INVESTIGATING THE CHANGES IN CHILDREN'S ENVIRONMENTAL
ATTITUDES THROUGH MOBILE GAME INTERVENTION

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ABSTRACT

INVESTIGATING THE CHANGES IN CHILDREN'S ENVIRONMENTAL ATTITUDES THROUGH MOBILE GAME INTERVENTION

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Environmental education has gained significant importance in recent years to increase the new generation's environmental awareness, attitudes, and behaviors with the intention of reducing and preventing the possible destruction of climate change. In Northern Cyprus, most of the studies focused on the relationship between environmental education and environmental attitudes of students at secondary school, high school, and university levels. In this thesis, environmental education has been examined from a fresh perspective; therefore, environmental attitudes of primary school students have been explored using a mobile game intervention. Supporting environmental education through technological tools besides the traditionally applied classroom teaching and outdoor activities may be an important step. For this purpose, a quasi-experimental pre-test and post-test design was adopted, and two groups of students were compared. A mobile game was designed and implemented to investigate the possible effects on primary school children's environmental attitudes in Northern Cyprus. The data was collected through mobile game and online surveys of demographic information, Health Belief Model Survey and Children's Attitude Towards the Environment Survey. As a result of this study, it was found that mobile game positively affects

environmental attitudes of primary school children. In addition, in baseline, no significant difference was found between the children's ages and environmental attitude scores, but a significant difference was observed between gender, school type, father's level of education, and environmental attitude scores. Girls and children attending private school have higher environmental attitudes compare to boys and those attending public school. Additionally, it was found that those who played the mobile game longer had higher environmental attitude scores.

Keywords: Sustainability, Mobile Game, Pro-Environmental Behavior, Environmental Attitude, Environmental Education

ÖZ

ÇOCUKLARDA ÇEVRE TUTUMUNUN GELİŞTİRİLMESİNDE MOBIL OYUN UYGULAMALARININ ETKİSİNİN İNCELENMESİ

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İklim değişikliğinin olası zararlı etkilerini azaltmak ve önlemek amacıyla yeni neslin çevre bilincini, tutum ve davranışlarını artırmak için çevre eğitimi son yıllarda önem kazanmıştır. Kuzey Kıbrıs'ta çalışmaların büyük çoğunluğu ortaokul, lise ve üniversite düzeyindeki öğrencilerin çevre eğitimi ile çevre tutumları arasındaki ilişkiye odaklanmıştır. Bu tez çalışmasında çevre eğitimi farklı bir bakış açısıyla ele alınmış böylece ilkokul çocuklarının çevre tutumları mobil oyun uygulaması aracılığıyla araştırılmıştır. Çevre eğitiminde geleneksel olarak uygulanan sınıf içi eğitim ve açık hava etkinliklerinin yanı sıra teknolojik araçları kullanarak desteklemek önemli bir adım olabilir. Bu amaçla yarı deneysel bir test öncesi ve sonrası tasarım benimsenmiş ve iki öğrenci grubu karşılaştırılmıştır. Kuzey Kıbrıs'ta ilkokul çocuklarının çevre tutumları üzerindeki olası etkilerini araştırmak üzere bir mobil oyun tasarlanmış ve uygulanmıştır. Veriler, mobil oyun ve demografik bilgilere ilişkin çevrimiçi anketler, Sağlık İnanç Modeli Anketi ve Çocukların Çevreye Karşı Tutumu Anketi ile toplanmıştır. Bu çalışma sonucunda mobil oyun uygulamasının ilkokul çocuklarının çevresel tutumlarını olumlu yönde etkilediği bulunmuştur. Buna ek olarak, ön-test çalışmasında çocukların yaşları ve çevre tutumları arasında anlamlı

bir fark bulunmamış, ancak cinsiyet, okul türü ve babaların eğitim seviyeleri ile çocukların çevre tutumları arasında farklılık gözlemlenmiştir. Özel okula giden çocuklar ve kız çocukları, devlet okuluna giden çocuklar ve erkek çocuklara kıyasla daha yüksek çevre tutumlarına sahiptir. Ek olarak, mobil oyunu daha uzun süre oynayanların daha yüksek çevre tutumuna sahip olduğu bulunmuştur.

Anahtar Kelimeler: Sürdürülebilirlik, Mobil Oyun, Çevreci Davranış, Çevre Tutumu, Çevre Eğitimi

To my beloved family
For their unconditional love, support, and encouragement

ACKNOWLEDGMENTS

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LIST OF ABBREVIATIONS

CO_2 Carbon Dioxide

Ppm   parts per million

Btu   British Thermal Unit

TRNC   Turkish Republic of Northern Cyprus

PEB   Pro-environmental Behavior

TPB   Theory of Planned Behavior

HBM   Health Belief Model

EID   Environmental Identity Development

EE   Environmental Education

EA   Environmental Attitude

CATES   The Children's Attitudes Toward the Environment Scale

HBMS   Health Belief Model Scale

CHAPTER 1

INTRODUCTION

1.1   Background Information

Starting from the early 1960s, the number of environmental problems such as ozone depletion, water scarcity, and air pollution gradually increased due to the modernized and industrialized community's impact on the environment. These problems are the consequences of a bigger problem called climate change. It is defined as significant changes in climate patterns and measures that last long periods of time. In other words, climate change refers to any significant and major changes in temperature, air currents, or precipitation that occur for several decades or more (EPA, 2017). It is happening very rapidly, and it has started to affect our life quality since there is a rapid increase in population, production to meet the demand, and excessive consumption. In other words, climate change is the result of the irresponsible actions of humanity, and it is a severe threat to life on earth.

One of the essential demands is access to energy. It is vital for the well-being and economic development of each country. However, energy production has become one of the most critical impacts on the environment. Unfortunately, excessive usage of fossil fuels and an increased amount of Carbon Dioxide (CO_2) in the atmosphere is considered as one of the major contributors to the greenhouse effect, in other words, climate change. Although many people believe the contrary, scientists are providing information that global warming results from human-related events. Satellites and other technological devices are helping them to collect information about extreme climate events. Those data reveal that climate change is happening due to the greenhouse gases humans are producing (EPA, 2021; NASA,

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2021). Figure 1.1 presents the global average atmospheric CO_2 concentrations, measured in parts per million (ppm) over time, based on the data Tans and Keeling (2018) provided. It is visible that the last 100 years are the peak time for CO_2 concentrations. Based on similar statistics, Lindsey (2020) and NASA (2021) reported that in just 130 years, CO_2 levels in the atmosphere have increased by 45% (from 280ppm to 410ppm), which is considered a severe problem. Especially Lindsey (2020) stated that by the end of this century, it is projected that atmospheric CO_2 will exceed 900ppm if the world energy demand continues to grow and we continue to supply this demand mainly by fossil fuels. This amount of concentration may bring much more trouble in the future.
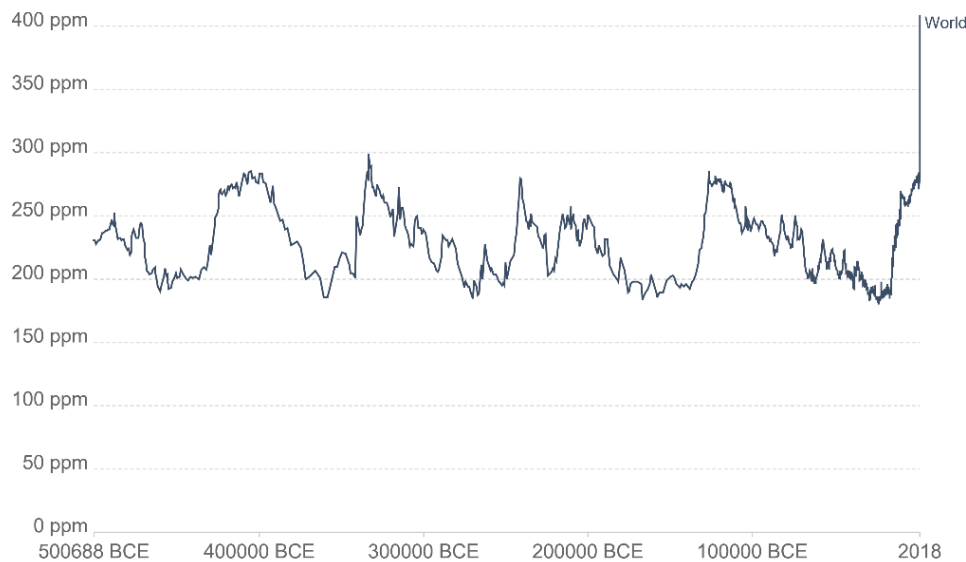
Figure 1.1 Global average atmospheric CO_2 concentration (ppm; parts per million). The data are from *Trend in Atmospheric Carbon Dioxide*, by Tans and Keeling (2018)

Furthermore, changes in global temperature, increased sea levels, high amounts of ice melting in Greenland and Antarctica, as well as extreme events happening all over the world, are the signs of climate change by the effect of elevated greenhouse gas levels, especially the Carbon Dioxide (IPCC, 2007). If the carbon emission rates are not reduced soon, there will be many more harmful events. As shown in Figure 1.2, the average temperature consistently increased due to the high CO_2

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concentrations between the years 1880 and 2020 (GISTEMP Team, 2021). Based on this data, it is stated that the year 2020 keeps the record for being the warmest year since 1880. Governments are putting targets to stay under the 2°C limit in the average increase of global temperature to prevent more damage. However, unfortunately, this is just the beginning since world energy consumption is expected to increase in the following years. The U.S. Energy Information Administration (EIA) reported in the International Energy Outlook report released in 2013, that in the year 2010 total consumption of energy of world total was 524 quadrillion British thermal units (Btu), and it is expected to grow 56% in the year of 2040 to approximately 820 quadrillion Btu. Hence, they reported that countries are not prosperous yet with meeting the governments' target of a 2°C limit in the average global temperature rise. Accordingly, this is primarily due to the energy sector, responsible for almost two-thirds of greenhouse gas emissions, as 84% of the energy is generated from fossil fuels (bp, 2020). Therefore, replacing fossil fuels and developing more efficient and affordable renewable energy resources are seen as a top priority on a global scale.

Figure 1.2 Global land-ocean temperature anomaly. The data are from *GISS Surface Temperature Analysis (GISTEMP) version 4,* by GISTEMP Team (2021) and *Geophy. Res. Atmos.* by Lenssen et al. (2019)

Apart from the energy demand, overpopulation is also another major contributor to climate change. Based on the analysis conducted by the population division of the United Nations (2019), the world's population already reached 7.7 billion in 2019, and by 2025 it is predicted to increase to nearly 8.2 billion. Scientists are expecting an increase in resource demand and a dramatic increase in ecosystem distortion as a consequence of population growth. The Club of Rome report published by Meadows et al. (1972) already stated arising concerns about resource depletion, destruction of the environment, and the inevitable collapse of civilization with the increasing population. They anticipated population growth would spark conflicts over water, electricity, food, and many other problems. Moreover, due to increased demand, overpopulation can cause the destruction of ecosystems and can lead to deforestation and wildlife extinction. Consequently, carbon emissions cause massive damage to societal levels. When natural disasters happen, this affects the economy and physical as well as the mental health of societies. Scientists are predicting biodiversity will be over soon since not all species can adapt to the environmental changes, and especially contamination of food and water sources is a potential threat to the survival of the species. This contamination can affect and damage all parts of society by causing unemployment, starvation, and arising health problems. Moreover, it is expected that natural disasters such as hurricanes and droughts will increase in intensity due to the temperature change and consequently destroy cities and nature. For all these reasons, many countries are trying to create prevention plans and raise awareness about this critical issue (WWF, 2019).

Scientists and politicians from various backgrounds are trying to minimize the effects and slow down the process with new technological developments and new policies. They are trying to fight against global warming by, for example, the Paris Agreement and Kyoto Protocol, and especially European Union trying to encourage their members to lessen their carbon emission and enhance their renewable energy stations with the climate and energy targets for the year 2030 and 2050 (European Commission, 2013). Paris Agreement, a legally binding

international treaty on climate change, putting targets and working on them with 197 countries. The goal of this agreement is to limit global warming by reducing greenhouse gas emissions. Every five year countries require to put contribution plans, working on economic and social transformations towards zero-emission. Developed countries are responsible for supporting those who are struggling in financial and technical aspects (UNFCC, 2020). Many countries already shifted to energy generation by renewables which is considered as a correct strategy because renewable energy stations provide lots of advantages. It is sustainable, and the resource never runs out since their fuels come from natural resources. Most of the power stations are non-pollutant and not creating any Carbon Dioxide or other harmful greenhouse gases. However, it does not seem possible to reduce carbon emission rates in the near future because developing countries do not pay attention to the agreements and signals coming from nature since they are trying to develop their economies with lots of industrial technologies that produce an excessive amount of Carbon Dioxide. Over the past three decades, politicians have ignored the decisions that are taken and the threat of climate change. Economic competition between countries and shifting power balances in a destabilized world are considered the primary reasons for inaction.

Climate change is predicted to have devastating consequences on the ecosystems on Earth. Ignoring it can lead to a significant increase in hazardous climate events, sea-level rise, and increase in temperatures that will make an important portion of lands uninhabitable in the not distant future, which will create politically difficult issues because of migrations (IPCC, 2007). Although scientists and engineers are generating energy-efficient and environmental-friendly technologies, unfortunately, those are not enough to reduce the consequences of the upcoming effects of global warming and climate change (Grilli & Curtis, 2021). When the importance and severity of these problems are brought to public attention, a concern for environmental problems is increasing. Although the impact of a single person on the environment is small, collectively the impact of individuals on the environment is too great to ignore. Therefore, it is critical to examine the psychological

mechanisms of individuals' responses to environmental issues as we attempt to gain a better understanding of the elements that influence decisions and environmental responsible behaviors of individuals (Grilli & Curtis, 2021). Surveys about climate change awareness and related behavior changes revealed that people are highly concerned about environmental issues and climate change especially those who are highly educated (Brulle et al., 2012; Knight, 2016; Semenza et al., 2008; Wang et al., 2017). Although they believe the problem is mainly due to human actions, participants are reported being primarily inactive or not active enough to make a change. It is claimed that people are concerned about environmental problems, and many believed that quick and radical actions are required if possible environmental disasters are to be avoided. While most people claim they are willing to help solve environmental issues, their only contribution is recycling and reducing energy usage (Semenza et al., 2008; Wang et al., 2017).

Out of all activities on Earth, the main contributor of the climate change is considered as human activity, in other words, anthropogenic activity. Considering anthropogenic activity, along with other natural changes is essential in order to explain the latest increases in global changes (Santer et al., 2004). Increased dependence on fossil fuels by anthropogenic activities such as transportation, heating, industrial enhancements, electricity generation, and deforestation has resulted in a rise in greenhouse gas emissions (Swim et al., 2011, 2012; Trenberth, 2018). That is why scientists and educators are trying to find new ways to handle this situation. They are creating ways to solve the problem from the core and educate the next generations to be cautious with the environment and be more environmentally friendly. Schools establish new education programs about the environment and create awareness among children to prepare them for upcoming years. Moreover, European Union is getting ready to establish a new education form in late 2021 about environmental sustainability (European Commission, 2021). The aim is to increase the knowledge, skills and attitudes needed to increase the chances of achieving sustainability. However, there is no standardized education program that is applied in all schools around the world yet. Mostly,

countries are including environment-related topics in the curriculum in science classes and mention environmental issues and activities briefly. For example, Derman and Gurbuz (2018) compared the environmental curriculums of Australia, Singapore, Ireland, Canada, and Turkey. Although all mentioned countries included environmental concepts in their science, biology, chemistry and physics curricula, information about important concepts such as sustainability, climate, recycling and energy resources were either very little or non-existent. Moreover, while Turkey and Canada were focusing more on material developments and research projects, Singapore and Ireland focused on field trips and the attitudes of the students. Differences between education curricula of the countries show us that children are not getting standardized education about the environment where they learn all the aspects of climate change and its importance. Furthermore, there is limited research about the application of the technologies in the environmental behavior change process. We know that people need to change their attitudes and behaviors towards the environment in order to achieve real change towards global warming. Unfortunately, the interest in technological innovations such as electric cars or solar panel installations is escalating every day to reduce the risk of climate change; however, strategies involving changing people's behavior get relatively less attention as a solution for environmental problems. Behavior change, indeed, can fix the problems that technological advancements are not able to. We, humans, are the major producers and consumers; that is why we must be cautious and conscious about the consequences of our behaviors so that we can preserve our resources and our planet. For this reason, this study aims to suggest a novel way to create awareness and positive environmental attitudes in children by using technological resources.

