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IMPACT OF ENVIRONMENTAL KNOWLEDGE AND ATTITUDE ON ENVIRONMENTAL BEHAVIOR: A CASE STUDY OF SECONDARY SCHOOLS, PAKISTAN

Abstract

This study examined the impact of environmental knowledge and environmental attitude on pro-environmental behavior among 375 students of 9th and 10th grade of public and private secondary schools of Pakistan through mixed method approach. An adapted tool called "CATES" developed by Malkus, Amy, Musser, and Lynn (1993) was used to collect the quantitative data and open ended interviews were used for yielding qualitative data. Overall reliability for this tool was found to be 0.791 in Pakistani context. Association and dissociation were determined among male and female, rural and urban, and public and private students. The multiple regression analysis revealed that both environmental knowledge and environmental attitude make significant contribution, R-square = .753 (75.3 %) to the prediction of environmental behavior. Environmental attitude was found best predictor, R-square = .708 (70.8 %) while knowledge weak predictor, R-square = .428 (42.8 %) of environmental behavior. Significant differences between environmental knowledge and income of the parents of the respondents were reported. These significant differences were also found between the environmental attitude and the age groups. One way analysis of variance (ANOVA) revealed significant differences in environmental knowledge with education and income of parents, similarly these significant differences were also found in environmental attitude and education of parents. The qualitative findings highlighted three

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major themes; environmental consumption, environmental worry and environmental protection. Finally, new directions for future research in environmental knowledge and its impact on teachers and students of elementary and higher level of education are recommended..

Keywords: *Environmental education; environmental knowledge, attitude, and behavior; secondary schools*

Introduction

Environmental education should be remembered as life long process which creates sense of responsibility among the individuals. The main objective of Environmental Education is to develop awareness, knowledge, skills, attitude and participation level for solving environmental issues. Hamalosmanoglu (2012, p. 4840)

Environmental education is a learning process that enhances public knowledge and awareness of the environment and associated challenges. It develops the skills and expertise needed to address the challenges and promote attitudes, motivations, and commitments to make informed decisions to act responsibly (UNESCO, Tbilisi Declaration, 1978).

Industrialization and urbanization, has resulted in better social life, but on the other hand created multiple threats to sound and safe environment for humans and biotic life. The biotic component of environment involves three basic components namely producers (green plants), consumers (animals including human), and decomposers (micro-organisms). They are all interdependent; and imbalance in any component becomes a reason of multiple environmental issues (Sindh Textbook Board, Jamshoro, 2013).

Mughal, Qaisrani, Solangi and Faiz (2011) pointed out that there are many burning environmental issues. Some of the most important amongst these are: industrialization; over population; pollution of air, water, soil, and sound ; urbanization;

desertification; deforestation; global warming; poor conservation of biodiversity; and lack of treatment of solid and liquid wastes (pp. 17-25). The continuous growth of environmental worry sensitized the global organizations to put their heads together to think for better, safer, and sustainable measures with pro-environment activities for the well-being of humans and other creatures.

In this regard, the Stockholm Declaration on the Human Environment held on June 15-16, 1972 was the first initiative. It claims that man is the nucleus of all efforts to preserve environment or vice-versa; his life is influenced by his environment which is also affected by his activities; indispensable and safer environment is crucial for man's well-being, life itself, and for maximum enjoyment of basic human rights (Sohn, 1973. p. 436). The first Conference on Environmental Education was held in Tiblisi, reaffirmed the announcement of earlier conference "to defend and improve the environment for present and future generations have become an imperative goal for mankind." It strongly suggested that "Environmental education should be provided for all ages, at all levels and in both formal and non-formal education" (UNESCO, 1978, p. 24). Another international organization aimed at maintaining life-supporting systems; preserving bio-diversity; and to ensuring sustainable utilization of resources or species. It listed their importance, hurdles, and specific actions and strategies at governmental, conservationist (concerned with living resources) and development practitioners' levels (aiding agencies, industry, and commerce) (IUCNN, 1980, pp. IV-VII).

Pakistan being a member and signatory to the declarations of United Nations, SAARC, and other international organizations, took efforts for environmental protection through different legislations and actions. Federal Ministry of Environment was established in Pakistan in 1994. Later on, an environment department was started in all four provinces. Pakistan

Environment Protection Act (PEPA) was passed in 1997, and National Environment Quality Standard (NEQS) was established at federal level (Farooqi & Fatima, 2010, pp.1- 8). National Conservation Strategy has been framed as a result of World Conservation Strategy, but majority of the masses and other stake holders are unaware of these.

National Education Policy 2009 is worried over worsening environmental issues and provided policy action in these words, "Environmental Education shall be made an integral part of early education" (MOE, Government of Pakistan, 2009, p. 36). In an Environmental overview, Mahmood (2006) wrote that Pakistan covers 0.7 percent of the area of the globe and more than 2% of the world population, but is unable to redress the effects of environmental degradation because of poor social services, awareness among individuals, and lack of interest of the government institutes (p. 1). Yousuf and Bhutta (2012) performed a content analysis of elementary curriculum with respect to environmental education. They found that it does not involve a well-established environmental education and is somewhat integrated with science and other curricula (p. 3). They conducted their quantitative study aimed at studying secondary students' attitude towards environmental issues in the context of Karachi (Pakistan) through a questionnaire adopted from Relevance of 'Science Education' (ROSE) across 312 public and private secondary schools. The study revealed insignificant difference among students' attitude towards environmental issues throughout the gender (p. 19). Larijani and Yeshodhara (2008) suggested that there is dire need to develop environmental consciousness across all ages, all sections of society, and educational institutions at all levels (p. 199).

