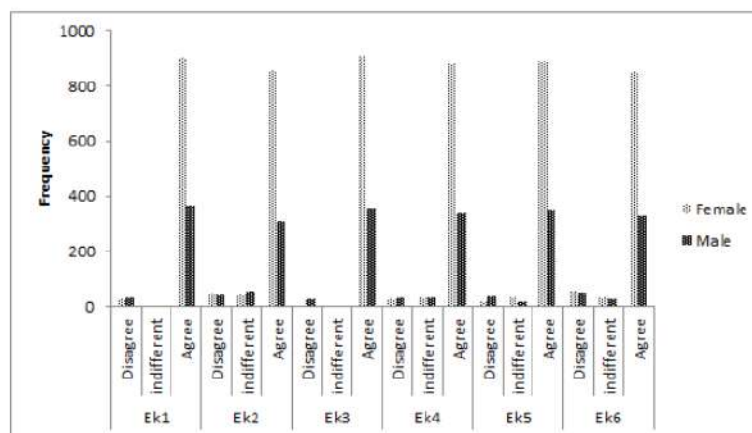

Figure 1. Analysis of EK aspects based on gender

3.2. The influence of study programs and GPA on EK

The analysis results in Table 2 show that the variables of study program and the GPA affect students' EK. The ANOVA and post hoc analyses were carried out to explore this as shown in Table 4. The analysis results in Table 4 show that students in different study programs and GPA levels have different EK ($p<.05$). To find out which study program has the most significant EK value and in what level the GPA has the highest EK value, a post hoct analysis is carried out, which is shown in Table 5.

The results in Table 5 show that students in different majors or study programs have different EK. There are four major groups: i) Social, humanities, and education; ii) Science; iii) Science education; and iv) Information technology and computer. Post hoc analysis revealed that students in the science and computer majors have better knowledge than students in science and social humanities majors. The high EK of students in these two majors, especially in the science education department, is probably because the students have already gained basic insight or understanding related to the environment. The group of science education study programs in this research are science education, biology, chemistry, physics, and mathematics. This is supported by Yusup [32] who states that the duration of environmental education in schools can affect students' EK. In addition, education plays a vital role in increasing students' EK [33].

Another thing that is considered a cause of students' high EK in the science education department is that students often interact with activities that involve direct contact with the environment. This is reinforced by Erdogan *et al*. [34] who found that students who have activities directly related to the environment have better EK than those who do not. However, this is not the case for science study programs. Ideally, science study programs are more involved with the environment, so they have the same or even better EK than science education majors. Therefore, further research is needed to examine this matter.

Table 5 also reveals that students with a high-GPA also have better EK than students with a medium and low-GPA. These results also indicate a linear relationship between students' GPA and EK. The higher the GPA, the higher the student's EK. Specifically, no previous research supports this result. The high score of students' EK scores in the high-GPA group is considered to be caused by the emotional intelligence possessed by each student. Emotional intelligence also plays a part in how far a student understands a concept and the learning outcomes. This is in accord with Anni [35] and Purwanto [36] who stated that one factor influencing learning outcomes is the level of intelligence of each student.

Table 4. Analysis of variance of study program and GPA on EK

	Variable	Sum of squares	df	Mean square	F	Sig.
	Between groups	3532.905	3	1177.635		
Study program	Within groups	225191.633	1341	167.928	7.013	.000
	Total	228724.538	1344			
	Between groups	7177.270	2	3588.635		
GPA	Within groups	221547.268	1342	165.087	21.738	.000
	Total	228724.538	1344			

Table 5. Post hoct analysis on study program and GPA variables

	Methods and variable	N	Subset for alpha=0.05		
			1	2	3
Duncan[a,b]	Study program				
	Social humanities and education	838	84.5385		
	Science	139	84.7724		
	Science education	351	88.1009	88.1009	
	Information technology and computer	17		89.8035	
Duncan[a,b]	GPA				
	Low	40	74.6662		
	Medium	429		84.0016	
	High	876			86.8189

a. Uses harmonic mean sample size = 57.094 and 105.365

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed

3.3. The influence of parents' occupation on EK

The regression analysis results prove that the parents' occupations variable affects students' EK (Table 2). To find out which occupation has the highest influence compared to others, a post hoc analysis is carried out as shown in Table 6. This table shows that there are two main groups of parents' occupations based on their value and significance. The first group is farmers, freelancers, and civil servants, and the second group consists of entrepreneurs and private company employees. Students in the second group have better EK scores than the other group of occupations. These results indicate that parents have an influence on students' understanding and knowledge of the environment. Previous research [37] proves that parents do contribute to students' environmental awareness. This is also reinforced by Damerell *et al*. [38] who state that environmental education can also be transferred from generation to generation. The results of this study strengthen the previous research [17] which found that parents' occupation affected students' EK.