1.2   Study Objectives

Existing studies focus only on formal teaching and outdoor activity aspects of environmental knowledge and attitudes. Their main goal is to design class activities

and outdoor activities to inform and make children more aware of the environmental issues so that in the future, they may have high environmental attitudes and environmental connection to decrease the effects of environmental issues (Liu et al., 2018). However, not every school has such in-class activities, or not every parent let their children attend hiking, camping, or school trips to nature. The main objective of this study was to fill this gap and support students who do not have any in-class or outdoor learning opportunities so that their environmental attitudes can also increase and show more environmentally friendly behaviors.

To achieve the objective stated above, this thesis has the following three specific goals. The first goal was to understand and explain the environmental attitudes of primary school children in the Turkish Republic of Northern Cyprus (TRNC) by their Health Belief Model scores and demographic information, including age, gender, school type, and family education level. The second goal was to create an educational mobile game that targets the children to teach them the essential concepts about the environmental issues in Northern Cyprus. The final goal was to analyse the effect of this mobile game on the participant's environmental attitudes. In order to see the effect of the game, participants were divided into two groups as control and experimental. It was expected to see a change and enhancement in the environmental attitudes of the children in the experimental group with the help of the mobile application. Based on these goals, the following hypotheses were made and investigated in this thesis:

H1: This study predicted that there will be a relationship between demographic information of the participants and their initial The Children's Attitudes Toward the Environment Scale (CATES) scores. It was hypothesized that students would have different CATES scores based on their gender, age, school type, and family education level.

H2: This study predicted that there will be a relationship between the Health Belief Model Scale scores of the participants and their CATES scores. It was

hypothesized that lower scores on perceived barrier and higher scores on self-efficacy would predict higher CATES scores.

H3: This study predicted that participants would report a higher score on CATES from the pre-test to the post-test. It was hypothesized that students would initially have lower CATES scores before completing two weeks of mobile game intervention and a higher score following the intervention's completion.

H4: This study predicted that game play time of the mobile game will have an effect on CATES score change after completing two weeks of mobile game intervention. It was hypothesized that students who spent more time playing the mobile game would score higher on CATES.

1.3   Methodology and Results

A mobile game that is targeting primary school children was designed and developed based on the official Life Sciences and Social Studies curriculum textbooks. Moreover, in order to test the effectiveness of the mobile game, an environmental attitude survey was given to the participants before and after they played the game. Since there is limited research on the environmental attitudes of primary school children in TRNC, understanding the relationship between environmental attitudes and factors that are affecting them was essential. For this purpose, Health Belief Model Scale and demographic information survey were created, and The Children's Attitudes Toward the Environment Scale was adopted from Musser and Malkus (1994). Data was collected through surveys and a mobile game. Collected data is analysed and investigated with respect to the hypotheses given above.

1.4   Research Motivation

The overall objective of this thesis is to investigate the environmental attitude change of children through a mobile-based game. While trying to do so, various contributions have been made. The contributions of this thesis can be listed as such:

First of all, literature about demographic information and environmental attitudes of primary school students in Northern Cyprus is limited. Moreover, the effects of mobile games on the environmental attitude enhancement on primary school children have not been addressed before. That is why, this thesis presents important information about demographics and environmental attitude levels of primary school students as well as having a pioneering role in terms of supporting that mobile-based games can be effective for environmental attitude enhancement of primary scholars.

Secondly, previously there was no mobile game that is based on the environmental issues in Northern Cyprus. Therefore, a mobile game is designed and developed in accordance with the official Life Sciences and Social Studies curriculum textbooks by the Ministry of National Education and Culture of TRNC.

Overall, increasing environmental awareness, attitude, and behavior of children are highly important, and there are lots of different educational techniques to do so. This thesis presents a novel approach to educate children about environmental issues and emphasizes the importance of mobile technologies in this era.

1.5   Organization

Following this introductory chapter, Chapter 2 presents the literature review. Relevant studies in the fields of pro-environmental behavior, environmental knowledge and attitudes, and the theories used by previous related studies are summarized and discussed. Following this discussion, in Chapter 3, the study

methodology, mobile game design, sampling method, survey design, and procedure to collect data are presented. Chapter 4 is devoted to reporting descriptive statistics and results of normality, correlation, regression, and t-test analysis. In Chapter 5, the findings of the hypotheses are detailed with support from the literature. Finally, major findings of this study concerning the relationship between the mobile application and environmental attitude are reviewed, and research limitations and recommendations are presented based on the result of this study in Chapter 6.

CHAPTER 2

LITERATURE REVIEW

2.1 Environmental and Pro-Environmental Behavior

The concept of environmental behavior is way broader and more profound than it is emphasized. When we are talking about environmental behaviors, we must include all the human behaviors related to the environment, even the simple things we do like breathing or running (Krajhanzl, 2010). In order not to confuse the concepts and bring a clear-cut definition, having a significant impact on the environment is also added to its definition. Such behaviors can be categorized as positive, negative, or neutral depending on the time and place of the particular activity performed. Since environmental behavior has a vast meaning, researchers have started categorizing activities as environmental-friendly and environmental-unfriendly based on the context. Moreover, for positive environmental behaviors, another term emerged, which is called pro-environmental behavior (Krajhanzl, 2010). Pro-environmental behavior (PEB) is defined as our conscious actions to minimize harm to the environment. PEBs include being attentive to recycling methods, market behaviors, water and energy consumptions, and transportation practices (Lee & Khan, 2020). It is argued that if we manage to increase pro-environmental behavior, we may achieve a decrease in environmental problems. For each PEB, it is essential to evaluate the mechanisms, identify and interpret the factors that affect people to act in a certain way. Thus, it would be beneficial and practical when developing instruments and strategies to improve green behavior. In the literature of environmental behaviors, environmental values, beliefs, and attitudes have received a lot of attention in order to predict pro-environmental behavior.

One of the most widely studied predictors of environmental behavior is environmental attitudes. In the environmental context, attitude is defined as the positive or negative feeling towards activities or issues (Gifford & Sussman, 2012). It includes worries about the biospheric outcomes of environmental issues, as well as specific opinions toward policies or actions. Environmental attitudes are necessary to include in behavior-related studies because they frequently regulate behavior that either improves or degrades environmental protection. It is commonly accepted that attitudes are characterized by having cognitive, emotive, intuitive, and conative components. Environmental attitudes are believed to have additional dimensions such as conservation and utilization. Pro-environmental attitudes fluctuate with current events and are influenced by certain personal factors such as socio-economic status, education level, gender, and age. Studies have found that attitudes about environmental issues are strongly correlated with pro-environmental behaviors (Aminrad et al., 2013; Bamberg & Möser, 2007; Msengi, 2019; Niaura, 2013). According to a study on the enthusiasm of university students to be involved in pro-environmental behavior, those who believe that innovations and affluence would solve environmental issues were less willing to make sacrifices and change their behaviors (Gigliotti, 1994). This finding suggests that those with a firm belief in development and innovative solutions may not understand the necessity of action and are less likely to participate in lifestyle adjustments for environmental actions.

Secondly, personal norms are considered as one of the major pro-environmental behavior indicators. It is known as the moral obligation individuals feel and use as a compass to differentiate the activities as harmful or protective to the natural environment (Schwartz, 1970). Individuals who feel more substantial moral responsibility are more likely to participate in pro-environmental behaviors (Bamberg et al., 2007; Harland et al., 2007), and when triggered, personal norms are extremely powerful behavior predictors (Schultz et al., 2005). Particularly they lead directly to pro-environmental behavior because of the increased sense of responsibility (Kim & Seock, 2019; Wynveen & Sutton, 2015).

Lastly, values are considered as a predictor of pro-environmental behavior. Values are described as the life goals of an individual, large sets of personal objectives that people define in their lives as key principles (Schwartz, 1992). More transcendence values are found to be associated with more pro-environmental activities. Research has shown that people with more self-transcendent values such as fairness and broad-mindedness are more likely to participate in pro-environmental actions (Milfont et al., 2010; Schultz, 2000; Schultz & Zelezny, 1998). It is the responsibility of values to shape intrinsic motivation. Moreover, environmental attitudes tend to mediate the impact of environmental values on behavior, implying that values trigger attitudes, which then lead to behavior (Kim & Stepchenkova, 2020; Shin et al., 2017). Several values influence environmental attitudes. High rates of environmental concern and environmental preservation are predicted by biospheric and humanistic values along with high levels of openness and understanding (Milfont & Gouveia, 2006). These values show a tendency for caring others as well as putting importance on self-improvement or independence over material possessions.

Existing studies reported various theories and strategies as an explanation for PEB mechanisms. However, it is clear that no single theory provides a perfect description of the complete interaction and relationship between variables that influence environmental behavior. In this part, the Theory of Planned Behavior, the Health Belief Model, and the Environmental Identity Development Model, with the support of Erikson's Stage Model, will be discussed for further understanding of the pro-environmental behavior. Moreover, more details about external and internal factors that are influential on pro-environmental behaviors will be given.

2.1.1   Theory of Planned Behavior

A number of theories have been suggested to describe the relationship between attitudes and behavior change. The most widely used model and the one with the greatest support (de Leeuw et al., 2015; Laudenslager et al., 2004; Macovei, 2015)

is the Theory of Planned Behavior (TPB; Ajzen, 1991). In this model, particular behavior intentions determine pro-environmental behaviors. Moreover, these intentions are predicted by attitude toward behavior, subjective norm, and perceived behavioral control. According to the Theory of Planned Behavior, our intentions determine whether we engage in a specific behavior or not (Ajzen, 1991).
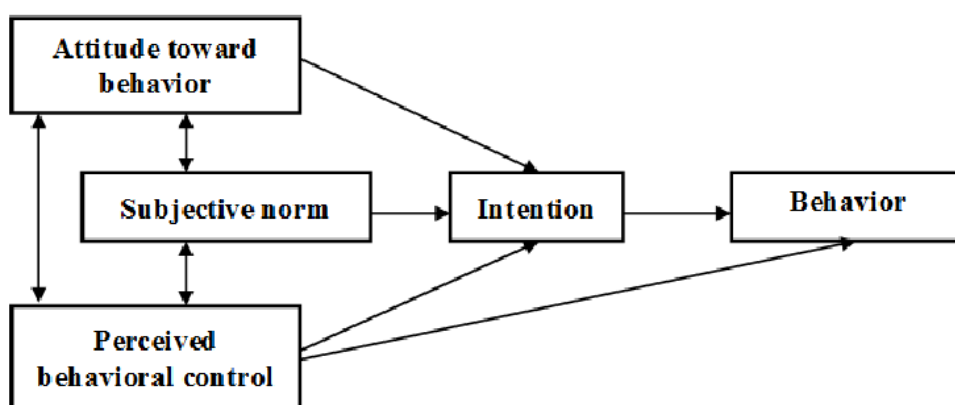
Figure 2.1 Theory of Planned Behavior. From "Applying the Theory of Planned Behavior in Predicting Pro-environmentalBehavior: The Case of Energy Conservation" by Macovei (2015). *Acta Universitatis Danubius: Oeconomica*, *11*(4), p. 18.

As shown in Figure 2.1, intentions are predicted by attitude toward behavior (positive evaluations of the situation), subjective norm (social approval of actions), and perceived behavioral control (control over the situation with opportunities and resources). In other words, those three factors determine our possibility of performing the behavior through intention enhancement. In addition to that, perceived behavioral control can directly affect behaviors without needing intentions prediction. As a concept, perceived behavior control is very similar to self-efficacy as both of them referring to the individual's belief about having control over the situation. However, their functionality is different from each other. While perceived behavioral control is evaluated by the difficulty level of the behavior, self-efficacy is evaluated by the confidence of individual's in being able to perform the behavior when facing challenging situations (Wallston, 2001). Table

2.1 shows the studies that used the Theory of Planned Behavior Model to explain certain environmental behaviors. Out of the factors mentioned in Figure 2.1, the majority of studies reported in Table 2.1 mentioned that attitudes are the key factors in determining environmental behavior. They found a significant correlation between the attitudes of the participants and their tendencies to act environmentally.

Table 2.1 Environmental Behavior Studies with Theory of Planned Behavior

References	Age	Variables	Results
Tonglet et al., 2004	25+	Recycling behavior, attitude, beliefs	mixed
Niaura, 2013	17-36	Attitude, intention, behavior	+
Mancha et al., 2014	18-24	Green behavior, attitude, intention	+
Macovei, 2015	18-24	Energy conservation, intention	+
Passafaro et al., 2019	18-50	Recycling intention, norms, behavior	+

Note. Mixed: Positive relationship and no relationship was found between stated variables
Positive (+): Positive relationship was found between stated variables

Apart from attitudes, other studies reported perceived behavioral control as something we should not underestimate since it is the most substantial barrier that stands in the way of behavior change. It is directly related to existing opportunities that society offers. People might have positive attitudes and positive approval from their social environment about a specific PEB, but if there are obstacles such as having no facility nearby, monetary issues, or time dedication, then the behavior change cannot be expected (Tonglet et al., 2004). Similarly, de Leeuw et al. (2015) confirm that although the other two PEB factors have a good amount of effect, perceived behavioral control has a bigger impact on environmentally friendly

behaviors of high school students. Presence of recycling bins, affordable environmentally friendly products, and availability of environmental information are some of the perceived behavioral control factors mentioned by students. In addition, Laudenslager et al. (2004) indicated that recycling, energy conservation, and carpooling behaviors are significantly related to attitudes, subjective norms, and perceived behavioral control. Similarly, according to Tonglet et al. (2004), perceived control is a vital part of the process, and it was found that in Brixworth, the U.K., the primary determinant of recycling behavior is having opportunities, facilities, and knowledge to recycle.

Therefore, it is summarized that the situation should be seen as voluntary, easily manageable, or at low risk so that people tend to behave more pro-environmentally. If we can create tools and strategies to make the process seem less time-consuming and easy to conduct, people would be more likely to change their behaviors.

2.1.2   Health Belief Model

The Health Belief Model (HBM) focuses on individual's willingness to modify their behaviors due to their perceptions. For almost half a century, HBM has been one of the most successful frameworks to understand and promote health-enhancing behaviors (Msengi, 2019). According to this model, there are two main determinants of health behavior: threat perception and behavioral evaluation. As shown in Figure 2.2, which is adapted from Glanz et al. (2015), the main constructs of HBM are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.
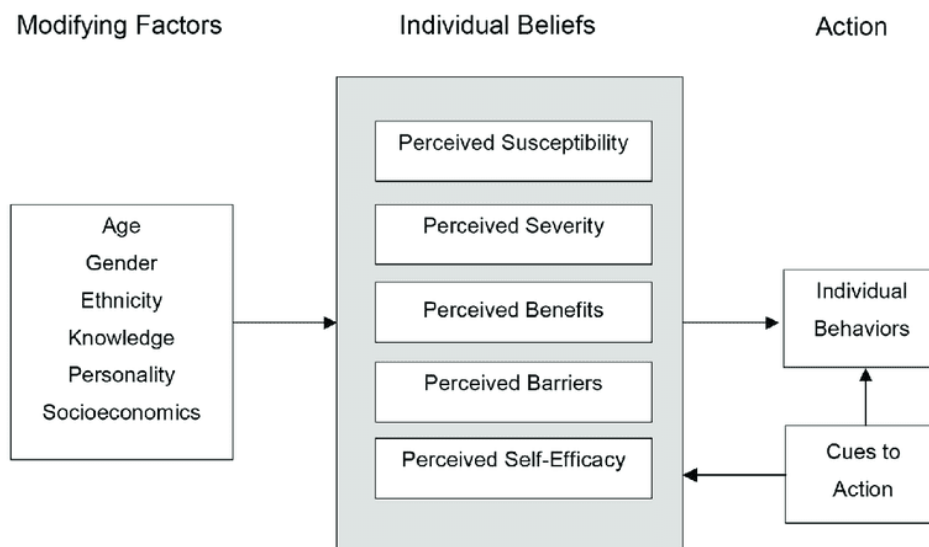
Figure 2.2 General components of the Health Belief Model. From *Health Behavior:
Theory, Research and Practice* (p.49) by Glanz et al., 2015, Jossey-Bass.
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Perceived severity shows a person's likelihood of modifying his habits to prevent a
negative outcome which depends on how serious he perceives the effects will be.
On the other hand, perceived susceptibility shows the belief of the person whether
he sees himself in the risk group that can get affected by these consequences or not
(Kwon & Ahn, 2019). One of the important studies conducted by Oskamp et al.
(1991) found that perceived severity plays a vital role in engaging in recycling
programs as well as intrinsic motivation on the recycling and house waste issue.
Participants reported decreases in air and water quality as a severe consequence of
improper solid waste management. The majority of the participants (82%)
supported recycling as an effective way to reduce trash and prevent more harm
towards the environment, hence improving their life quality.