Ali, Khan, Ahmed and Shahzad (2011) found from 400 undergraduates and graduates at Islamabad that they were ready to buy green products, the eco-friendly things but their prices were expensive to purchase (p. 223) however, Hamid, Ghafoor and Shah

(2012) in similar study from 300 graduates or higher degree holders, did not find significant association between environmental awareness and green purchase (eco-friendly things) across gender, age, and education (p. 112).

Environmental education is not touched seriously, and hardly any study is available about environment at secondary level, that has ever studied in association between students' environmental awareness and attitude on their environmental behavior. It calls for deeper analysis in this regard.

Statement Of The Problem

There is a growing concern about the state of the environment all around the world. Environmental issues such as global warning, ozone depletion, deforestation, diseases, and population explosion have captured the attention of the world. The rising environmental worry sensitized the global community to put their heads together to think about the sorrowful state of environment. Sensitivity towards environmental issues leads the developing and developed countries to take careful environmental steps for the healthy environment through increasing the environmental knowledge of the learners (Shah and Jehangir, 2006, pp. 566 - 568).

Orr (1996) pointed out that in our teaching and learning system, we are not really teaching science, environmental awareness, knowledge, attitude, and meaningful activities. But we are teaching only dead words without inculcating clear concepts to the learners (p.30).

According to Larijani and Yeshodhara (2008) there was a dire need to develop environmental consciousness across all ages, all sections of society, and all educational levels (p 199). Environment related issues are no longer a matter of choice. There is a wide felt need for pooling up of resources in order to help and solve environment related problems. A school as a social institution bears the responsibility to produce individuals sensitive to the

environment they live in. Unfortunately, the case in Pakistan is otherwise. The environmental knowledge, attitude and behavior of the secondary school students are very much neglected in our education system.

Thus, this study was aimed at exploring the impact of environmental knowledge and attitude on environmental behavior of the students. Moreover, the study attempted to measure the effect of environmental knowledge and attitude on students' behavior of 9th and 10th grade.

The Present Case Study

The study aimed to explore the effect of environmental knowledge and environmental attitude on environmental behavior of secondary school students of class 9th and 10th in the context of Pakistan.

Objectives

More specifically, the study aims to:

a) Investigate the environmental knowledge and attitude among the secondary schools students.

b) Measure the effect of environmental knowledge and attitudes on students' behavior.

c) Assess how do secondary school students' environmental knowledge, attitude, and behavior associate or differ with some demographic factors in terms of (gender, age, type of school, locality, income, and education of parents)

Research Questions

The research questions for this study were:

Q.1: What contribution do both environmental knowledge and environmental attitude make to the prediction of environmental behavior?

Q.2: Which is the best predictor of environmental behavior?

Q.3: Is environmental knowledge a salient predictor of environmental behavior?
Q.4: What is the relationship of environmental knowledge, attitude, and behavior among the students of secondary schools?
Q.5: To what extent do the secondary school students' environmental knowledge, attitude and behavior associate or differ with some demographic factors (gender, age, type of school, location, income and education of parents)?

Research Hypotheses

On the basis of literature reviews and empirical studies, the following research and null hypotheses were framed for the study.

Hypotheses through Regression

H1. Environmental knowledge and environmental attitude make significant contribution to the prediction of environmental behavior

H2. Environmental Attitude is the best predictor of the environmental behavior.

H3. Environmental knowledge is a salient predictor of environmental behavior.

Hypotheses through Independent Samples t-test

$H_0$1: There is no difference in environmental knowledge levels of male and female students.

$H_0$2: There is no difference in environmental knowledge levels of public and private type of schools.

$H_0$3: There is no difference in environmental knowledge levels of urban and rural locality of schools.

$H_0$4: There is no difference in environmental knowledge levels of age group 1 (12-13) and age group 2 (14-15) years.

$H_0$5: There is no difference in environmental attitude levels of male and female students.

$H_0$6: There is no difference in environmental attitude levels of public and private type of schools.

$H_0$7: There is no difference in environmental attitude levels of urban and rural locality of schools.
$H_0$8: There is no difference in environmental attitude levels of age group1 (12-13) and age group2 (14-15) years.
$H_0$9: There is no difference in environmental behavior levels of male and female students.
$H_0$10: There is no difference in environmental behavior levels of public and private type of schools.
$H_0$11: There is no difference in environmental behavior levels of urban and rural locality of **$H_0$12:** There is no difference in environmental behavior levels of age group1 (12-13) and age group2 (14-15) years.
Hypotheses through One Way Analysis of Variance (ANOVA):
$H_0$13: There is no difference in the environmental knowledge levels of students across the income of the parents.
$H_0$14: There is no difference in the environmental knowledge levels of students across the education of the parents: (Above graduation, Graduation, Intermediate, Matriculation, Primary and Illiterate)
$H_0$15: There is no difference in the environmental attitude levels of students across the income of the parents.
$H_0$16: There is no difference in the environmental attitude levels of students across the education of the parents: (Above graduation, Graduation, Intermediate, Matriculation, Primary and Illiterate.
$H_0$17: There is no difference in the environmental behavior levels of students across the income of the parents.
$H_0$18: There is no difference in the environmental behavior levels of students across the education of the parents.