Table 6. Post hoc analysis on parents' occupation

	Parents' occupation	N	Subset for alpha=0.05		
			1	2	3
	Farmer	371	83.6658		
	Freelancer	197	84.2809		
Duncan[a,b]	Civil servant/army/police	289	85.9283		
	Entrepreneur	338		87.0414	
	Private company employee	150		87.8670	
	Sig.		.071	.123	

a. Uses harmonic mean sample size=239.728;

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed

These results support previous research regarding the type of occupation that significantly influences students' EK. Table 6 shows that the private employee and the freelancers have the most significant EK value compared to other types of work. Private office workers and security employees are classified as private company workers, while entrepreneurs in this study work as small entrepreneurs, such as vegetable traders, rice traders, and others. In terms of income, freelance workers have irregular and unstable incomes to be categorized as low incomes. Even though private company employees have a steady income, it is relatively low for fulfilling the living cost in Indonesia. Considering this condition, this result is analogous to the research [39] which revealed that students with low-income parents tend to have better habits or behavior towards the environment. In addition, students with low socioeconomic status tend to have higher environmental literacy and vice versa [40]. However, this does not happen to farmers and freelancers, even though both types of work have a small income compared to other occupations. When referring to the research [41] which revealed that students with higher parental income tend to have better environmental behavior than students with lower parental income, students in these two types of work should show better knowledge compared to other jobs. In terms of employment and income, each country has different indicators. Therefore, the differences in the results obtained with previous research conducted in other countries reflect the diversity that enriches the scientific treasures according to their respective conditions.

3.4. The influence of grade on EK

The regression analysis in Table 2 shows that the probability value for the grade/semester variable is >.05, which is .439. This indicates that the grade variable does not affect on students' EK. Şahin and Erkal [31] revealed that 4th year (senior) students have better EK than students from lower years. The same thing was also found by Erdogan et al. [34] who revealed that third-year students had better environmental attitudes than first and second-year students. On the other hand, first-year students have better EK and attitudes than sophomores, juniors, and seniors [42]. The results of this study contradict the results of those two studies. The post hoc analysis results revealed no significant difference in students' EK value for first-year students, juniors, sophomores, and senior students. There is no influence of grade or semester on students' EK, allegedly because information related to the environment is not only obtained in lectures during classes. Therefore, there is no barrier for freshman students, second-year students (sophomore), third-year students (junior), and fourth-year students (senior) in obtaining this information. This is reinforced by previous researchers [43] who found that more information related to EK came from outside the school, such as from mass media and electronics (53.7%), than from education in schools (30.7%).

4. CONCLUSION

The results proved that demographic variables including gender, study program, grade point avera GPA, and parents' occupation influence students' EK, with a contribution of 6.2%. On the other hand, the grade variable does not significantly impact students' EK. Female students do better than male students for all aspects of EK. Likewise, with the GPA, the tendency shows that the higher the GPA, the higher the students' EK. Students in science education study programs have better EK than other fields such as social humanities. It confirmed that education plays a vital role in providing environmental understanding and knowledge for students. The results of this study also strengthen the previous results, which found that students with high-income parents tend to have better EK than those with lower income, but to clarify these results, further research is needed.

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BIOGRAPHIES OF AUTHORS

Akhmad Sukri 🆔 🈯 SC Ⓟ was born in Central Lombok, West Nusa Tenggara, Indonesia. He graduated Doctoral Program from Department of Biology Education, Universitas Negeri Malang in 2014. Affiliation: Study Program of Biology Education, FSTT, Universitas Pendidikan Mandalika, Indonesia. He can be contacted at email: akhmadsukri@undikma.ac.id.

Muhammad Arief Rizka 🆔 🈯 SC Ⓟ was born in Yogyakarta, Central Java, Indonesia. Affiliation: Study Program of Non-Formal Education, Universitas Pendidikan Mandalika, Indonesia. He can be contacted at email: m.ariefrizka@ikipmataram.ac.id.

Hadi Gunawan Sakti 🆔 🈯 SC Ⓟ was born in Lombok, NTB, Indonesia. He graduated Doctoral Program from Department of Educational Technology, Universitas Negeri Malang in 2016. Affiliation: Study Program of Educational Technology, Universitas Pendidikan Mandalika, Indonesia. He can be contacted at: hadigunawansakti_tp@ikipmataram.ac.id.

Marheny Lukitasari 🆔 🈯 SC Ⓟ was born in Madiun, East Java, Indonesia. She graduated Doctoral Program from Department of Biology Education, Universitas Negeri Malang in 2014. Research interest in metacognition, higher order thingking skills (HOTs), ICT and Lesson Study. Affiliation: Study Program of Biology Education, Faculty of Teacher Training and Education, Universitas PGRI Madiun, Indonesia. She can be contacted at email: marheny@unipma.ac.id.

Elly Purwanti 🆔 🈯 SC Ⓟ was born in Yogyakarta, Central Java, Indonesia. She graduated Doctoral Program from Department of Biology Education, Universitas Negeri Malang in 2014. Affiliation: Study Program of Biology Education, Faculty of Teacher Training and Education, Universitas Muhammadiyah Malang, Indonesia. She can be contacted at email: elly@umm.ac.id.

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