Even though health behavior prevention studies frequently focused on those two
factors and found that they are powerful predictors of a possible behavior change,
there is limited research about perceived severity and perceived susceptibility in the
environmental context. Instead of those two constructs, pro-environmental studies
mainly focus on the effects of perceived benefits and barriers on behavior change.

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Perceived benefits are defined as the perception of positive and enjoyable outcomes of the action. On the contrary, perceived barriers are factors that were perceived as problems, difficulties, and costs of the behavior (Pippin, 2013). Studies over time found different results for different aspects of environmental behaviors. For example, Schultz et al. (1995) reported that recycling behavior increased when monetary rewards were presented. However, de Young (1986) has reported that perceived benefits in an environmental context are not monetary all the time. People can perceive them as intrinsic, characterized by a sense of personal satisfaction as well. Msengi (2019) reported that HBM educational intervention was efficient when fewer demands like simple tasks and low cost exist. Porter et al. (1995) stated that changing the environment by providing more recycling stations in more accessible locations results in higher rates of recycling. Based on all these different studies, it can be concluded that if there are more benefits and fewer barriers, people are more likely to learn and apply environment-related behaviors.

In addition to these components, self-efficacy and cues to action are also important factors that need to be understood and considered. Self-efficacy is described as individuals' belief in their capacity to plan and carry out a course of action and to complete a task in order to resolve an issue (Bandura, 1997). Since it is linked to self-esteem, locus of control, and pro-social development, self-efficacy is considered as an essential element. Individuals who have high levels of self-esteem and control in their skills to perform and complete tasks are more likely to engage in pro-social activities. Although perceived susceptibility, perceived barriers, and perceived benefits were described as the significant factors in explaining behavior change based on the analysis between 1974 and 1984, recent findings suggest self-efficacy as the strongest of all (Msengi, 2019). Similarly, Meinhold and Malkus (2005) found that high levels of self-efficacy predict pro-environmental attitudes and behaviors in adolescents. Lastly, a factor named cues to action is described as the stimuli required to initiate or trigger participation in the intended, positive behaviors. Cues might appear in various forms, such as advertisements or the illness of a family member or close friend. It is proposed that the function of cues

to action is to stimulate overt behavior while other constructs determine people's readiness or willingness to act (Pippin, 2013). Table 2.2 shows studies that used HBM in the environmental-related behavior change interventions.

Table 2.2 Environmental Behavior Studies with Health Belief Model

References	Age	Variables	Results
Lindsay and Strathman, 1997	18+	Recycling behavior, barriers, self-efficacy	+
Meinhold and Malkus, 2005	14-18	Environmental behavior, self-efficacy, knowledge, attitude	Mixed
Straub and Leahy, 2014	11+	Private well water behavior, barriers, cue to action	+
Kwon and Ahn, 2019	25+	Healthy housing material selection, benefits, threats, barriers, knowledge, intentions	Mixed
Msengi, 2019	18+	Recycling behavior, knowledge, behavior, attitude	+

Note. Mixed: Positive relationship and no relationship was found between stated variables positive (+): Positive relationship was found between stated variables

Based on several research, it can be stated that when proper intervention techniques are applied, actions such as recycling, changing purchasing habits, reusing and repairing goods can be easily adopted (Msengi, 2019). Designing instructional contents and messages based on such models that can successfully deliver the intended informative message while influencing individuals' attitudes and actions is critical.

2.1.3   Environmental Identity Development Model

Apart from attitudes and values, age is considered as an important factor in determining the behavior change in environmental behavior context. Existing studies mainly focused on the behaviors of adults and university students; however, in the literature, we see behavior change is more persistent and stable when things are learned about the environment at a younger age. In 2016, Green et al. (2016) and his colleagues developed the Environmental Identity Development (EID) model based on Erikson's Psychosocial Theory. Erikson (1968) studied the connections of biology and environment in childhood development, as well as children's eagerness to learn. Based on various contexts and experiences, he argued that kids go through a number of psychosocial phases in the formation of their identity. According to him, only when a kid is able to effectively solve the challenges given at each level, positive identity developments happen. Green et al. (2016) mostly focused on the fourth stage of Erikson's model, which includes children between the ages 6-10. During this stage, children acquire the ability to perform increasingly complicated activities. Accordingly, they exert to learn new skills. Kids try and complete tasks as well as pursue new interests and challenges with the help of support and encouragement from others. Also, they start believing in their abilities which is the foundation of self-efficacy mentioned in the previous section.

As shown in Figure 2.3, Environmental Identity Development Model considers children as active participants when constructing identities. In order to create a healthy environmental identity, one must construct trust in nature, spatial autonomy, environmental competency, and environmental action. Unlike Erikson's theory, EID does not put strict age limitations on its stages.
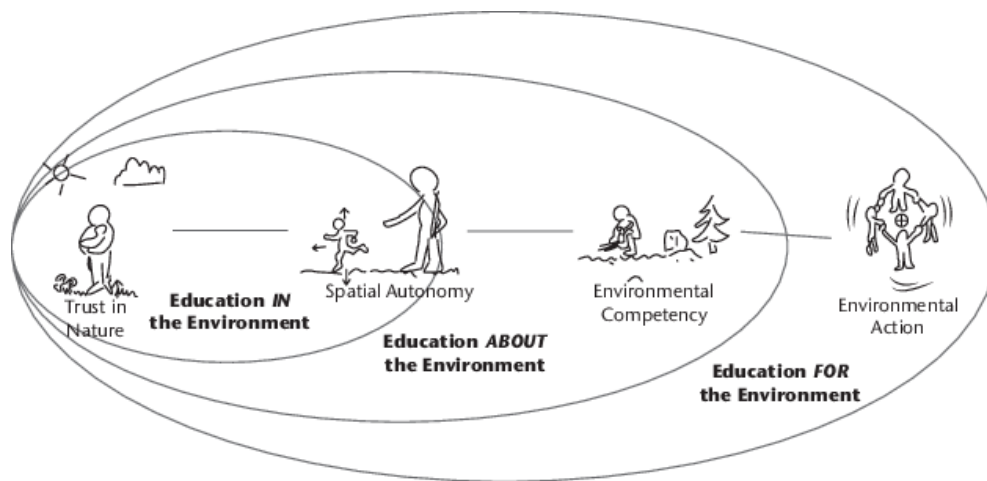
Figure 2.3 Model of Environmental Identity Development. From "Recontextualizing psychosocial development in young children: a model of environmental identity development" by Green et al., 2016, *Environmental Education Research, 22* (7), p 1035.

According to the model, trust in nature brings secure and comfort feelings towards nature. Children can gain autonomy through developing their own sense of place in the natural environment as they interact and bond with nature. Children acquire environmental competence as a result of repeated positive interactions in nature, and this leads them to participate in environmental action. According to EID, caregivers and teachers are in a crucial position in assisting children in considering ecological values and actions in the environmental action stage. Failure to develop this feeling of environmental activity may lead to behaviors that can hurt or disregard the environment. Environmental action is essential for putting beliefs, care, and ethics into action in order to help build a more sustainable world. If one can achieve this, high levels of environmental identity would be recognized and implemented during the adolescent years as well. Two important surveys in the United States about environmental sensitivity reported that people with childhood experiences of hunting, fishing, camping, and family vacation in natural areas as well as those who read nature books have higher pro-environmental attitudes and behaviors such as recycling activities in the future (Chawla, 2007). Moreover, studies about the future effects of childhood nature experiences found that exposure

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to nature-related activities and education in childhood are linked to increased engagement with nature and positive actions towards the environment in adulthood (Broom, 2017; Rosa et al., 2018; Wells & Lekies, 2006). Such studies concluded that in order to understand the environmental behavior mechanisms and enhance permanent positive behaviors towards the environment, children should be included in environmental studies.

2.2   Factors Shaping Pro-Environmental Behavior

Factors that influence human behavior towards the environment are divided into two categories: external and internal factors, as shown in Figure 2.4 below. Some factors have an impact on the vast majority, while others may influence only a few individuals. Although the Theory of Planned Behavior and Health Belief Model are able to explain an essential portion of the environmental action mechanisms based on heavily influenced internal factors such as attitudes and self-efficacy, they are not enough to fully understand the individual variability of such actions (Gifford & Nilsson, 2014).
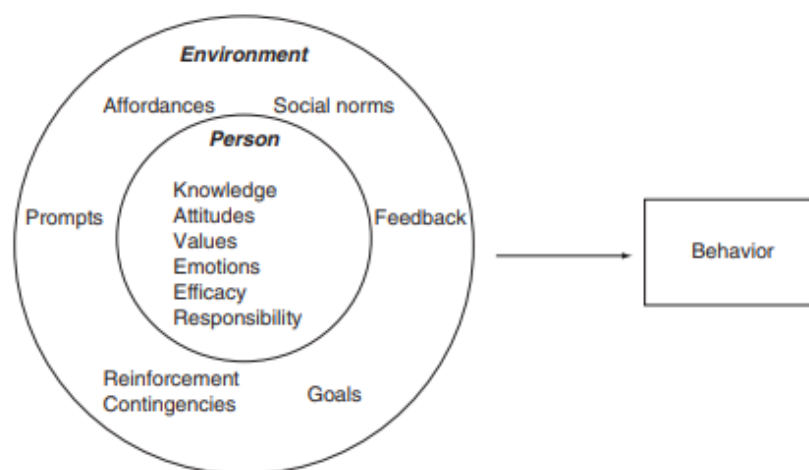
Figure 2.4 Factors affecting behavior. From *Conservation Psychology: Understanding and promoting human care for nature* (p. 146) by S. Clayton and G. Myers, 2015, Wiley-Blackwell. Copyright 2009 by Susan Clayton and Gene Myers.

Since human beings are highly complex, to comprehend and clarify the concept of pro-environmental behavior, a broad range of other personal and social factors should be considered in the process of data collection and analysis. In this part of the literature review, various research findings on important situational and personal factors will be discussed.

2.2.1 External Factors

External (also known as situational) factors consist of factors arising from behavioral context, individual characteristics, and personal knowledge and experience. Environmental studies deal with the matter of how these conditions influence the environmental behavior of individuals.

One of the most studied determinants of pro-environmental behaviors is affordance. Affordance is about what is provided in the environment to encourage behavior. Clayton and Myers (2015) stated that the presence of options is an important factor in consumer choices. For example, if there are no garbage cans, the number of littering can increase noticeably, or if the transportation services are insufficient, people may prefer private cars instead of public transportation. Similarly, Kollmuss and Agyeman (2002) reported that people would be less likely to use the services if they are weakly organized and insufficient to fulfil its mission. Studies about recycling behaviors reported that the availability of curb side recycling collection, as well as the proximity of static recycling facilities, increases recycling behavior and even the availability of these services can overshadow the influence of other variables such as education and income levels (Derksen & Gartrell, 1993). When studying pro-environmental behavior, affordances should be taken into consideration to analyse mechanisms and increase such behaviors.

Apart from affordances, social and cultural norms play an important role in determining people's behavior since people are likely to do what they see other people doing (Clayton & Myers, 2015). Subjective norm that discussed under the Theory of Planned Behavior is considered one of the social norms. Compared to

subjective norms, social norms are a much broader concept, including subjective, injunctive, and descriptive norms (Fang et al., 2017). While subjective norms are known as meeting the requirement of the society by conformity, injunctive and descriptive norms are used in situations if the person is not familiar with the particular situation so that they make judgements by observing people around them to make the situation meaningful. In short, social norms by including those three different norms, is a way for people to understand, interact and behave in socially acceptable or approved forms. A study conducted by Nolan et al. (2008) showed that social norms are a very powerful predictor of behavior change by showing people two different pieces of information. One was about the energy use of a regular homeowner and the other one was about the importance of environmental protection and social responsibility. The former was more effective on behavior change, although people stated that they do not get affected by social norms. Furthermore, studies found that families are the most influential in the context of social norms compared to teachers and peers (Göckeritz et al., 2010; Goldstein et al., 2008; Gotschi et al., 2009). In the study of Gotschi et al. (2009), it is reported that children tend to have positive attitudes towards organic products if their cultural norms and families also support it as something positive.

Another external factor is the availability of incentives. According to Clayton and Myers (2015), giving rewards is important to encourage people to act more environmentally, but incentives must be designed very carefully. While giving rewards, not eliminating intrinsic motivation is vital. Yeow et al. (2014) identified cost-saving and incentives as factors that facilitate the use of non-plastic shopping bags. However, if the reward is too big, people tend to change their behavior to get the reward, not because they want to commit to that behavior. Non-monetary incentives such as social approval or personal satisfaction may be more effective than monetary ones since they are not harmful to intrinsic motivation. In a study to reduce water consumption, Rajapaksa and his colleges (2019) stated that although monetary incentives reduced water consumption rates of the participants, attitudinal and behavioral changes were not as long-lasting as non-monetary

incentives. Instead of monetary incentives, knowledge, and moral suasion worked better and both showed a positive impact on attitudes and consecutively on pro-environmental behavior.

2.2.2 Internal Factors

Compared to external factors, internal ones are harder to change for behavior modification; however, they give us a more comprehensive range of behavior influence rather than situation-specific actions. As mentioned in the TPB and the HBM, internal factors such as attitudes and self-efficacy are significant predictors of behavior. Apart from them, the Big Five Model of personality is relevant because personality characteristics are related to all the actions that an individual is taking. The factors Costa and McCrae (1995) created are all regarded to represent the normal personality traits which includes openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. The Big Five Model has been utilized a lot in environmental behavior research. Openness to experience was found to be more related to pro-environmental activities since such people are more imaginative, curious, and open-minded (Fraj & Martinez, 2006; Markowitz et al., 2012; Pavalache-Ilie & Cazan, 2018). Moreover, agreeableness is found to be related to greater environmental concern because people with higher agreeableness levels tend to be more compassionate and cooperative towards others (Hirsh, 2010; Pavalache-Ilie & Cazan, 2018). On the other hand, waste management behavior was found to be correlated with the conscientiousness trait since it is associated with self-discipline, intellectualism, and the need to act for achievement (Swami et al., 2011). Similar to the results mentioned above, Milfont and Sibley (2012) reported traits that are strongly associated with environmental attitudes and behaviors are agreeableness, conscientiousness, and openness to experience. Although the relationship between pro-environmental behaviors and personality traits differs among studies, it can be concluded that personality traits

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that are mentioned above are important and have positive effects on environmental engagement.

Another internal factor is perceived control. Locus of control is a trait-like characteristic that refers to the level at which people believe they have personal control over events in their life (internal LoC) or not (external LoC) (Levenson, 1973). It is proposed that individuals who have an internal locus of control proactively seek out knowledge, including topics about environmental issues. Indeed, internal locus of control has been liked to a higher level of willingness to buy environmentally friendly items in the United States (Schwepker & Cornwell, 1991) and to stronger pro-environmental intentions and behavior in Germany, Japan, and Australia (Ando et al., 2010; Fielding & Head, 2012).