METHOD

Research Design

Combining quantitative and qualitative approaches, this study used an explanatory sequential mixed-method design to investigate the problem through survey method.

The population of study was picked up from 9th and 10th grade (male and female students across public and private secondary schools) in Pakistan. However to make the study feasible it was delimited to District Mirpurkhas (Sindh). Therefore the target-population for this study was all the male and female students of ninth and tenth grade across public and private schools of District Mirpurkhas. The target-population involved 13853 secondary school students.

RESEARCH MODEL OF VARIABLES

This model had two independent variables and one dependent variable as under.

Independent variables (IV): Environmental knowledge (E.K) and environmental attitude (E.A)

Dependent variables (DV): Environmental Behavior (E.B)

Following was the model for dependent variable and independent variables for the present study:

Participants

Multi-stage random sampling was used. At first stage respondents were classified into boys and girls across public and private strata. Then, required specific number of respondents each for boys and girls were randomly selected out of total population across public and private secondary schools of rural and urban strata of all six taluckas of District Mirpurkhas. The sample involved 375 secondary school students of 9th and 10th graders with 88 schools each for boys and girls across public and private respectively.

Instrumentation

An adopted tool, known as the Children's Attitude toward the Environment Scale (CATES) was used to collect the quantitative

data. The instrument was developed by Amy Malkus, Amy, Musser, and Lynn in 1993. A survey questionnaire consisted of three sections. Section "A" measured the students' levels of understanding of environmental facts, concepts and generalization consisting 10 items on five point Likert scale from 1= strongly disagree to 5= strongly agree. Section "B" measured students' attitudes (feeling towards environment) consisting 24 items. Section "C" measured the environmental behavior (actions towards environment) consisting 15 items.

Its' reliability was known to be: 0.87, 0.73, and 0.57 respectively with an overall reliability of 0.722. However in our Pakistani context the overall reliability for our present study tool was found to be 0.791.

Demographic data were also sought through questionnaires to obtain the participants' age, gender, type of school (public, private), level of income of parents , and level of education of parents and locality (urban, rural) strata of the respondents. The questionnaires used in the study have two independent variables (environmental knowledge and attitude) and one dependent variable (environmental behavior of the respondents).

Procedure

The researcher got the adopted questionnaire translated in the local languages by experts and personally administered it to the participants in the field. Creswell (2008) urges that "to reduce non-response error, use rigorous administration procedures to achieve as large, a return rate as possible" (p. 394). According to Gray (2004) "face-to-face interviews are the most expensive because they require large amounts of time, a significant proportion of which is often spent travelling to and from interviews. Similarly the questionnaires can be difficult, time consuming and costly but rate of return will be high" (p. 111). Creswell (2008) urges that "to reduce measurement error, should use a good instrument, with clear, unambiguous question and response options" (p. 394).

In the light of above guidelines following steps were followed:

- Firstly, CATES questionnaire was adapted in the sense that the researcher simplified the compared set of items into local languages.
- Secondly, the quantitative data collected from 375 respondents were statistically analyzed through multiple regression analysis, independent samples-t-test, and one way analysis of variance (ANOVA) using SPSS package 16.0 version.
- Thirdly, 45 open ended interviews of students across all strata were conducted. Finally, quantitative and qualitative data were triangulated and converged to bring holistic and broader understanding of the study. Then, related recommendations were made to respective stakeholders.

Data Analysis

The quantitative data collected from 375 respondents was statistically analyzed through regression analysis, independent samples-t-test, and one way analysis of variance (ANOVA), using SPSS package 16.0 version. Moreover the descriptive statistical procedures were used to measure mean, mode, median, standard deviation, variance of each item of demographic variables.

Thematic analyses were performed for qualitative data which was collected through open ended interviews. The general themes were drawn from transcribed interviews to fit all the textual data, and then the researcher looked for emerging themes in the light of 'quotes', 'codes', and 'categories' that truly reflected the perceived picture from learners' perspective

Ethical Considerations

The following ethical measures were taken:

a) Consent: The legal consent in advance was taken from Iqra University, Karachi, the Director, primary and secondary schools, Mirpurkhas region at Mirpurkhas, Sindh Pakistan.

b) Voluntary Participation: The respondents were taken in confidence that their participation in the study would be voluntary and they were free to quit from the research at any time.

c) Confidentiality and anonymity: The confidentiality and anonymity of the respondents was ensured by giving clear instructions, not to write their names or identity on the questionnaires.

d) Availability of results: The availability of results to respondents was assured. At any time the respondents can get the results of the study if they want.

FINDINGS

Demographic Data

The demographic data were analyzed using descriptive statistical procedures.