Several sociodemographic factors are found to be correlated with pro-environmental behavior as well. For example, the majority of the research argues that due to cultural and social-structural variables that make them more aware of the connection between cause-effect of environmental damage, women are more likely to participate in a pro-environmental activity (Kennedy et al., 2015; Milfont & Duckitt, 2004; Onur et al., 2012). Moreover, the link between income, environmental attitudes, and behavior has been an important issue within environmental studies. Views on the relationship between income and environmental action are highly debatable. One view argues that individuals with higher income are more prone to engage in high-value pro-environmental behaviors (Akil et al., 2015). For example, Barber et al. (2012) reported that high-income earners are willing to pay for premium-priced green products than low-income earners. However, individuals with high incomes have higher carbon footprints than low-income earners, which is concerning (Huddart Kennedy et al., 2015). According to Sovacool and Brown (2010), individuals with high incomes tend to engage more in conspicuous consumption and own big homes, consuming more water and electricity. Additionally, they are reluctant to be associated with pro-environmental behaviors that are perceived as unpleasant or inconvenient such as the use of public transport or recycling (Martínez-Espiñeira et al., 2014). They

further noted that individuals with high incomes show apathy to pro-environmental behaviors that contradict the convenience and comfort of life. This view gains support from a study conducted by Yeow et al. (2014), showing the reluctance of high-income earners to use reusable shopping bags. In addition to that, other studies reported that citizens with less income or people in lower-income countries may have stronger pro-environmental ideas and may be ready to make more economic sacrifices for environmental conservation than those in higher-income ones, mainly because they have direct experiences with the outcomes of environmental degradation (Breching & Kempton, 1994; Dunlap & York, 2008).

Finally, knowledge is considered an essential internal factor. Based on the study of Hines et al. (1987), knowledge was the primary distinguishing variable between the environmentalists and non-environmentalist groups. Knowledge is essential because it creates an ecological awareness and a wide range of information about sustainable behavior such as energy consumption, green consumerism, and recycling. If there is action-related adequate information about environmental issues and its solutions, effective environmental protection behaviors can occur (Frick et al., 2004). In the individual knowledge and experience context, research has been focusing on concrete knowledge rather than an abstract one. Concrete knowledge is defined as knowing what is essential to take action, such as knowing which materials are recyclable and how to manage the waste and how to recycle. Schahn and Holzer (1990) found a strong relationship between concrete knowledge and recycling behavior. Moreover, children who learn about the environment from books, magazines, movies, or documentaries and teenagers who have knowledge of certain environmental problems were more concerned about the environment (Eagles & Demare, 1999). Lastly, it is found that individuals with high levels of environmental education are more likely to participate in pro-environmental activity since they are subjected to more information and able to understand complex environmental problems (Bodur & Sarigöllü, 2005; Scott & Willits, 1994; Xiao & Dunlap, 2007). A study conducted by López-Mosquera et al. (2015)

confirmed that individuals with higher education levels tend to engage more in green purchase behavior than those with lower education levels.

Underlying mechanisms of pro-environmental behavior is highly complex since it includes human factor. It is important to be aware of the fact that the factors mentioned above cannot be generalized to whole humanity or all pro-environmental behaviors. Each situation should be considered unique and studied separately. However, overall, studies show us that external factors such as affordance, social norms, and incentives and internal factors such as personality traits, internal control, and demographics have a big impact on the way to enhance pro-environmental attitudes and behaviors to make a change.

2.3   Environmental Education

Global warming threatens the sensitive balance of the environment and human life with the consequences that are mentioned in the previous sections such as water and air pollution and loss of biodiversity. According to Zsóka et al. (2013), the majority of environmental issues are caused by a lack of information and understanding; hence, personal awareness of the causes of environmental issues is critical. Recently, supporting sustainable development and sustainable lifestyles via education has gained popularity through the United Nations Sustainable Development Goal 4, which states that by 2030 people will acquire the knowledge and awareness that is necessary to ensure a sustainable future (United Nations, 2015). Thus, environmental education started to be used as a tool for teaching in order to improve individuals' knowledge and perception about the environment and related issues described previously. Environmental education is designed to help individuals to achieve awareness, knowledge, attitude, and responsible behavior about the environment (Aminrad et al., 2013; Sellmann & Bogner, 2013). It addresses the concerns toward natural resources such as water, energy, biodiversity and develops the understanding of the interconnectedness and vulnerability of the earth systems. Since at a younger age, behavioral change and modification are

easier to accomplish (Korda & Itani, 2013), schools included environmental education in their curriculum to teach environmental responsibilities to young generations. Classrooms are the most common formal education environments, and there are numerous widely used educational programs and resources developed for various age groups. In addition to activities in classroom-based education programs, environmental education can be offered outside of the regular classes in informal learning settings, usually as a complement to a leisure activity. Apart from those two, children mostly spent their time in online activities, which also influence their education and daily lives. Investigating the effects of such online activities in the environmental education context is as important as formal and informal education techniques. The following section discusses outcomes of the studies that are focused on formal education, education through outdoor activities, and education through online technologies for further understanding.

2.3.1 Formal Education

Indoor education is where students are presented with environmental education material in classrooms through formal teaching settings. So far, educators are following two major methods in this type of education. They are either adding certain topics such as the importance of ecosystems, energy consumption, or waste management into their curriculum or they are creating environmental education programs after regular school hours to have more focused education for children. Table 2.3 summarizes relevant characteristics and results of classroom-based interventions. According to Jennings et al. (2013), classroom education has a critical role in achieving long-term knowledge and skills. Aminrad et al. (2013) stated that environmental education is necessary to increase the attitudes and knowledge to understand environmental issues and solve them, and classroom education is where it starts. He also mentions that due to the lack of environmental education curriculum in some schools, students' skills, and knowledge to understand the environment are insufficient. Strong (1998) reported that children's

knowledge and awareness towards the environmental issues are very high in the schools that implement environmental education seriously.

Table 2.3 Summary of Classroom Interventions

Reference	Age	Participants	Variable	Duration	Results
Fennessey et al., 1972	7- 12	1,874	Attitude, knowledge	2 weeks	-
Ramsey and Hungerford, 1989	13	149	Knowledge, reported behavior	18 weeks	+
Armstrong and Impara, 1991	9-11	85	Attitude, knowledge	4-8 weeks	-
Ramsey, 1993	13	182	Knowledge, reported behavior	18 weeks	+
Strong, 1998	7-11	227	Knowledge, awareness	-	+
Eagles and Demare, 1999	12	72	Attitudes	1 week	-
Legault, 1999	12+	412	Attitudes, motivation, behaviors	1 year	mixed
de la Vega, 2006	15+	226	Awareness, knowledge, attitude	-	mixed
Rentas et al., 2007	10-11	-	Awareness	1 month	+
Abd El-Salam et al., 2009	17+	543	Knowledge, attitudes	5 hours	+
Aminrad et al., 2013	16	470	Awareness, knowledge, attitude	-	+

Note. Mixed: Positive relationship and no relationship was found between stated variables

Positive (+): Positive relationship was found between stated variables

Negative (-): No relationship was found between stated variables

Schools with formal environmental teaching techniques enable children to gain basic knowledge and understanding of the environment and they develop environmental concern as well as environmental responsibility through positive attitude development. Hence, having environmental-related lessons in school curriculums enhances the environmental awareness of students. Besides, based on the statement of Charter (1992), environmental education can be effective on green consumer behavior since children are using the information they learned from lessons on their market decision behaviors. Moreover, Ramsey and Hungerford (1989) observed that formal education methods in environmental subjects improve the understanding towards environmental problems and solution strategies as well as self-efficacy of the students. Legault (1999) found similar results after applying for an environmental education course on sixth-grade students and students' families over a school year. There was a change in knowledge, attitudes, behavior, and motivation levels of kids and their families. Additionally, they found that those who got environmental education over a year had less extrinsic motivation compared to the control group. Without waiting for an external reward, they engaged in environmental behaviors because they get personal satisfaction from it. Although those studies mentioned above successfully point out the differences, other existing literature states that formal education creates no significant difference between knowledge and attitude (Barr, 2007; Chen et al., 2011).

Although they do not deny the effectiveness to some extent, it is claimed that the relationship between attitudes and behavior can be strengthened when formal education is combined with various other teaching methods since formal education curricula that contain elements of environmental education are not always practical alone (Eagles & Demare, 1999). Chapman and Sharma (2001) reported that schools in Asia have high levels of theoretical environmental education. Although students are getting a good education with such curricula, the majority of the students do not have the required awareness and attitude levels to protect their environment. It is concluded that just giving environmental concepts and ideas in the formal classroom settings is not enough to teach them how to handle environmental issues.

Environmental education is critical for developing a generation that is aware of or concerned about the environment and its issues and possesses the knowledge, abilities, attitudes, and dedication to work to solve present issues and avoid the rise of new problems. A meta-analysis done by Leeming et al. (1993) revealed that out of 34 class-based environmental education programs, only 14 had positive effects. Moreover, they supported the idea that environmental education should not be limited to only in a school environment since the problem is beyond the school boundaries. For example, Rentas et al. (2007) reported that fifth-grade students' academic success in science courses increased 50% after a month-long lesson on waste management and water resources. However, students did not attend classroom lessons only. Those who participated in these classes also got exposed to non-traditional strategies such as hands-on activities, field trips, movies, and technological tools to help them boost their performances. The study conducted by Rentas et al. (2007) clearly shows that hands-on activities are essential as much as in-class teaching in order to enhance the learning experience of students and enable them to gain lifelong skills and values related to environmental protection. Similarly, Eagles and Demare (1999) found that there was no correlation between attending one-week summer camp and moralistic attitude scores of children. However, they found that the media reinforce and strengthen developing attitudes. Movies and written media are found to be very influential on environmental attitudes.

The problem with formal environmental education is not limited to the lack of environmental contact and media tools. There are also some other factors that are impactful on the effectiveness of this type of education system. As discussed in the previous section, various external and internal factors that are affecting pro-environmental behavior can also be impactful on formal education environments. Components such as gender, age, socio-economic situation, education level affect environmental education. Family income and levels of education of parents are known as predictive factors on students (de la Vega, 2006). Children from high-income families tend to be more resistant to energy-saving and using

environmentally friendly items. Moreover, there is a relationship between age and concern. Younger generations tend to be more concerned about environmental quality compared to older generations which makes younger generation more interested in listening to lessons related to environmental issues and learning more (Aminrad et al., 2013). Finally, Abd El-Salam et al. (2009) revealed that knowledge and attitudes were positively correlated to students' socio-economic levels; however, they believe that it can be changed with proper education. After six sessions of environmental education, the knowledge and attitudes of the students towards the environment were improved from 80% negative attitudes toward the environment to 88% positive attitudes, although students were coming from various socio-economic backgrounds.

Therefore, for an environmental education program to be effectively influence children's attitudes and awareness, it must be part of holistic environmental education curricula with outdoor activities and media tools over many years. Overall, it is found that students have a good level of theoretical knowledge about environmental education that is presented as part of their academic curriculum. However, there are problems in the applied aspect. Students do not know how they can change, how they can apply their theoretical knowledge which is considered a big gap (Chapman & Sharma, 2001). While designing such interventions considering demographic characteristics and tailoring the curriculum and applications based on the characteristic of the participants are important to increase the effectiveness of environmental education programs.

2.3.2   Education Through Activities

Education through activities is different from formal teaching settings. Those activities take place mostly outside by being present in nature, such as visits to national parks, zoos, camps, or nature-related activities like visits to museums, exhibits, and even watching movies and documentaries. According to the principles of environmental psychology, the environment is holding a remarkable amount of

information that we learn what to observe and perceive and how to act and engage. When kids go outside and spend time climbing trees or touching the plants and soil, they go after their curiosities leading them to learn the fundamental values of nature. Moreover, they learn their own abilities and capabilities for action. Studies support and encourage a child to go out on an adventure in nature, listen to the sound of the wind, feel the rain, sun and snow and observe how the seasons are changing. So that they can learn about nature and create a particular attachment to it. These experiences allow kids to explore themselves, and in nature, kids come across with a dynamic, multisensory flow of information that is infinite and diverse (Chawla, 2007). As our contact with nature is very limited nowadays, studies are supporting an approach that mainly focuses on promoting a sense of connection and attachment with nature can be the solution. Participating in nature-related outdoor recreations is frequently associated with increased feelings of responsibility, awareness, and connectedness towards the environment (Liefländer et al., 2013; Sellmann & Bogner, 2013; Stern et al., 2008). Table 2.4 summarizes relevant characteristics and results of outdoor activity-based interventions. Savita et al. (2016) stated that children aged between 7-11 are concerned about the environment, particularly flora and fauna. This particular attention is said to emerge as a result of environmental teaching outside the classroom. However, the type of outdoor recreation matters. Dunlap and Heffernan (1975) found that people who take part in consumptive outdoor activities like hunting are much less concerned about the environment than those who take part in non-consumptive activities like hiking, camping, and photography.

Table 2.4 Summary of Outdoor Activities

Reference	Age	Participants	Variable	Duration	Results
Aird and Tomera, 1977	11	50	Knowledge	2 weeks	+
Gillett et al., 1991	17	61	Knowledge, attitude	6 days	mixed
Dresner and Gill, 1994	10-13	28	Awareness, knowledge, self-esteem	2 weeks	+
Bogner and Wiseman, 2004	9-13	287	Perception, knowledge, attitudes	1 week	+
Kruse and Card, 2004	10-18	383	Knowledge, attitude, behavior	1 month	+
Stern et al., 2008	8-11	4.000+	Connection, stewardship, interest, awareness	3-5 days	+
Fančovičová and Prokop, 2011	10-11	34	Knowledge, attitude	6 months	+
Sellmann and Bogner, 2013	14-19	114	Attitude and connectedness with nature	1 day	+
Liefländer et al., 2013	9-13	568	Connectedness	4 days	+
Dieser and Bogner, 2016	9-10	289	Knowledge	1 week	+
Williams and Chawla, 2016	19-50	13	Ecological identity	1 year	+

Note. Mixed: Positive relationship and no relationship was found between stated variables

Positive (+): Positive relationship was found between stated variables

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A study conducted by Bogner and Wiseman (2004) has shown how informal education programs presented at national parks or field centers can influence the knowledge and attitudes of kids. Similarly, Hart and Nolan (1999) concluded from their review of existing studies that exposure to some form of environment-related education, whether short or long term, can improve environmental attitudes among people of all ages. Many studies have shown that outdoor education interventions can have a positive impact of environmental attitudes (Fančovičová & Prokop, 2011; Kruse & Card, 2004; Sellmann & Bogner, 2013). Researchers believe that environmental education (EE) programs in outdoor settings can offer a first-hand enjoyable experience in nature, and both affect knowledge and attitudes and create a connectedness with nature. Environmental knowledge can be gained by the school and out-of-school learning settings, but in order to create a connectedness to nature, people need to have direct contact.

Outcomes of environmental education programs depend mostly on the length of the program. Especially for environmental attitudes, one-day EE programs often have no long-term effects (Sellmann & Bogner, 2013; Stern et al., 2008). On the other hand, Bogner (1998) reported that taking part in a five-day field trip program resulted in significant changes in children's environmental attitudes on environmental protection and utilization. Over the course of six months, such changes were consistent. Interventions that are repeated and long periods of time may lead to long-lasting results. For instance, after taking part in a six-day outdoor trip, students showed greater environmental concern (Gillett et al., 1991), and students who took part in a two-week summer camp program showed higher levels of environmental concern and abilities (Dresner & Gill, 1994). However, densely packed curricula often restrict out-of-school activities that last longer than single annual field programs. In Sellmann and Bogner (2013) study, 15-19 years of age participated in an EE program in an ecological botanical garden; however, after a four-week period, change in connectedness with nature retreated.

Successful programs that significantly increased pro-environmental behaviors of children chose to integrate in-class education with activities that extend outside the

classroom. For instance, in the study of Aird and Tomera (1977), sixth-grade students were given instructions about water pollution and resources for two weeks. While taking classes, they were asked to observe their daily water consumption, report, and discuss the ways to preserve water. Students who worked through the unit showed a significantly greater increase in intended conservation behaviors than the control group. Williams and Chawla (2016) studied participants from summer programs including hands-on activities, camping and field trips after 5 to 40 years to see the long-term effects of such activities. She found that such outdoor activities still show their effects on participants even after 40 years as knowledge, awareness, and behavioral action to protect the environment.