The (Table 1) describes the demographic data of variables. The sample consisted of 375 participants of six taluckas from Mirpurkhas. Out of this 49.6 % are males and 50.4 % are females. Age of students between 12-13 are 52.3 % and 14-15 are 47.7 %. Education of parents: illiterates 10.4%, up to primary education 18.1%, matric to intermediate 32.3%, graduate 29.6% and above graduate 9.6 %. Income of parents below 5 thousands is 16.8%, between 5 to 10 thousands 17.1%, 11 to 40 thousands 41.1 %, and above 40 thousand is 25.1%. Ratio of public schools 72.8 % and private schools 27.2 %, Locality ratio (urban) 62.1% and (rural) 37.9%.

The (Table 2) presents the percentage, mean, and standard deviation of the demographic variables. The descriptive mean of

the gender, age, income of parents, education of parents, type of school, location of total subjects (N=375) were computed as 1.5, 1.4, 2.7, 3.0, 1.2, 1.3 respectively where as the standard deviations for these demographic variables were 0.5, 0.5, 1.0, 1.1, 0.4, 0.4 respectively. The sum of these demographic variables for gender, age, income of parents, education of parents, type of school, and location were found 564, 554, 1029, 1162, 477, 517 respectively for each variable.

Hypotheses Testing Through Multiple Regression Analysis

Q.1: What contributions do both environmental knowledge and environmental attitude make to the prediction of environmental behavior?

H1. Environmental knowledge and environmental attitude make significant contribution to the prediction of environmental behavior

Table 3 (a) represents model summary of multiple regressions for environmental knowledge, attitude and behavior. The multiple regression analysis revealed that the students' environmental knowledge and attitude predicted their environmental behavior, R-square = .753 (75.3 %). The R-square is the proportion of variation in the dependent variable (environmental behavior) that is explained by the two contributing independent variables (environmental Knowledge and environmental attitude). In other words the value of R = .868 indicates strong, positive association of environmental knowledge and attitude towards environmental behavior.

The (Table 3. b) shows that the overall model is statistically significant as both independent variables have a significant combined effect on environmental behavior, $F(2, 372) = 565.697$, $p < .05$.

The (Table 3.c) shows that the environmental knowledge (Beta =.258, $p < .05$) and environmental attitude (Beta = .694, $p <$

.05) are significant predictors of environmental behavior and both positively contribute with environmental behavior.

Q.2: Which is the best predictor of environmental behavior?
H2. Attitude is the best predictor of the environmental behavior

In the (Table 4.a) the multiple regression analysis revealed that the students' environmental attitude predicted their environmental behavior, R-square = .708 (70.8 %). The R-square is the proportion of variation in the dependent variable (environmental behavior) that is explained by the independent variable environmental attitude. In other words the value of R = .841 indicates strong, positive association between environmental attitude and environmental behavior.

The (Table 4.b) shows that the overall model is statistically significant as the independent variable (environmental attitude) has a significant effect on environmental behavior, $F(1, 373) = 902.67$, $p < .05$.

The (Table 4.c) shows that the environmental attitude (Beta =.841, $p < .05$) is significant predictors of environmental behavior and positively contribute with environmental behavior.

Q.3: Is environmental knowledge a salient predictor of environmental behavior?
H3. Environmental knowledge is a salient predictor of environmental behavior.

The multiple regression analysis (Table 5.a) revealed that the students' environmental knowledge saliently predicted the environmental behavior, R-square = .428 (42.6 %) in the model. It contributed as weak portion of variation and stood as salient predictor of environmental behavior. In other words the value of R = .654 indicates strong, positive association between environmental knowledge and environmental behavior.

The (Table 5. b) shows that the overall model is statistically significant as the independent variable (environmental knowledge)

has a significant effect on environmental behavior, F (1, 373) = 278.944, $p < .05$.

The (Table 5.c) shows that the environmental knowledge (Beta =.654, $p < .05$) is salient (weak) predictors of environmental behavior and positively contribute with environmental behavior.

Hypotheses Testing through Independent-Samples t-test

While regression analysis was used to determine association, independent samples t- tests were used to determine differences resulting through the demographic variables. As four of the demographic variables of the study were found in two categories (Gender, Age, type of school, type of location), independent samples t- test was applied to measure the difference. The results of independent samples t-test were analyzed and presented as under:

Independent Samples t-test Analyses:

i**) Environmental Knowledge**: The findings supported the researchers to accept the null hypotheses (H01, H02, H03, H04,) as there were no differences in environmental knowledge due to gender (male/female), type of school (public/private), locality (urban/rural), and age group (12-13 and 14-15yr) of the students. (See Table.6)

ii) **Environmental attitude**: The findings supported the researchers to accept the null hypotheses (H05, H06, H07) as there were no differences in environmental attitude due to gender (male/female), type of school (public/private), and locality (urban / rural). However the findings supported to reject the null hypothesis (H08) as there was significant difference in environmental attitude due to age group (12-13 and 14-15yr) of students. (See Table.7)

iii) **Environmental behavior**: The findings supported the researchers to accept the null hypotheses (H09, H010, H011, H012,) as there were no differences in environmental behavior due to gender (male/female), type of school (public/private),

locality (urban/rural), and age group (12-13 and 14-15yr) of the students. (See Table.8)