Louv (2008) raised concerns about lack of environmental contact and the fact that in comparison to earlier generations, kids spend less time in natural environments. Although limited data from previous decades were obtained for comparison, this result has been validated by numerous research. For instance, Clements (2004) conducted an online poll with 830 women in the US to compare their childhood outdoor activities to their kids'. Seventy percent of the mothers stated that they spend their time outside every day when they were young; however, only thirty-one percent of their 3- to 12-year-old children are playing outside currently. Television and computer usage were reported as the major cause for their kids' disrupted play patterns by eighty-five percent. Moreover, eighty-two percent of the mothers stated that they have worries about crime and safety, and seventy-seven percent felt they do not have enough time to play outside with their kids. Hofferth (2009) found a further decrease from sixteen percent in 1997 to ten percent in 2003 in the numbers of children participating in outdoor activities. According to the report of Rideout et al. (2010), the screen time of children in the US between 8 to 18 years old is around 7.5 hours a day. Children's daily involvement with nature and natural environments reducing as their screen time is growing in time. Compared to the previous generation, children have significantly less contact with nature. According to the Nature of Americans (2018) and Nature Canada (2019), children spend less than six hours per week outside, which is far less than the amount of time spent in front

of an electronic device. In Britain, children spend about seven and half hours a day in front of a screen (Moss, 2012). Similarly, a survey in Australia revealed that 73% of adults were playing outside when they were young; however, only 13% of their children are playing outdoors now (Bowden et al., 2011). Unfortunately, these numbers even increased more recently due to Covid-19 pandemic regulations. Screen time of primary school children increased to five hours per day on weekdays and six hours per day on weekends in Netherlands (Velde et al., 2021). Moreover, only leisure screen time of children and adolescence increased from three hours to seven and half hours per week in China (Xiang et al., 2020) and from four hours to almost ten hours in Italy (Pietrobelli et al., 2020).

Although the effect of outdoor activities and combination of outdoor activities with in-class education are very strong on environmental attitudes and behaviors, children started spending less time outdoor is creating a barrier for environmental education studies. Further studies and new methods are needed to increase children's environmental awareness, including using technological tools and games that children are interested. For this reason, mentioning education through online technologies has a big importance since kids are spending big parts of their day in front of screens due to the Covid-19 pandemic.

2.3.3   Education Through Technologies

People are staying at home rather than spending time outside in nature because of the emergence of Internet and new media technologies (Clements, 2004). Studies found that this dependency affected kids as well. As mentioned in the previous section, screen time sharply increased recently. Internet and related technological tools are an inseparable part of our daily lives, especially after the lockdown due to the current pandemic. Currently, all educational activities are computer-based. Even before the pandemic, a handful of research focused on the effectiveness of media and technological tools on education. For more than 20 years, the value of learning by digital games has been investigated (Fabricatore & Lopez, 2012).

According to Hildmann and Hirsch (2008) mobile technologies are the most dominant tool used by youth, now replacing computer technologies since they are highly computational. Almost every child has one mobile device with them where they play games and perform online activities. Moreover, students show high interest in using such mobile devices for the intention of education (Savita et al., 2016). The Internet is becoming more popular as a tool for raising environmental awareness among kids. For instance, the National Institute of Environmental Health Sciences provides a website with short online games designed to teach kids about the environment (NIH, 2021), and the United States Environmental Protection Agency provides a website with games, quizzes, and videos about the environment to inform children from various age groups (EPA, n.d.; NIH, 2021). Games and game-based learning can develop complex skills such as problem-solving, analytical, communication, critical thinking, and they can keep the motivation levels high (Healy, 2006). Moreover, intrinsic motivation can be facilitated, and experiential learning may occur through games (Dieleman & Huisingh, 2006).

Sandberg et al. (2011) designed a mobile game for English language learning with fifth graders. The game included multiple choice quizzes, memory games, and jigsaw puzzles. After two weeks of game play, they found that those who played the game had higher levels of vocabulary knowledge and competence compared to those who only attended face-to-face English classes. Similarly, Tsai et al. (2017) designed a mobile game-based English learning tool and studied Taiwanese vocational high school students. After eight weeks of playing, they found that mobile game increased students' motivation and achievement. Moreover, mobile game-based education tools are not just about English learning. Various other studies focused on a variety of different topics. For example, based on a review of 49 studies by Bano et al. (2018), sixty-five percent of the studies reported that they had achieved the increase in math and science knowledge and competence, while twenty-eight percent were inconclusive and only seven percent reported mixed and/or not achieved study outcomes.

Savita et al. (2016) stated that early exposure to environmental issues can increase feelings of responsibility and pro-environmental behaviors among children, and mobile technologies are great tools to promote such practices in school children by creating an entertaining learning platform. Table 2.5 summarizes the studies using mobile education and environmental topics. According to the research, environmental education through mobile game is very limited and not enough to make any statement about the influence of mobile games on environmental attitudes and behaviors of children.

Table 2.5 Summary of Environmental Education Through Technologies

Reference	Age	Participants	Variable	Duration	Results
Hildmann and Hirsch, 2008	-	-	Research management game	-	No experimentation
Zualkernan et al., 2009	-	-	Role-playing game	7 hours to 3 days	No experimentation
Savita et al., 2016	9-10	52	Green-up app	-	No experimentation
Özgen et al., 2020	20-30	22	Attitude and behavior	-	+

Note. Positive (+): Positive relationship was found between stated variables

Based on mentioned potential benefits, Hildmann and Hirsch (2008) mentioned that a good design of repetition and sufficient challenge in a game can led to a mastery of skills on environmental-related attitudes and behaviors. Although they designed a resource management game to increase such skills, they did not implement it to see the environmental behavior change in children. Similarly, Savita et al. (2016) presented an application called Green-up manager targeting to increase environmental knowledge and support the current education syllabus of school-aged children. However, they did not conduct any research on the before-after effects of the application on the children's attitudes and behaviors toward the

environment. Zualkernan et al. (2009) used a role-playing game for increasing children's environmental awareness; however, similar to the other two research, they also did not conduct a pre-test and post-test experiment on the awareness levels. After showing the game to the children, they presented a game evaluation survey. The questions were about the visuality and attractiveness of the game and its stages. Ninety-three percent of the participants found the game interesting. Recently, Özgen et al. (2020) studied the relationship between environmental awareness and serious game called "Save the Planets". They collected the attitude and behavior change of the university students after playing the mobile game, and they reported a small but positive change in pro-environmental behaviors and environmental actions of the students.

Although the benefits of technological tools and online and mobile games on education are widely known, there is a big research gap in the relationship between environmental education and mobile game-based technologies.

2.4   Environmental Education in Northern Cyprus

The focus group of this thesis is primary school students in Northern Cyprus. In recent years environmental education gained much attention in the country and school curriculums adopted environmental topics to teach environmental awareness and issues to the young generation. Currently, environmental subjects are taught within the lesson called Life Sciences (Hayat Bilgisi) for primary school children in the first, second, and third grades. For those who are in fourth and fifth grade have a lesson called Social Studies (Sosyal Bilgiler) where they are presented with environmental concepts and environmental issues that we are facing. For all five grades, lectures include important information about environmental issues in Northern Cyprus. Table 2.6 summarizes studies investigating environmental education and environmental attitudes of students in Northern Cyprus.

Table 2.6 Summary of Environmental Research in Northern Cyprus

Reference	Age	Participants	Variable	Results
Kiraz et al., 2010	13	78	Attitude, success	Attitudes higher than success
Gündüz and Bilir, 2012	15-18	470	Environmental education, water conservation	Awareness is not reflected on behavior
Özbaş, 2013	13-14	199	Attitudes towards forest	Higher interest in public school
Kiraz and Firat, 2016	10+	78	Environmental perception and consciousness	Younger students are more emotional towards the environment
Varoglu et al., 2017	13	145	Knowledge, attitude, behavior	Lack of knowledge
Akkor and Gündüz, 2017	18+	175	Attitude, behavior	Females have higher positive attitude

Majority of the research in Northern Cyprus has focused on the environmental attitudes of secondary school, high school, and university students. There is limited evidence on the environmental attitudes and knowledge of primary school students. Varoglu et al. (2017) conducted research with children aged 13, and results have shown that environmental knowledge, attitude, and behavior were not sufficient to protect the environment. However, they reported that environmental knowledge has a relation with environmental attitude and behavior. Gündüz and Bilir (2012) reported that although high school students have high levels of environmental awareness through their environmental education, it was not sufficient to influence their behaviors towards the environment. Similarly, Kiraz and Fırat (2016) found

that students' perception towards the environment they live in is high, and they were able to list possible solutions for the environmental problems in Northern Cyprus. However, although students rate their environmental sensitivity as high or medium, the results suggested that the environmental sensitivity of students was low. These results suggest that children are not attentive to the environmental problems around them. Therefore, they concluded that current education is helpful to create awareness about environmental problems and their solutions; however, it was not enough to create environmental sensitiveness. To increase environmental sensitiveness, it was suggested to revise the curriculum of lessons that includes environmental topics.

Apart from grade differences, it is important to mention school differences as well. In Northern Cyprus, there are differences between public and private schools in terms of education that is given. While public schools operate in the Turkish language and follow the curriculum ordered by the Ministry of National Education and Culture, private schools mainly operate in the English language and follow different curriculums such as IGCSE, A- and AS levels, and UK Key Stages. In some classes, private schools follow curriculum of the Ministry of National Education and Culture such as Turkish Language lessons. Moreover, public schools usually end around lunch time while private schools end around four pm. Due to the longer education periods, private schools extend their curriculum and offer diverse extra-curricular activities to their students. Stated educational differences in public and private schools are an important study topic in Northern Cyprus. For instance, Özbaş (2013) reported that students attending public schools have more positive attitudes towards forests and are more sensitive to deforestation than private school students. On the other hand, Kiraz et al. (2010) found that there was no significant difference in the environmental attitude levels of students in public and private schools. The only difference they reported was that course grades were higher in those who are attending private schools.

To sum up, there is limited research about environmental attitudes of primary school children in Northern Cyprus. Moreover, there is no game-based intervention

that is mentioning local environmental problems on the island. That is why the goal of this thesis was to fill this gap by using a pre-test and post-test experimental design to give an insight into environmental attitudes of primary school children in Northern Cyprus and show what is the effect of environmental-related mobile-based game on primary school children's attitudes toward the environment.

CHAPTER 3

METHOD

It is important to increase children's environmental attitudes for a sustainable future. Since children have interest towards online and mobile-based games and they can learn new things from these technologies, educating them through mobile-based games might be a good solution to create more awareness and solutions for environmental issues. For this purpose, this study aimed to design a mobile game targeting primary school children and analyse the effects in the context of environmental attitudes. That is why a quasi-experimental pre-test and post-test design was adopted, and two groups of students were compared. In this chapter, mobile game, materials, and procedure of the study are described in detail.

3.1 Mobile Game: Wordy's World

Learning with game-based activities is widely known as one of the most effective learning methods since gaming makes learning easier, entertaining, and engaging. Lately, mobile games are being widely used in informal learning settings to promote knowledge acquisition and support school curriculums (Rosas et al., 2003; Tsai et al., 2017). For instance, in the study of Kefeli et al. (2018) it is found that vocabulary games related with the school textbook has a positive influence on students' attitude towards the environment. Repetition of the topic-related words in a game environment helps children to understand and associate the concepts better. In the light of this finding, this study used a vocabulary game to see the effects on primary school students' environmental attitudes. With the help of a team of computer engineers, a mobile game called Wordy's World was designed and developed. The game aimed to present primary school children with a word game exercise where children got exposed to the words from their official social studies

curriculum. The game design includes the following steps: selection of words, design of the exercises, visual design, and data storing as described below.

Firstly, for the design of the exercises, textbooks of social studies by Kaptan et al. (2019), Taçman et al. (2018, 2019), and Üçışık-Erbilen et al. (2017, 2018) were scanned, and a suitable world list was created from the words that are related with environment and environmental issues so that children can be exposed to words covered in their curriculum. The game consisted of 134 target words divided over five categories based on the provinces of Northern Cyprus and their related environmental problems based on textbooks mentioned above. Moreover, target words were divided into three difficulty levels based on their syllables since words that are longer and with complex morphology are considered more difficult for children (Rello et al., 2014). Words with one syllable were categorized as level one whereas two syllable words were categorized as level two and words with three or more syllables were categorized as level three. Figure 3.1 illustrates the distribution of the words by category and number of syllables, and Figure 3.2 illustrates the game visuals about provinces and stages.
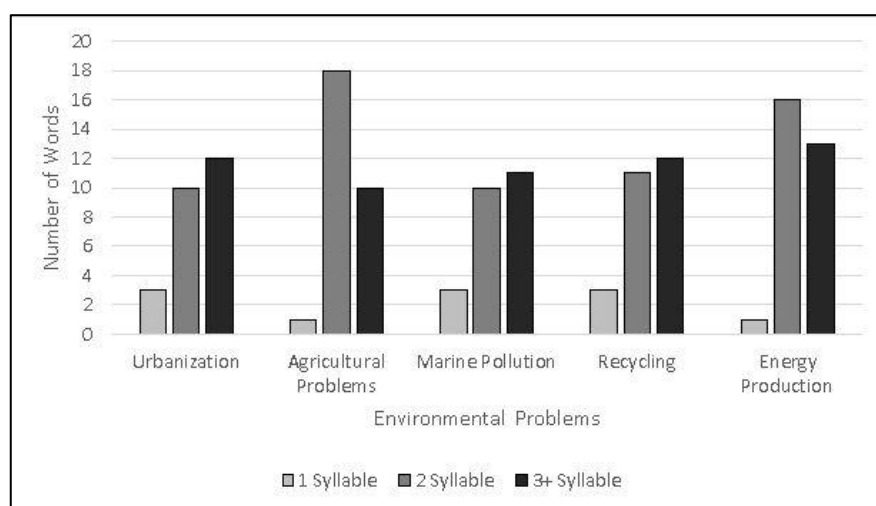
Figure 3.1 Word number by category and number of syllables.
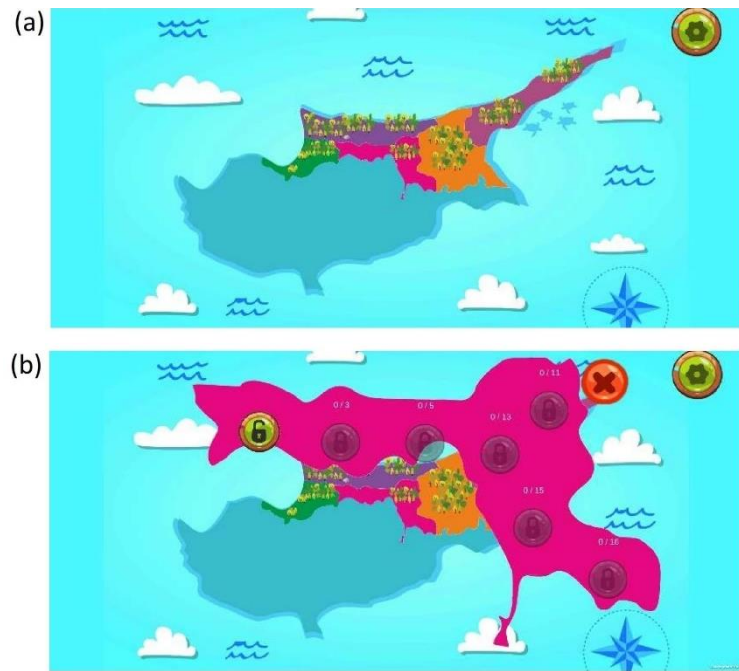
Figure 3.2 Wordy's World province and stage visuals. (a) Cyprus map with TRNC provinces, (b) Stages in Lefkoşa province.

The game has three different vocabulary practice types as finding the missing letter, omitting the extra letter, and ordering the letters that are given as mixed to create a meaningful word. Figure 3.3 illustrates different vocabulary practices with visuals from the game. Based on the research on vocabulary games for children, those three were the easiest to solve (Rello et al., 2013, 2014) and most suitable for this study since the aim of this study is to design a game targeting primary school students. Therefore, easy to solve vocabulary game for the targeted age group was decided.
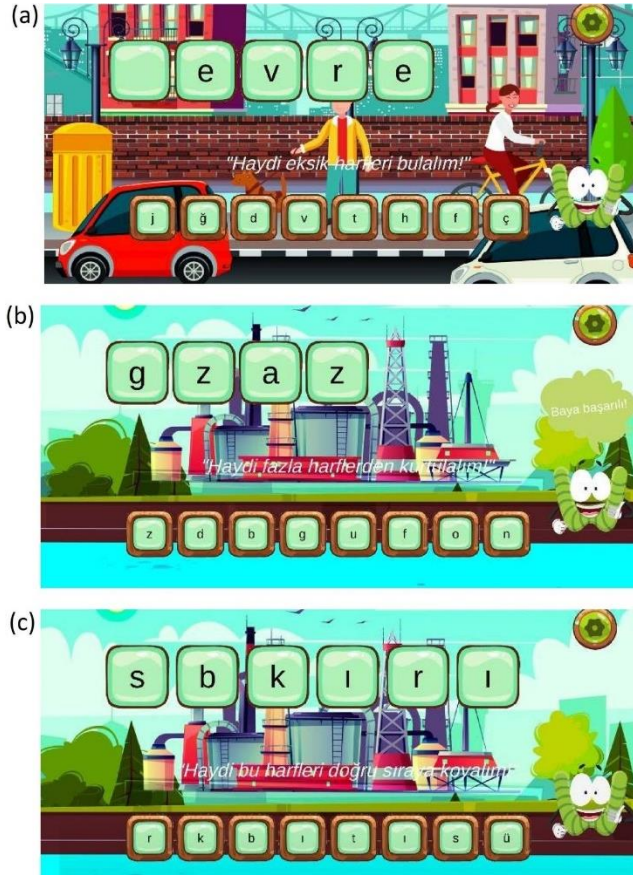
Figure 3.3 Wordy's World exercises visuals of (a) adding a letter, (b) removing a letter, (c) ordering letters.