One Way ANOVA:

i) Environmental knowledge with education and income of parents:

The findings supported to reject the null hypotheses (H013, H014) as there were significant difference in environmental knowledge due to education and income of parents of students. (See Table.9)

ii) Environmental Attitude with education of parents and income of parents:

The findings supported to reject the null hypotheses (H015) as there was significant difference in environmental attitude due to education of parents of students. However the findings supported to accept the null hypothesis (H016) as there was no difference in environmental attitude due to income of parents. (See Table. 10)

iii) Environmental Behavior with education and income of parents:

The findings supported to accept the null hypotheses (H017 and H018) as there were no differences in environmental behavior of students due to education and income of parents. (See Table.11)

Comprehensive summary of findings:

The (table.12) presents the comprehensive summary of all hypotheses tested through multiple regression, Independent Samples t-test, and ANOVA.

Thematic Analysis And Data Reduction

Forty five open ended interviews were conducted and data was collected from the randomly selected sampled students. The male secondary school students responses were quoted as (RM) and responses of females as (RF) respectively.

The first major theme extracted from the open ended interviews of the respondents was environmental consumption. One of the 10th graders from rural area shared students' poor awareness towards environment in these words: "Some of our friends pluck flowers from the fields and surroundings on the way

while coming to school. One day, when one of our teachers saw many flowers in their hands, he gave them moral advice: 'Plants and flowers are living things and they have also sense of pain. They are like our body-parts; if someone injures our finger we feel a lot of pain even when we get minor injury, similarly, the plants and the beauty of nature get injured when you pluck flowers from their branches" (Quoted by RM in open ended interview on May 3, 2013). It showed the poor knowledge and anthropocentric attitude and behavior of students for their personal enjoyment.

The second major theme extracted from the respondents' open ended interviews was environmental worry. The respondents were deeply shocked over the protection of the natural parks' plants and grass. In an interview with a male student of 10th grade explained his grief and hurt: "Look at this park! The Municipal Administration of the city uses untreated sewage or gutter-water twice a week through water tankers to water it. This water is contaminated water and carries germs and harmful wastes. It really hurts me very much" (Quoted by RM, in open ended interview on May 5, 2013).

The third major theme extracted from the interviews of the respondents was environmental protection**.** In an open ended interview one student of 10th grade expressed his worry over street lights at day time, in these words: "I believe that there is contradiction between the claims and actions of the government. On the one hand, they are offering and promoting energy saver-bulbs throughout the country to save electricity and to overcome power crisis, but on the other hand, no one likes to turn the street lights off during day time" (Quoted by RM in open ended interview on May 5, 2013

Discussion

The result of this study confirmed that students' environmental knowledge, attitude, and behavior are significantly and positively correlated. The independent variables of environmental knowledge and attitude are predictors of related

pro-environmental behavior with weak and moderate statistical significance respectively. The findings of this study were similar to other studies that showed that attitudes are highest, followed by lower knowledge and low behavior (Farooqi & Fatima, 2010; Marcus, 2012; Akomolafe, 2011; Hini, Gendall, & Kearns, 1995; Nameghi & Shadi, 2013; Aminrad, Azizi, Wahab, Huron & Nawawi, 2010; Yousuf & Bhutta, 2012). Weak and positive correlation was found between environmental knowledge and attitude, positive and moderate association was found between environmental attitude and behavior; however weak and positive correlation was found between environmental knowledge and environmental behavior. These results revealed that there is a positive impact of environmental knowledge and environmental attitude on the environmental behavior levels of the secondary stage students as the environmental knowledge and environmental attitudes of the students increase the environmental behavior levels also increase.

Flamm (2006) and Harun, Hock & Othman (2011) found strong correlation between environmental knowledge and attitude; however, the present study found such relation as weaker one. It might be due to the poor quality education in our Sindh's educational system especially at secondary school level. This finding equally validates Aminrad, Azizi, Wahab, Huron & Nawawi, 2010) in this connection. Unlike multiple researches (Hassan, Osman, & Pudin, 2009; Yousuf & Bhutta; Aminrad, Azizi, Wahab, Huron & Nawawi, 2010; Bhardwaj & Behal, 2011; Harun, Hock, & Othman, 2011; Khan, 2013; Aminrad, Azizi, Wahab, Huron & Nawawi, 2010; Rebolj & Devetak, 2013) the independent samples t-test results of present study surprisingly revealed no difference of environmental knowledge and behavior levels across gender, type of school (public and private), location (urban and rural), age of students, and income of parents. It clearly indicates the inefficient and ineffective environmental education in terms of curricula and pedagogy at secondary school level in Pakistan especially in Sindh

because poor educational system (Marcus, 2012) and poverty (Farooqi & Fatima, 2010) are responsible for low level of environmental knowledge and attitude among learners. The evidence from the study of Harun, Hock and Othman (2011) confirms this point as they found greater environmental knowledge in the context of Malaysia. The researchers believe that Malaysian educational system is better than ours. However, present study has found significant difference of environmental knowledge at extreme level of education of parents, while it was missing at moderate level of education of parents.

CONCLUSIONS

Deductions from quantitative part:

- The multiple regression analysis revealed that there is a strong, positive association (R = .868) of environmental knowledge and attitude towards environmental behavior of the students.
- The multiple regression analysis revealed that the students' environmental knowledge and attitude, both independent variables have a significant effect on environmental behavior (the dependent variable) i.e. R-square = .753 (75.3%)
- Environmental knowledge (Beta =.258, $p < .05$) and environmental attitude (Beta = .694, $p < .05$) are significant predictors of environmental behavior and both positively contribute with environmental behavior
- The multiple regression analysis revealed that the students' environmental attitude predicted their environmental behavior, R-square = .708 (70.8 %).
- The independent variable (environmental attitude) has a significant effect on environmental behavior, $F (1, 373) = 902.67$, $p < .05$.

- This study revealed that the higher level of environmental attitude is strongly associated with higher level of environmental behavior.
- The multiple regression analysis revealed that the students' environmental knowledge is salient predictors of environmental behavior and positively contribute with environmental behavior, R-square = .428 (42.6 %).
- The study revealed s that there was impact of age group (12-13 and 14-15 years) on the levels of environmental attitude of the respondents. The students of 9th grade performed better than 10th grade.
- The findings of the study indicate that the parents whose income level is sound they invest more income on the education of their children and in return their children's environmental knowledge is improved.
- The findings of the study revealed that above graduation level of education of parents really do have an effect on the environmental knowledge of the students.
- The study found no significant differences among environmental knowledge, attitude, and behavior towards the groups of male and female, public and private, rural and urban respondents of the study.

Deductions from qualitative part:

The qualitative analysis through thematic analysis generated three major themes:

- Theme1: Environmental consumption
- Theme 2: Environmental worry
- Theme 3: Environmental protection

Limitations Of Study

- The study was limited to one district of Pakistan, Mirpurkhas, Sindh.

- The study was limited to 9th and 10th grade (secondary level) students of public and private sectors.
- In mix methodology the, tilt was towards quantitative part (80%) as compared to qualitative part (20%).

Recommendations

On the basis of the findings of the present study the following measures are recommended for better environmental education at secondary school level in Pakistan:

- **Curriculum Integration:**

It is recommended that environmental education (EE) may be integrated in the curricula of secondary schools.

- **Teacher Training Incorporation:**

It is suggests that the curricula of teaching and assessment criteria of pre and in-service should be revised accordingly, to develop appropriate competencies of environmental knowledge, attitudes and skills among the teachers.

- **School Environment Care:**

It is recommended that school administration should take initiative to start the programs which create ownership among the students to promote the pro-environmental activities as individual specific. They should be involved in celebrating tree plantation week and other environmental protection events to care the deterioration of environment.

- **Pro-Environmental Incentive Policy:**

Our schools are suggested to formulate an incentive policy. Healthy environment programs should be carried to promote the eco-friendly environment**.** The incentives should be given to those participants who perform eco-friendly activities successfully.

- **Cleanliness:**

Head teacher, school teachers, and students should ensure the cleanliness of the school, classrooms and surroundings on daily basis.

- **3Rs (recycling, reusing and reducing):**

The students should be involved in pro-environmental activities like recycling, reusing and reducing and other pro-environmental activities to reduce the environmental issues.

- **Field Trips:**

To promote the healthy environmental habits and increasing the poor environmental knowledge among students, the regular field trips to historical places, natural parks, and other places should be arranged by the school administration, as a co-curricular activity.

- **School Management Committee Role:**

The role of School Management Committee should be strengthen to check the students' involvement in environment related programs and projects. The researcher suggests further studies that involve teachers, experts and parents in the field of environmental education.

EDUCATIONAL IMPLICATIONS

- **Health Concerns:**

The weak environmental knowledge of the students and dis-owning the environmental issues like lack of interest in consumption and protection patterns among students of secondary schools contribute health concerns, which may cause different type of diseases and infections like hepatitis, diarrhea and typhoid among the students.

- **Poor Environmental conditions:**

In the result of weak environmental understanding and lack of consumption and protection patterns of the students, there is threat of poor health conditions which cannot nurture fresh minds.

- **Deterioration of environment:**

Respondents' weak knowledge towards environmental issues, lack of consumption and protection patterns is a threat for deterioration of environment.

Implications for Future Studies

The present study focused only to found impact of environmental knowledge and attitude towards pro-environmental behaviors among 9th and 10th grade students of secondary school level, further studies may be extended to the other levels of education like elementary and higher education too.

This study is limited to explore the problem from the point of view of the only students; further studies can be conducted to investigate from the point of views of the teachers, administrators, parents and policymakers of the education system of the country.

This study examined the effect of environmental knowledge, attitude and behavior of the students in one district of Pakistan, Mirpurkhas, similar studies can be conducted by larger sample in other districts of Pakistan to view the holistic perspective of the environmental degradation. In the present study the effects of six demographic variables namely gender (male and female), age (12-13 and 14-15) years, type of school (public and private), location (urban and rural), income and education of the parents were also investigated. The three demographics variables' effect was not explored by this study and thus should be a direction of the future research.