For each 134 target words (Appendix A), all three vocabulary practices were created, and target words are divided into three categories by their number of syllables from easy to hard to solve. Participants were asked to solve from level one to level three difficulty levels of the words with three different vocabulary practice types. As mentioned before, each province has specific list of words. When participants solved the given words correctly in a province, they were earning points, mastering the word, and leveling up. If enough points were collected, they were mastering the province, solving the problem in the province, and passing to the next level, which is another province with a new word pool.

Secondly, for visuals, based on the guidelines of Rello et al. (2012), it is decided to use colourful background with pure black Arial font type for easier readability.

Background visuals were designed province specific. The problem of each province selected from official Life Sciences and Social Studies textbooks was projected on the background visuals with a cartoon like design to be more suitable with the age of the participants. After completing each province, the background visual changes from poor environmental quality to good and clean one. Example designs for background visuals are presented in Figure 3.4 for Kyrenia and Nicosia provinces.
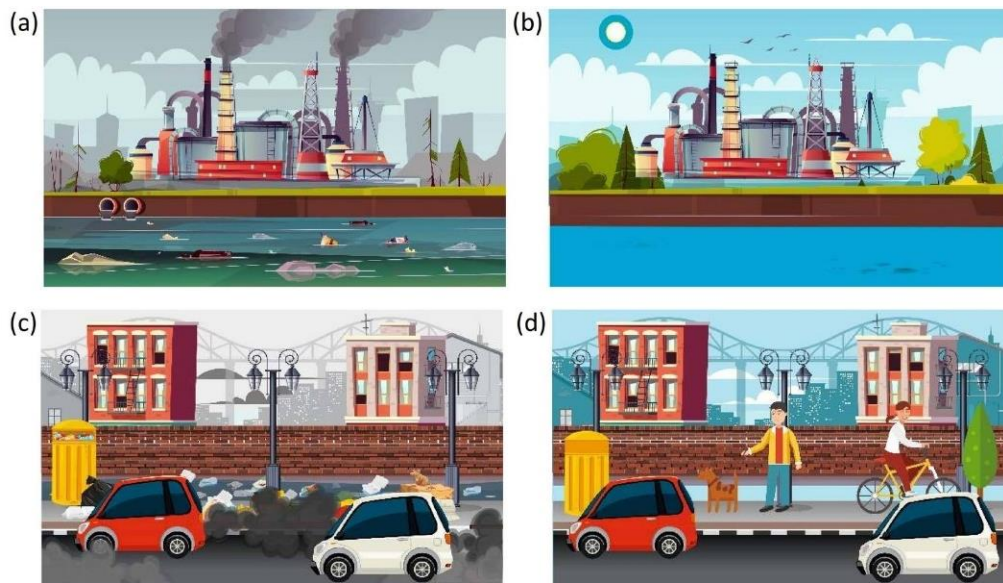
Figure 3.4 Wordy's World background visuals based on provinces. (a) Kyrenia Teknecik Power Plant before completing the stage, (b) Kyrenia Teknecik Power Plant after completing the stage, (c) Nicosia before completing the stage, (d) Nicosia after completing the stage.

Lastly, when storing data, no personal information was collected or stored. Application gave each mobile device a random identification (ID) number, and data were collected according to that specific ID number. Game play time, number of correct answers, and number of wrong answers were collected for each participant. Table 3.1 shows the distribution of game play time by minutes based on gender differences. Before the actual study, pilot test was conducted with five children to ensure usability and flow of engagement of the game as well as detection of any problems related with visuals or spelling mistakes. Some scoring and storing problems were detected after the pilot test. Number of words and level

passing scores were not matching, and the game was not allowing children to pass the next stage. Participants were being presented with the same words repeatedly as there were no other available words left to give on the stage. Therefore, stage passing scores were re-arranged, and the issue was solved before collecting the data for the actual study. Game data that was collected from five children in the pilot test were not included in the actual study since CATES for pre-test were not collected from these children.

Table 3.1 Game Play Time in Minutes by Gender

Girls		Boys	
Number of participants	Game play time (min.)	Number of participants	Game play time (min.)
2	20	1	20
1	25	2	25
1	26	1	26
1	30	1	30
1	40	2	60
1	55	1	142
1	106	1	248
1	260		

3.2 Participants

Participants in this study included primary school students in the Turkish Republic of Northern Cyprus in the academic year of 2020-2021. Participants were between the ages of 7 to 10, and their participation was completely voluntary. Children were assigned to two different groups. Only those with parental consent were included in the study. Table 3.2 illustrates the characteristics of the participants.

Table 3.2 Characteristics of Participants

Variable	Control		Experimental		Total	
	N	*%*	*N*	*%*	*N*	*%*
Boy	14	46.7	9	50	23	47.9
Girl	16	53.3	9	50	25	52.1
Age 7	7	23.3	5	27.8	12	25
Age 8	9	30	4	22.2	13	27.1
Age 9	10	33.3	6	33.3	16	33.3
Age 10	4	13.3	3	16.7	7	14.6
Total	30	100	18	100	48	100

At first, there were 52 participants in total, 30 in the control group and 22 in the experimental group. However, 4 participants from experimental group could not finish the study due to the out-dated Android system version of their phone; hence, they were not included in the study. Because of this extraction, experimental group has 18 participants, and there were 48 participants in total. Gender distribution was almost equal in both groups; however, age distribution has some differences. Sixty percent of the participants are from ages 8 and 9.

3.3 Materials

Due to Covid-19 quarantine and curfew rules and regulations, all materials were presented and collected online. Details of the materials that are used in the research are described below.

3.3.1 Informed Consent Form

Informed consent form (Appendix B) was presented to the parents of the participants. The purpose and procedure of the research as well as all the rights of the participants and confidentiality measures were explained in detail.

3.3.2 Demographic Information Form

The demographic information form (Appendix C) with fourteen questions included child's age, gender, whether they are attending public or private school as well as educational background of the parents and some environmental related questions such as recycling at home or type of transportation that is used by the family members. It was aimed to see the attitude score differences between participants by using demographic information since findings in the literature show that factors such as gender and age have a big influence on environmental behaviors (Akil et al., 2015; Kennedy et al., 2015).

3.3.3 Environmental Attitude Survey

Different environmental attitude scales have been investigated. However, it has been observed that the target group of majority of the scales were secondary school, high school, and university age group (Erzengin & Teke, 2013; Uzun et al., 2019; Uzun & Sağlam, 2006). Only two studies implemented surveys that were targeting primary school-age children (Artvinli & Demir, 2018; Musser & Malkus, 1994). One of these was not suitable for this study in terms of a large number of questions, difficulty of the language use, and the type of scale. The Children's Attitudes Toward the Environment Scale (CATES) created by Musser and Malkus (1994) was found to be suitable for this research in terms of number of questions, suitable language level, and convenience of the scale. CATES aims to measure the environmental attitudes of children ages eight to twelve. In their study, Musser and

Malkus (1994) were reported the Cronbach's alphas of internal consistency for a small sample as 0,7 and for a larger sample 0,85. Also, test-retest reliability was found to be 0,68 when it tested third (0,61), fourth (0,6) and fifth (0,77) grades all combined. The survey was systematically translated into Turkish to be used in this study by three steps. First, survey was translated into Turkish and after that Turkish version was translated into its original language. Next, both translated versions were compared to see if there are any irregularities. After the necessary corrections with linguistic validation, as a third step, cultural validation was conducted by comparing each question to Social Studies and Life Sciences textbooks in order to see culturally irrelevant concepts. No irrelevant concepts were found, and the Turkish version of the CATES was finalized (Appendix D). The survey includes 25 questions. Each question has four choices. For example, question one asks:

Some kids like to leave water running when they brush their teeth.

| 1 | | 2 |

Other kids always turn the water off while brushing their teeth.

| 3 | | 4 |

Choices are going from least pro-environmental (1) to the most pro-environmental (4). It requires the students to choose how close they feel toward the statement. The test scores can range from twenty-five to hundred points, where twenty-five represents a student that is the least pro-environmental and hundred represents a student that is the most pro-environmental. Survey collected from each group were compared and analysed by adding up the scores of each student.

3.3.4   Health Belief Model Survey

In order to see health belief variances of the participants, a Health Belief Model Survey (HBMS, Appendix E) designed specifically to the primary school children. Since there was no available survey that is targeting primary school children and

their environmental related behaviors, the survey was created by getting the information and characteristics from different studies (Meinhold & Malkus, 2005; Msengi, 2019; Straub & Leahy, 2014).

4-point Likert type of scale created with six different sub-categories. Likert includes options such as *strongly agree, agree, disagree,* and *strongly disagree*. On the other hand, sub-categories include perceived susceptibility, perceived benefits, perceived barriers, cues to action, pro-environmental behavior intentions, and self-efficacy. At least one question was added for each sub-category. At first, there were twenty-seven questions in total. The test was pre-tested with 57 students before the actual study. It was found that internal consistency was 0,7, and test-retest reliability was 0,8. After the analysis, it was found that questions 10 *(protecting nature allows us to spend less money on environmental issues)*, 18 *(I am interested in Internet, social media, and phones)*, and 20 *(my parents remind me to turn off the lights when I leave the room)* were unrelated and those three items were deleted. After this procedure it was found that Cronbach's alpha for internal consistency increased to 0.8 in pre-test and 0.84 in post-test. And test-retest reliability increased to 0.9. Final version of the test has twenty-four questions, and six of them are related to perceived barriers and one of them is related with perceived susceptibility are reversed items. Total scores can vary between twenty-four to ninety-six, where twenty-four represents very low HBM total score, and ninety-six represents very high HBM total score.

3.3.5   Debriefing Form

Debriefing form (Appendix F) that is summarizing the aim of the research was given to parents. Hypothesis and study procedure were described and expected results were explained. Contact number was given for further questions and information.

3.4 Design

The study was a between-group design where participants were divided into two groups with different conditions. The first condition, the experimental condition, consisted of students playing the mobile game at home for two weeks. Game play time was calculated by the minutes children spent in the game. Distribution of the game play time was shown in the mobile game section. The second condition, the control condition, consisted of students that did not play the mobile game. The independent variables in the analysis were game play time, HBM scores, and demographic characteristics such as age and gender. The dependent variable was CATES score differences between pre-test and post-test.

3.5 Procedure

Participants in the study were found through snowball technique. Google Forms was used to create all the survey and informative forms that is going to be filled by parents and participants due to Covid-19 regulations. All the related links with forms sent to parents via e-mail (Appendix G, H). After getting parental consent, demographic information was collected in order to be able to gain insight about the data that will be collected with the environmental attitude survey. For control group, pre- and post-environmental attitude surveys with two weeks gap period were collected. For the experimental group, environmental attitude survey was collected before presenting the mobile game. After filling the survey, they started playing mobile game for two weeks. Since time duration for environmental education studies for both in-class and outdoor education models were highly diverse from one day to one year (Eagles & Demare, 1999; Legault, 1999; Sellmann & Bogner, 2013; Williams & Chawla, 2016), there was no suggested ideal time interval. Because the data collection of this thesis started almost at the end of the semester, two weeks period was decided to be more suitable to not interfere primary school children's final exam period. After two weeks period same

CATES survey with different question order was given as a post-test, to ensure participants did not memorize the questions. After solving the CATES post-test, both groups were asked to fill HBMS, and parents were given a debrief form with the information regarding the study and contact details in case of worries that may arise from participating in the study.

3.6   Analysis

Data analyses were performed by using SPSS 22.0. Descriptive statistics, including the mean and standard deviation, were used to describe the demographic information. A Shapiro-Wilk test was conducted to check the normality of scales and subscales. Moreover, a variety of tests were conducted to answer the research questions.

First, independent samples t-test was used to compare differences between two groups. It is a test to compare the means of two independent groups to determine whether there is statistical evidence that the associated population means are significantly different from each other (Yeager, 2021). It can only make comparisons among two groups. That is why when comparing CATES scores and gender differences, independent samples t-test was used since gender consist of only two groups. In order to make a comparison among more than two groups, one-way ANOVA was conducted. It is similar to the independent samples t-test because it compares the means of groups as well (Yeager, 2021). When comparing CATES scores of different age groups one-way ANOVA was used since age groups are more than two. Another test that was used in this study is regression. Regression analysis helps to determine the relationship between two or more variables and helps to understand how one variable changes when another change. There are many kinds of regression analysis, but only linear regression and multiple regression analysis were used in this study. Linear regression establishes the relationship between two variables, while multiple regression attempts to explain a dependent variable using more than one independent variable (Yeager, 2021).

Finally, moderator analysis was conducted. It is used to determine whether the value of a third variable moderates the relationship between two variables (Blair, 2021). Moderators can strength or weaken the relationships. Statistical tests that are used in order to answer the research questions are listed in the order below.

H1: Independent samples t-test and one-way ANOVA were carried out to find any relationship between demographic information and CATES scores.

H2: A multiple regression analysis was conducted to determine if any of the HBM subscales predict CATES scores.

H3: An independent samples t-test and a multiple regression were carried out to find any change in CATES scores after two weeks of mobile game intervention and if this change can be explained by HBM subscales or not.

H4: A linear regression and a moderator analysis were carried out to find if the game play time predicts attitude change and any moderating effect of HBM subscales on game play time and attitude change relationship.

3.7   Ethical Considerations

Approval to conduct this research was obtained from Middle East Technical University Northern Cyprus Campus Scientific Research and Publication Ethics Committee (BAYEK; Appendix I) with the number 5484. Since data collection procedure done by using Google Forms, all the forms and questionnaires used for this study downloaded to the primary investigator's computer and deleted from Google Forms to ensure the safety of the information and data that is collected. All consent forms and identity information such as names and e-mail addresses of subjects were kept in a separate file in a private locked computer file that only the primary investigator could access. All data from the study, including questionnaires and demographic data, were kept in a locked file in a private document that only the primary investigator could access. Demographic Information, Health Belief

Model, and Children's Attitude Towards the Environment questionnaires were identified by a code number and contained no identifying information.

CHAPTER 4

RESULTS

In this chapter, the results of the relevant analysis for each hypothesis are explained in detail. Demographic Information and HBMS survey answers were analysed based on environmental attitude scores. CATES pre-test and post-test scores were compared to see if there is any change in experimental group with the help of mobile game intervention. Mobile game play time and environmental attitude score changes were investigated, and the moderator role of HBMS subscales was investigated.

4.1   Test of Normality

A Shapiro-Wilk test was conducted to detect departures from normality. Results of the normality test for scales and subscales are presented in Table 4.1.

Table 4.1 Results of Shapiro-Wilk Test for Scales and Subscales.

Scales and Subscales	Group	W	p
CATES pre-test	Control	.96	.23
	Experimental	.96	.53
	Total	.96	.07
CATES post-test	Control	.95	.16
	Experimental	.94	.30
	Total	.97	.37
HBMS 1		.87	.00*
HBMS 2		.93	.01*
HBMS 3		.94	.02*
HBMS 4		.93	.01*
HBMS 5		.92	.00*
HBMS 6		.87	.00*
HBMS Total		.97	.25

Note. HBMS 1: Perceived Susceptibility, HBMS 2: Perceived Benefits, HBMS 3: Perceived Barriers, HBMS 4: Cues to Action, HBMS 5: Pro-Environmental Intention, HBMS 6: Self-efficacy
$*p<.05$

Table 4.1 shows an insignificant difference in CATES pre-test, CATES post-test, and HBMS total scores ($p>0.05$), while subscales of HBMS showed a significant difference ($p<0.05$). As a result, normal distribution found in CATES pre-test, W(48)= .96, p= .07, CATES post-test, W(48)= .97, p= .37 and HBMS total scores, W(48)= .97, p= .25. For the rest of the analysis, parametric tests were used for CATES pre-test, CATES post-test, and HBMS total scores, while non-parametric tests were used for subscales of HBMS.