AUTHORS' NOTE

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Table: 1

	Demographic Variables	Ratio of each variable out of N=375	% of each demographic variable
	Gender		
	Male	186	49.4
	Female	189	50.4
	Age		
	Between 12-13 years	197	52.5
	Between 14-15 years	178	47.5
	Education of Parents		
	Above Graduation	39	10.4
	Graduation	68	18.1
	Intermediate	121	32.3
	matriculation	111	29.6
	Primary and Illiterates	36	9.6
	Income of Parents		
	Below Rs 5000 PM	69	18.4
	Rs 5000-10000 PM	63	16.8
	Rs 11000-40000 PM	151	40.3
	Rs Above 40000 thousands PM	92	24.5

	Types of school		
	Public school	273	72.8
	Private schools	102	27.2
	Type of Location		
	Urban	232	61.9
	Rural	143	38.1

Table 2 (a): Model summary of multiple regressions for environmental knowledge, attitude and behavior

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.868[a]	.753	.751	3.928

a. Predictors: (Constant), Attitude, Knowledge
b. Dependent Variable: Behavior

Table 2 (b)

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig
1 Regression	17454.418	2	8727.209	565.697	.000[a]
Residual	5738.979	372	15.427		
	23193.397	374			

Total

a. Predictors: (Constant), Attitude, Knowledge
b. Dependent Variable: Behavior

Table 2 (c)

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1	43.148	.781		55.218	.000
(Constant)	3.771	.459	.258	8.221	.000
Knowledge	3.928	.178	.694	22.094	.000
Attitude					

Coefficients[a]

a. Dependent Variable: Behavior

Table 3 (a) Model Summary for Regression between Attitude and Behavior

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.841[a]	.708	.707	4.264

a. Predictors: (Constant), Attitude

Table 3 (b)

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig
1	16411.763	1	16411.763	902.671	.000[a]
Regression	6781.635	373	18.181		
Residual	23193.397	374			
Total					

a. Predictors: (Constant), Attitude
b. Dependent Variable: Behavior

Table 3 (c)

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1	44.647	.825		54.127	.000
(Constant)	4.761	.158	.841	30.044	.000
Attitude					

Dependent Variable: Behavior

Table: 4 (a): Model summary of multiple regressions between environmental knowledge and behavior

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.654[a]	.428	.426	5.965

a. Predictors: (Constant), Knowledge

Table: 4 (b)

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig
1	9923.650	1	9923.650	278.944	.000[a]
Regression	13269.748	373	35.576		
	23193.397	374			
Residual					
Total					

a. Predictors: (Constant), Knowledge
b. Dependent Variable: Behavior

Table: 4 (c)

Coefficient[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	54.134	.915		59.141	.000
(Constant)	9.555	.572	.654	16.702	.000
Knowledge					

a. Dependent Variable: Behavior

Table 5. Independent samples t-test regarding Environmental Knowledge, N=375

No.	Main Variable	Groups	N	Mean	SD	p-value	t-value	Result
1	Environmental Knowledge	Male Female	186 189	2.61 2.58	.56 .54	.551	.596	Not Sig
2	Environmental Knowledge	Public Private	273 102	2.59 2.62	.51 .65	.687	-.403	Not Sig
3	Environmental Knowledge	Urban Rural	233 142	2.56 2.65	.53 .58	.119	-1.564	Not Sig

4	Environmental Knowledge	Age 12-13 yrs 14-15 yrs	196 179	2.64 2.55	.58 .52	.105	1.626	Not Sig

Table 6. Independent samples t-test regarding Environmental Attitude, N=375

No.	Main Variable	Groups	N	Mean	SD	p-value	t-value	Result
1	Environmental Attitude	Male Female	186 189	3.48 3.53	.56 .44	.435	-.781	Not Sig
2	Environmental Attitude	Public Private	273 102	3.51 3.50	.50 .49	.901	.124	Not Sig
3	Environmental Attitude	Urban Rural	233 142	3.48 3.54	.53	.265	-1.117	Not Sig

					.43			
4	Environmental Attitude	Age 12-13 yrs	196	3.57	.50	**.015***	2.444	**Sig**
		14-15 yrs	179	3.44	.49			

*** represents the significant difference**

Table 7. Independent samples t-test regarding Environmental Behavior, N=375

No.	Main Variable	Groups	N	Mean	SD	p-value	t-value	Result
1	Environmental Behavior	Male	18	3.58	.50	.775	.286	Not Sig
		Female	6		0			

				3.5	.5			
			18	7	5			
			9					
2	Environ mental Behavior	Public	27	3.5	.4 9			
		Private	3	9				Not
					.6	.270	1.105	
			10	3.5	1			Sig
			2	3				
3	Environ mental Behavior	Urban	23	3.5	.5 7			
		Rural	3	5			-	Not
					.4	.293		
			14	3.6	5		1.053	Sig
			2	1				
4	Environ mental Behavior	12-13 yrs	19	3.5	.5 5			
		14-15 yrs	6	7				Not
					.5	.992	-.011	
			17	3.5	0			Sig
			9	7				