4.2   Hypothesis 1 – Demographic Information and Environmental Attitude Relationship

This study predicted that there will be a relationship between the demographic information of the participants and their initial CATES scores. It was hypothesized that students would have different CATES pre-test scores based on their demographic information such as gender, age, school type, and family education level. There was a partial support for this hypothesis. Findings for each variable are explained in detail below.

4.2.1   Gender and Environmental Attitude

Descriptive statistics was carried out for gender and CATES pre-test scores. The scores for CATES pre-test based on gender are presented in Table 4.2.

Table 4.2 Descriptive Statistics of CATES pre-test Scores by Gender.

	Gender	N	Min	Max	Mean	SD
CATES	Boy	23	68	79	73.5	3.23
pre-test	Girl	25	70	85	79.4	4.30
	Total	48				

Table 4.2 shows that the mean score of girls and boys were 79.4 and 73.5, respectively, which indicates girls have higher environmental attitude scores in baseline. An independent samples t-test was conducted to compare the means of CATES pre-test scores for both genders, as shown in Table 4.3.

Table 4.3 Independent Samples t-test for Gender and CATES pre-test Score.

	Gender	N	t	df	p	Mean Difference	SE Difference	Cohen's d
CATES pre-test	Boy	23	- 5.32	46	.00	-5.88	1.11	1.55
	Girl	25						
	Total	48						

Table 4.3 indicates that statistically significant difference was found between genders, $t(46)= 5.32$, $p=.00$, $d= 1.55$. Extremely large effect size ($d= 1.55$) was found for this analysis. These results suggest that girls ($M=79.4$, $SD=4.3$) have higher environmental attitude scores compared to boys ($M=73.5$, $SD=3.23$).

4.2.2 Age and Environmental Attitude

Descriptive statistics was carried out for age and CATES pre-test scores. The scores for CATES pre-test based on age are presented in Table 4.4.

Table 4.4 Descriptive Statistics of CATES pre-test Scores by Age.

	Age	N	Min	Max	Mean	SD
CATES pre-test	7	12	68	84	76.9	5.5
	8	13	70	85	76.2	4.5
	9	16	70	85	76.6	4.8
	10	7	68	84	76.5	5.3

Table 4.4 shows that the mean scores of all ages are similar in baseline. One-way ANOVA was conducted to compare the means of CATES pre-test scores for age as it shown in Table 4.5.

Table 4.5 One-way ANOVA for Age and CATES pre-test Score.

Source of variance	SS	df	MS	F	p
Between Groups	3.84	3	1.28	.05	.98
Within Groups	1084.07	44	24.64		
Total	1087.92	47			

Table 4.5 shows insignificant differences in CATES pre-test scores for four different age groups. As determined by one-way ANOVA, there were no statistically significant differences between group means ($F(3,44) = .05$, $p =.98$).

4.2.3 School Type and Environmental Attitude

Descriptive statistics was carried out for school type and CATES pre-test scores. The scores for CATES pre-test based on school type are presented in Table 4.6.

Table 4.6 Descriptive Statistics of CATES pre-test Scores by School Type.

	School	N	Min	Max	Mean	SD
CATES	Public	30	68	83	74.87	.82
pre-test	Private	18	79	85	79.33	.96

Table 4.6 shows that the mean score of children attending public school and private school were 74.87 and 79.33, respectively, which indicates children attending private school have higher environmental attitude scores in baseline. An independent samples t-test was conducted to compare the means of CATES pre-test scores based on school type, as shown in Table 4.7.

Table 4.7 Independent Samples t-test for School Type and CATES pre-test Score.

School	N	t	df	p	Mean Difference	SE Difference	Cohen's d
Public	30	-	46	.00	-4.47	1.29	1.04
Private	18	3.46					
Total	48						

Table 4.7 indicates that statistically significant difference was found between school types, $t(46)= 3.46$, $p=.00$, $d= 1.04$. Very large effect size ($d= 1.04$) was found for this analysis. These results suggest that children attending private school ($M=79.2$, $SD=.96$) have higher environmental attitude scores compared to children attending public school ($M=74.87$, $SD=.82$).

4.2.4 Education Level of the Parents and Environmental Attitude

Descriptive statistics was carried out for the education level of parents and CATES pre-test scores of children in baseline. The scores for environmental education pre-test based on parent's education level are presented in Table 4.8.

Table 4.8 Descriptive Statistics of CATES pre-test Scores by Parent's Education Level.

	Parent	Education	N	Min	Max	Mean	SD
CATES pre-test	Father	High School	5	70	80	75.2	4.12
		Bachelor's	34	68	84	75.5	4.45
		Master's	9	74	85	81.2	3.90
CATES pre-test	Mother	High School	3	72	78	75	1.73
		Bachelor's	36	68	83	75.9	4.30
		Master's	9	68	85	79.8	6.20

Table 4.8 shows that the mean score of fathers having master's degree compared to high school and bachelor's degree was higher, 81.2, 75.2, and 75.5, respectively. Similarly, the mean score of mothers having master's degree compared to high school and bachelor's degree was higher, 79.8, 75.9, and 75, respectively. One-way ANOVA was conducted to compare the means of CATES pre-test scores based on education levels of parents, as shown in Table 4.9.

Table 4.9 One-way ANOVA for Parent's Education Level and CATES pre-test Score.

Parent	Source of variance	SS	df	MS	F	p
Father	Between Groups	243.06	2	121.53	6.47	.00*
	Within Groups	844.86	45	18.78		
	Total	1087.92	47			
Mother	Between Groups	118.1	2	59.03	2.74	.08
	Within Groups	969.9	45	21.55		
	Total	1087.92	47			

*p<.05

Table 4.9 shows a significant difference between environmental attitudes scores of children and their father's education levels. As determined by one-way ANOVA, there were statistically significant differences between group means of father's education level ($F(2,45) = 6.47$, $p =.00$). On the other hand, there was no statistically significant difference between mother's education level and children's CATES scores ($F(2,45) = 2.74$, $p= .08$). Post hoc comparison using Tukey HSD test indicated that the mean score of fathers having a master's degree ($M= 81.2$, $SD= 3.9$) was significantly different than fathers having bachelor's degree ($M= 75.5$, $SD= 4.45$) and fathers having high school diplomas ($M= 75.2$, $SD= 4.12$). However, fathers having high school diploma did not significantly differ from fathers having bachelor's degree. These results suggest that the environmental attitude score of children is related to fathers having master's degree, rather than bachelor's degree or high school diplomas.

For further investigation on the effect of both parents' education level on environmental attitude score of children, a two-way ANOVA was conducted. Although when both parents have master's degree has higher mean score of environmental attitude score of children ($M= 82$), there was no statistically significant interaction between mothers' and fathers' education level combined on children's environmental attitude score, $F(2,48)= .09$, $p= .92$.

4.2.5   Hypothesis 2 – Health Belief Model and Environmental Attitude Relationship

This study predicted that there will be a relationship between the HBMS scores of the participants and their CATES pre-test scores in baseline. It was hypothesized that students with lower scores on perceived barrier and higher scores on self-efficacy would have higher CATES pre-test scores. There was a partial support for this hypothesis. A multiple linear regression was calculated to predict environmental attitude based on HBMS subscales. Results of multiple linear regression analysis are shown in Table 4.10.

Table 4.10 Multiple Regression Analysis for HBMS Subscales and CATES pre-test Score.

Source	B	SE β	β	t	p
(Constant)	33.05	6.81		4.85	.00*
HBMS 1	-.71	.55	-.13	-1.28	.21
HBMS 2	.78	.25	.34	3.14	.00*
HBMS 3	.41	.22	.25	1.88	.07
HBMS 4	.59	.49	.14	1.22	.23
HBMS 5	.43	.37	.13	1.15	.26
HBMS 6	1.8	.73	.32	2.49	.02*

Note. HBMS 1: Perceived Susceptibility, HBMS 2: Perceived Benefits, HBMS 3: Perceived Barriers, HBMS 4: Cues to Action, HBMS 5: Pro-Environmental Intention, HBMS 6: Self-efficacy
*p<.05

A significant regression equation was found ($F(6,41)= 15.38$, $p<.00$), with an R^2 of .69. It was found that HBMS 2 perceived benefits subscale ($\beta= .34$, $p<.00$) and HBMS 6 self-efficacy subscale ($\beta= .32$, $p=.02$) significantly predict the CATES pre-test score. Other subscales did not show any significant results. Participant's environmental attitude scores increased .78 scores for each score of perceived benefit and 1.8 scores for each score of self-efficacy. Both perceived benefits and self-efficacy subscales were significant predictors of environmental attitude in baseline before mobile game intervention.

4.2.6   Hypothesis 3 – Impact of the Mobile Game Intervention

This study predicted that participants would report a higher score on CATES from the pre-test to post-test. It was hypothesized that students would initially have lower CATES scores before completing two-weeks of mobile game intervention and a higher score following the intervention's completion. Descriptive statistics was carried out for CATES pre-test and post-test scores and presented in Table 4.11.

Table 4.11 Descriptive Statistics of CATES pre-test and post-test Scores by Control and Experimental Groups.

	Group	N	Min	Max	Mean	SD
CATES pre-test	Control	30	68	85	76.33	4.98
	Experimental	18	70	85	76.90	4.62
CATES post-test	Control	30	68	85	76.47	5.07
	Experimental	18	73	88	79.56	4.35

Table 4.11 shows that the mean scores of CATES pre-test in control and experimental groups are same. However, the mean score of CATES post-test in control group is lower than the experimental, 76.47 and 79.56, respectively. An independent samples t-test was conducted to compare the means of CATES pre-test

and post-test scores in both control and experimental groups, as shown in Table 4.12.

Table 4.12 Independent Samples t-test for CATES pre-test and post-test Scores.

Scales	Group	N	Mean	SD	t-test	df	p
CATES pre-test	Control	30	76.3	5	-.38	46	.70
	Experimental	18	76.9	4.6			
CATES post-test	Control	30	76.5	5.1	-2.2	46	.04*
	Experimental	18	79.6	4.4			

p<.05

Levene's test revealed an insignificant value for both pre-test (F=.26, p= .62) and post-test (F=.73, p= .4) environmental attitude scores (p>.05). These results reveal that all conditions have variance equality. Moreover, Table 4.12 indicates that there was no statistically significant difference in the CATES pre-test scores between control (M=76.3, SD=5) and experimental (M=76.8, SD=.4.6) groups, $t(46)$= .38, p=.70. On the other hand, CATES post-test scores were significantly higher in experimental group than control group, $t(46)$= 2.2, p= .04. These results suggest that environmental attitude scores of children who played the game in experimental group (M=79.6, SD=.4.4) significantly increased compared to those who did not play the game in control group (M=76.5, SD= 5.1).

For further investigation, a multiple regression was calculated to check if there is any influence of HBMS subscales on environmental attitude pre-test and post-test score difference. Test conducted only for experimental group and results are shown in Table 4.13.

Table 4.13 Multiple Regression Analysis for HBMS Subscales and CATES Score Difference.

Source	B	SE β	β	t	p
(Constant)	8.41	5.1		1.65	.13
HBMS 1	.16	.32	.16	.49	.64
HBMS 2	-.09	.16	-.22	-.63	.54
HBMS 3	-.02	.13	-.06	-.18	.87
HBMS 4	.2	.43	.21	.48	.64
HBMS 5	-.24	.24	-.34	-1.02	.33
HBMS 6	-.16	.46	-.14	-.36	.73

Note. HBMS 1: Perceived Susceptibility, HBMS 2: Perceived Benefits, HBMS 3: Perceived Barriers, HBMS 4: Cues to Action, HBMS 5: Pro-Environmental Intention, HBMS 6: Self-efficacy

Regression equation was found to be non-significant ($F_{(6,11)}= .5$, $p= .8$), with an R^2 of .21. There were no significant results for any of the subscales ($p>.05$). After the mobile game intervention, the environmental attitude score difference between CATES pre-test and post-test cannot be explained by the effect of HBMS subscale scores. However, since significant predictions were found in CATES pre-test scores and HBMS subscale scores, stating HBMS subscale has no effect on environmental attitude change is not possible. For further investigation, moderation analysis was conducted in the last hypothesis.

4.2.7 Hypothesis 4 – Game Play Time and Environmental Attitude Change Relationship

This study predicted that play time of the mobile game will have an effect on CATES pre-test and post-test score change after completing two weeks of intervention. It was hypothesized that students who spent more time playing the mobile game would score higher on CATES post-test. A linear regression analysis was conducted, as shown in Table 4.14.

Table 4.14 Linear Regression Analysis for Game Play Time and CATES pre-test and post-test Score Change.

Source	B	SE β	β	t	p
(Constant)	1.94	.14		14.2	.00*
Game time	.01	.00	.89	7.83	.00*

A simple linear regression was calculated to predict environmental attitude score change based on game play time, β= .89, $t(16)$= 14.2, $p<.00$. A significant regression equation was found ($F(1,16)$= 61.23, $p<.00$), with an R^2 of .79. Participants predicted environmental attitude change is equal to +1.94 +.01 (game play time) scores when game play time is measured in minutes. Participants CATES scores increased .01 for each minute of game play time. Game play time was a significant predictor of environmental attitude increase.

For further investigation, moderator analysis was conducted to check if HBMS subscales play a role in the relationship between game time and CATES score difference. For this moderation, two multiple regression models were constructed. In the first model, the direct effects of the variables time and HBMS subscales was examined in the explanation of environmental attitude score difference. In the second model, the combination in pairs (i.e., the double interactions) were added. Results of the moderation analysis are shown in Table 4.15

Table 4.15 Moderator Analysis for HBMS Subscales, Game Play Time, and CATES pre-test and post-test Score Change.

Source	1st model			2nd model		
	β	t	p	β	t	p
(Constant)		1.78	.1		1.7	.11
Game time	.9	7.83	.00*	.87	6.56	.00*
HBMS 1	.11	.92	.37	.11	.94	.36
Interaction				.06	.44	.67
(Constant)		1.36	.19		1.2	.25
Game time	.89	7.54	.00*	.91	6.5	.00*
HBMS 2	.02	.17	.87	.03	.21	.83
Interaction				.03	.23	.82
(Constant)		2.1	.05*		1.8	.1
Game time	.89	7.5	.00*	.9	5.6	.00*
HBMS 3	.02	.14	.89	.02	.16	.88
Interaction				.01	.08	.94
(Constant)		3.6	.00*		3.9	.00*
Game time	.91	7.5	.00*	.94	7.9	.00*
HBMS 4	.06	-.5	.62	.09	.76	.46
Interaction				.17	1.5	.17
(Constant)		2.7	.02*		3.6	.00*
Game time	.85	7.3	.00*	.69	5.5	.00*
HBMS 5	.15	-1.3	.21	.23	2.1	.05*
Interaction				.26	2.1	.05*
(Constant)		3.3	.01*		4.2	.00*
Game time	.9	7.9	.00*	.94	9.1	.00*
HBMS 6	.12	-1.1	.31	.2	1.8	.09
Interaction				.2	2.2	.046*

Note. HBMS 1: Perceived Susceptibility, HBMS 2: Perceived Benefits, HBMS 3: Perceived Barriers, HBMS 4: Cues to Action, HBMS 5: Pro-Environmental Intention, HBMS 6: Self-efficacy

p<.05

Regression equation was found to be non-significant for HBMS 1 perceived susceptibility subscale and time interaction ($F(1,14)= .2$, $p= .67$), with an R^2 of .76., HBMS 2 perceived benefits subscale and time interaction ($F(1,14)= .05$, $p= .82$), with an R^2 of .75, HBMS 3 perceived barrier subscale and time interaction ($F(1,14)= .01$, $p= .94$), with an R^2 of .46, and HBMS 4 cues to action subscale and time interaction ($F(1,14)= 2.13$, $p= .17$), with an R^2 of .79. Four stated subscales were not significant moderators between time and attitude change relationship ($p>.05$). However, significant moderation effect was found for HBMS 5 pro-environmental intention subscale and time interaction ($F(1,14)= 4.6$, $p= .05$), with an R^2 of .83, and HBMS 6 self-efficacy subscale and time interaction ($F(1,14)= 4.8$, $p= .046$), with an R^2 of .83. Pro-environmental intention and self-efficacy subscales were found to be significant moderators of the relationship between game play time and environmental attitude score change, $\beta= .26$, $t(14)= 2.1$, $p= .05$ and $\beta= .2$, $t(14)= 2.2$, $p= .046$, respectively.