Table 8. One way ANOVA analysis regarding Environmental knowledge, N=375

No	Main Variable	Groups and Sub-groups	Sum of squares	Mean square	df	p-value	F-value	Result
1	Environmental knowledge	Education of Parents: Illiterates Primary pass Matric to intermediate Graduate Above graduate	b/w groups: 3.51 within groups: 111.32 total: 114.84	.87 .30	4 370 374	**.021** *	2.9 2	**Sig**
2	Environmental knowledge	Income of parents: < Rs. 5 Thou Rs 5 – 10 Thou > Rs 10 Thou-40 Thou > Rs 40 Thou	b/w groups: 4.22 within groups: 110.61 total: 114.84	1.05 .29	4 370 374	**.008** *	3.5 3	Not Sig

Table 9. One way ANOVA analysis regarding Environmental attitude, N=375

No.	Main Variable	Groups and Sub-groups	Sum of squares	Mean square	df	p-value	F-value	Result

1	Environmental attitude	Education of Parents: Illiterates Primary pass Matric to intermediate Graduate Above graduate	b/w groups: 3.21 within groups: 91.72 total: 94.94	.80 .24	4 37 0 37 4	**.012***	3.23	**Sig**
2	Environmental attitude	Income of parents: < Rs. 5 Thou Rs 5 – 10 Thou > Rs 10 Thou-40 Thou > Rs 40 Thou	b/w groups: 1.64 within groups: 93.29 total: 94.94	.41 .25	4 37 0 37 4	.165	1.63	Not Sig

*** represents the significant difference**

Table 10. One way ANOVA analysis regarding Environmental behavior, N=37

No.	Main Variable	Groups and Sub-groups	Sum of squares	Mean square	df	p-value	F-value	Result
1	Environmental behavior	Education of Parents: Illiterates Primary pass Matric to intermediate Graduate Above graduate	b/w groups: 1.66 within groups: 103.81 total: 105.47	.41 .28	4 370 374	.206	1.48	Not Sig
2	Environmental behavior	Income of parents: < Rs. 5 Thou Rs 5 – 10 Thou > Rs 10 Thou-40 Thou > Rs 40 Thou	b/w groups: 1.18 within groups: 104.29 total: 105.47	.29 .28	4 370 374	.380	1.05	Not Sig

Table . 11: Summary of findings by regression, independent samples t-test, and ANOVA.

Hypo. No	Test used	Variable compared with group(s)	p value	R square value	Result: rejected/ nt rejected	Findings
H1	**Multiple regression**	Impact of E.K and E.A on E.B	.000*	**.753 or 75.3 %**	**Accepted**	Both E.K and E.A are predictors of E.B
H2	**-do-**	Impact of E.A on E.B	.000*	**.708 or 70.8 %**	**Accepted**	E.A is best predictor of E.B
H3	**-do-**	Impact of E.K on E.B	.000*	**.428 or 42.8 %**	**Accepted**	E.K is salient(weak) predictor of E.B
H01	**Independent samples t-test**	E.K with gender	.551	-	Not rejected	No sig: differences between gender in their E.K
H02	-do-	E.K and Public / Private	.687	-	Not rejected	No sig: differences between public and private schools in their E.K
H03	-do-	E.K and Urban / Rural	.119	-	Not rejected	No sig: differences between U/R schools in their E.K
H04	-do-	E.K and Age 12-13 14-15 yrs	.105	-	Not rejected	No sig: differences between age group in their E.K.
H05	-do-	E.A and gender	.435	-	Not rejected	No sig: differences between gender group in their E.A.
H06	-do-	E.A and Public / Private	.901	-	Not rejected	no differences between (public/private) sectors in their E.A

H0 7	-do-	E.A and Urban / Rural	.265	-	Not rejected	No differences between (urban/rural) sectors in their E.A
H0 8	-do-	E.A and Age 12-13 14-15 yrs	**.015***	-	**Rejected**	differences exist b/w age group in their E.A
H0 9	-do-	E.B and gender	.775	-	Not rejected	No differences b/w gender in their E.B
H0 10	-do-	E.B and Public / Private	.270	-	Not rejected	No differences between (public/private) sectors in their E.B.
H0 11	-do-	E.B and Urban / Rural	.293	-	Not rejected	No differences between (U/R) sectors in their E.B.
H0 12	-do-	E.B and Age 12-13 14- 15 yrs	.992	-	Not rejected	No sig: differences between age group in their E.B
H0 13	**ANOVA**	E.K and Education of Parents	**.021***	-	**Rejected**	Sig. difference exists between education of parents group in their E.K
H0 14	-do-	E.K and Income of Parents	**.008***	-	**Rejected**	Sig. difference exists between income of parents group in their E.K
H0 15	-do-	E.A and Education of Parents	**.012***	-	**Rejected**	Sig. difference exists between education of parents group in their E.A
H0 16	-do-	E.A and Income of Parents	.165	-	Not rejected	No sig: difference between income of parents in their E.A
H0 17	-do-	E.B and Education of Parents	.206	-	Not rejected	No sig: difference between education

						of parents in their E.B
H0 18	-do-	E.B and Income of Parents	.38 0	-	Not rejected	No sig: difference between income of parents in their E.B

**** represents significant differences***