To sum up, based on the mentioned analysis above, some of the stated hypotheses were rejected and some of them were supported. In the first hypothesis, it was stated that there would be a relationship between the demographic information such as age, gender, school type, and family education level, and CATES pre-test scores of the children. As a result of independent t-test and one-way ANOVA analysis, the null hypothesis was rejected in gender, father's education level, and school type variables, and hypothesis 1 was supported. On the other hand, a part of the hypothesis was rejected because no difference was observed in age and mother's education level.

The second hypothesis stated that there would be a relationship between the subscales of HBMS and the CATES pre-test scores of children. As a result of multiple regression analysis, it was found that HBM 2 perceived benefits subscale and HBM 6 self-efficacy subscale predicted environmental attitude scores; however, other subscales of HMBS did not predict environmental attitude scores. Thus, the null hypothesis was rejected for HBM 2 perceived benefits, and HMB 6 self-efficacy subscales and hypothesis 2 partially found support.

In the third hypothesis, it was stated that participants who played the mobile game would have higher scores on CATES post-test compared to the group that did not play the game. As a result of the independent t-test, it was observed that the environmental attitude scale scores of the group playing the game were significantly higher; hence, the null hypothesis was rejected, and hypothesis 3 was supported.

Finally, in the fourth hypothesis, it was stated that higher CATES pre-test and post-test score differences would be observed in participants who played the mobile game longer. As a result of the regression analysis, an increase of .01 points was observed as a result of the environmental attitude for each minute of playing the game. Null hypothesis rejected, and this result supported hypothesis 4. Moreover, further analysis revealed that there is a moderation effect of HBMS 5 pro-environmental intention subscale and HMBS 6 self-efficacy subscale on the relationship between game play time and environmental attitude score change.

CHAPTER 5

DISCUSSION

This study aimed to design a mobile game for primary school students and evaluate its impacts on environmental attitudes. Two groups of students were compared in a quasi-experimental pre-test and post-test design. Demographic information, HBMS, and CATES pre-test and post-test questionnaires were collected from two groups; however, only one group played mobile game for two-weeks in between the environmental attitude pre-test and post-test. Based on the literature, four different hypotheses were stated. Various t-test, ANOVA, and regression analysis were conducted, and as a result, the majority of the hypotheses were supported. In this chapter, the results obtained from the research findings are examined by considering the results from the relevant literature, and differences were compared, and the impact of the results was discussed.

5.1   Hypothesis 1 – Demographic Information and Environmental Attitude Relationship

This study hypothesized that there will be a relationship between the participants' demographic information and their CATES pre-test scores. Based on demographic variables such as gender, age, school type, and family education level, it was expected that children will have different CATES pre-test scores. According to the results obtained from the demographic information and CATES pre-test survey, a significant difference was observed in the environmental attitude levels of the students and their gender, $t(46)= 5.32$, $p=.00$. Girls ($M=79.4$, $SD=4.3$) have higher environmental attitude scores compared to boys ($M=73.5$, $SD=3.23$), in line with the stated hypothesis. This is consistent with previous study findings by Onur et al. (2012) and Akkor and Gündüz (2018) whereby a significant relationship between

environmental attitudes and gender of students has been found. They revealed that girls have higher environmental attitudes and environmental concerns compared to boys. Arslan (2012) and Yıldırım (2009) stated that female students are more likely to use critical thinking when solving issues and situations about the environment. This can be explained by social and cultural norms. Because of social learning and social structures, when growing up, girls face more problems and solve them compared to boys, which leads them to be more detail-oriented and self-confident so that their thinking patterns become flexible. Girls are raised in a way that they become more conscious about the situation of their surroundings and feel more responsible. Thus, they tend to act more emotionally driven and feel more responsible for having a clean and safe environment for survival (Alp et al., 2006). The main problem of gender-based differences is because gender equality is still not achieved in North Cyprus. Cultural norms and practices show a need for equal opportunities, rights, and responsibilities for all genders so that no one gets affected when getting an education. According to Güven-Lisaniller (2006), many women are quitting their education at the primary or secondary school level in North Cyprus. Unfortunately, there is no recent evidence about the island's current situation, but it is crucial to consider when looking at gender differences in education.

No significant difference was found between the environmental attitude level and the age of the participants. The stated hypothesis was not supported. This is consistent with study findings reported by Gündüz and Bilir (2012). They reported no significant difference between environmental attitude and age of high school students in Northern Cyprus. On the other hand, Özgür Güler et al. (2018) reported that as students' age increases, their environmental attitudes are decreasing. In our study, the reason for the lack of differences between ages may be that age differences were very small, and the number of participants was limited. In addition, the age difference may not have been observed in children at the primary school level because official textbook contents in primary school are very similar to each other. There may not be an educational difference that can create a

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difference in environmental attitudes, as primary school students are exposed to similar subjects regardless of their grade levels.

Significant difference was found between CATES score of children and the type of school they attend, $t(46)= 3.46$, $p=.00$. Children who are attending private school ($M=79.2$, $SD=.96$) have higher environmental attitude scores compared to children attending public school ($M=74.87$, $SD=.82$). This result supports the stated hypothesis. It is consistent with study findings by Özgür Güler et al. (2018), who reported that students who are attending private school have more responsibility and environmental attitude than those who are attending public school. As opposed to that, Taskin (2009) revealed that students who are attending private school have lower environmental attitude scores since they are coming from higher socio-economic status. They tend to have more quantifiable values rather than post-materialistic ones. However, their study was conducted in Turkey with a different education system and age group. They were focusing on senior high school students. Since senior high school students have overwhelming pressure about university exams and are in adolescent years, being more prone to have quantifiable values might be expected than primary school children.

The results about students who are attending private schools have higher environmental attitudes compare to those who are attending public schools are not surprising. According to Gürler (2020), private schools have more in-class, and out-class activity opportunities compare to public schools. Students find more chances to participate in extracurricular activities and have more opportunities in science classes, such as doing experiments in laboratories so that they can understand the environment on a deeper level. Also, private school classrooms are less crowded compared to public schools. This situation might be enabling teachers to have a better chance of educating children one-on-one base in private schools. Differences in curriculums of public and private schools might be another reason for the difference in environmental attitude scores of children. Due to high prices, only families who are in high socioeconomic status are able to send their children to private schools (Güler, 2020). Education and income have strong relationship

(Wolla & Sullivan, 2017). Good income means good educational background, a better job, and better socio-economic situations. Such parental and family conditions might also be affecting the environmental attitudes of children. Those who are in more educated families might be more aware of and attentive to environmental problems.

Significant difference was found between father's education levels and children's CATES scores, $F(2,45) = 6.47$, $p =.00$. Results showed that students have higher environmental attitude scores when their fathers have master's degree. On the other hand, no significant difference was found between mother's education levels and children's environmental attitudes. There is partial support for the stated hypothesis. Taskin (2009) and Makki et al. (2003) revealed that children with college-graduate parents have higher environmental attitudes; and are more concerned about environmental issues. In contrast, Leppanen et al. (2012) reported that parents' education level has no significant effect on the children's environmental attitude level. The findings could be attributed to the function of Turkish culture where fathers are more dominant than mothers in the education of the children. Mainly the father studies with his children and helps with their homework while mothers have a more nurturing role in parenting. As stated in the literature review chapter, knowledge, and education impact environmental attitudes and behaviors. According to Flouri and Buchanan (2003)when fathers are more educated, they are more interested in their children's education. Fathers with higher education degree, might be more aware of environmental problems; thus, when they spend time with their children on school-related subjects, they might transfer that information to the children. Also, the reason why mother's education level is not significantly related to children's environmental attitude might be because of regardless of the education level; mothers might be affecting their children's environmental attitudes since they are already more environmentally aware compared to fathers. Since females are more attentive and responsible towards the environment, mother's education level might not be as important as we might think.

5.2   Hypothesis 2 – Health Belief Model and Environmental Attitude Relationship

This study hypothesized that there will be a relationship between the HBMS scores of the participants and their CATES pre-test scores. Students with lower perceived barrier scores and higher self-efficacy scores were expected to have higher CATES pre-test results. Based on the results obtained from the HBMS and CATES, HBMS 2 perceived benefits subscale (β= .34, p<.00) and HBMS 6 self-efficacy subscale (β= .73, p=.02) significantly predict CATES score. Other subscales did not show any significant results. Both perceived benefits and self-efficacy subscales were significant predictors of environmental attitude. There is partial support for the stated hypothesis. Results from literature about HBM and environmental attitudes are highly diverse. According to Yoon and Kim (2016), only perceived barriers were a significant predictor, while Kwon and Ahn (2019) reported that perceived barriers were not a significant predictor of behavioral intentions. Straub and Leahy (2014) reported self-efficacy, perceived seriousness, and benefits significantly influence environmental behavior. Also, Kwon and Ahn (2019) found that perceived benefits influence environmental decisions. Meinhold and Malkus (2005) found a significant moderator effect of self-efficacy between environmental attitude and behaviors. Similarly, Lindsay and Strathman (1997) found that perceived barriers and self-efficacy were significant predictors of recycling behavior. However, it is important to consider that when investigating Health Belief parameters and environmental-related behaviors, relevant studies focused on specific behaviors. It is not unusual to see that the results of studies are highly diverse from each other. The reason for the differences between subscales in this study may be due to the limited number of participants and the age group. There was no available study in the literature focusing on explaining environmental attitudes of primary school students by using the Health Belief Model. For this reason, it was unknown what Health Belief Model subscales reveal in the study of primary school children's environmental attitudes. Northern Cyprus has no

sufficient infrastructure and equipment for solving environmental issues such as recycling facilities and public transportation. People are forced to use private cars, and highly dependent on heating systems like air conditioners for their daily functioning due to a lack of proper public transportation systems and cheaper and environmental heating systems. They are not able to do recycling because of lack of facilities. Children might not be able to understand that using private cars or air conditioners are bad for the environment and those lack of opportunities are considered as barriers because they born and raised in such living conditions. This might be the reason why subscales other than perceived benefits and self-efficacy does not have any effect on the environmental attitudes of primary school children. Children might be perceiving only the positive and beneficial activities and behaviors towards the environment due to their education. Thus, their perceived benefits and perceived self-efficacies are higher and significantly predicting their environmental attitudes.

5.3   Hypothesis 3 – Impact of the Mobile Game Intervention

This study hypothesized that participants in the experimental group will report higher CATES pre-test to post-test scores. After completing the two-week mobile game intervention, students were expected to score better in CATES post-test. According to the results obtained from the mobile game and CATES, a significant increase was observed in the environmental attitude levels of the students in the experimental group in which the mobile game was used, $t(46)= 3.46$, $p=.00$. There is support for the stated hypothesis. This finding is consistent with the study conducted by Özgen et al. (2020), who stated mobile game intervention increased environmental attitude and behavior levels of the participants between 20 to 30 years old. In their study, the age of the participants and the mobile game type were very different from this thesis study. In the literature, there is limited research about mobile game interventions and environmental attitude enhancement. The reason why this study revealed a significant increase in environmental attitudes after the

mobile game intervention is simply because the design of the mobile game is in line with the official textbook of Social Studies and Life Sciences classes. Children who played the game were repeatedly exposed to the environmental-related vocabulary that they are familiar with from their courses. Word repetition is important for children to understand and learn concepts better (Bruner, 2001; Kefeli et al., 2018). Moreover, visual cues were used in the game. Dirty and problematic graphic design of provinces were changing to clean and happier places after children completed each province. This might affect their perception of their environment, and they might become more aware of the problems and solutions of environmental issues in the place they live. These results provide new insight into the relationship between mobile game interventions and the enhancement of the environmental attitude of children.

5.4   Hypothesis 4 – Game Play Time and Environmental Attitude Change Relationship

This study hypothesized that mobile game play time will have a positive effect on the CATES post-test score. Students who spent more time playing the mobile game were expected to have higher scores on the CATES post-test compared to their pre-test scores. A significant regression equation was found based on the results obtained from the mobile game play time and CATES score differences. Participants who played the game longer had a higher positive attitude. Moreover, moderator analysis revealed that HBM 5 pro-environmental intention and HBM 6 self-efficacy moderated the relationship between game play time and environmental attitude change. This result supports the stated hypothesis. However, in the literature, Sandberg et al. (2014) and Gwee et al. (2010) stated the opposite. Sandberg et al. (2014) revealed that differences in time length in game play does not reveal any significant difference in performance of the vocabulary learning of the children, and Gwee et al. (2010) found that there was no statistically significant association between the game play time and learning outcomes of the students.

Students who spend little time playing also achieved higher scores in the learning task. The reason for a significant relationship between game play time and attitude change might be due to the mobile game design. Since each stage of the game consists of a different vocabulary list and different visuals, the more time children spent in the game, the more new vocabulary and environmental concepts they got exposed to. More vocabulary exposure might be the possible reason for environmental attitude increase compared to previous studies. Moreover, only two of the HBM subscales play a moderator role. The reason for this might be the limited participant number, limited play time of two-weeks, and also different interests of children. Mobile game that is designed for this study was a word puzzle game. Children might lose their interest after some time, and this might affect the study results.

5.5   Summary

To sum up, based on the mentioned results and relevant literature comparison above, some of the stated hypotheses were rejected and some were supported. Also, relevant explanations and assumptions were made. In the first hypothesis, it was expected to find a relationship between the demographic information and CATES pre-test scores of the children. As a result, it was revealed that gender and children's CATES pre-test scores have a relationship. Girls have higher environmental attitude scores due to suggested social and cultural norms. School type and CATES pre-test scores of children have a relationship. Those who are attending private schools have higher environmental scores due to the better opportunities and variety of courses presented in private schools. Father's education level and children's CATES pre-test scores were found to have a relationship. Children have higher environmental attitude scores when their fathers have master's degree due to the traditional Turkish family structure where fathers are more dominant figures. On the other hand, no difference was observed between age and children's CATES pre-test scores. There are various reasons for lack of

relationship such as limited number of participants and age of participants are very close to each other. Moreover, environmental education curriculum has small differences between primary school grades. Lastly, no difference was observed between mother's education level and children's CATES pre-test scores. This might be because mothers affect their children's environmental attitudes regardless of their degree levels since they are very sensitive and attentive towards environmental issues.

The second hypothesis stated that there would be a relationship between the subscales of HBMS and the CATES pre-test scores of children. As a result, it was found that HBM 2 perceived benefits subscale and HBM 6 self-efficacy subscale predicted environmental attitude scores; however, other subscales of HMBS did not predict environmental attitude scores. This might be because children might not be able to comprehend using private cars or air conditioners are bad for the environment since in Northern Cyprus, those things are vital part of daily lives.

In the third hypothesis, it was stated that participants who played the mobile game would have higher scores on CATES post-test compared to the group that did not play the game. As a result, it was observed that the environmental attitude scale scores of the group playing the game were significantly higher due to the design of the game. Children got exposed to repetitive words that are taken from official Social Studies and Life Sciences textbooks and important visual cues in the mobile game that might triggered an enhance in environmental attitudes.

Finally, in the fourth hypothesis, it was stated that higher CATES pre-test and post-test score differences would be observed in participants who played the mobile game longer. As a result, an increase was observed in environmental attitude scores when game play time is longer due to the design of the mobile game. In each stage children were exposed to a new concept which might keep them playing longer. Moreover, further analysis revealed that there is a moderation effect of HBMS 5 pro-environmental intention subscale and HMBS 6 self-efficacy subscale on the relationship between game play time and environmental attitude score change.

These results might be due to limited participant number or children's lack of interest in the game.

CHAPTER 6

CONCLUSION

The purpose of this thesis was to evaluate whether there was a relationship between demographic information and HBM levels of children with their environmental attitudes and whether the use of mobile game increased environmental attitudes of primary school children who are getting educated in TRNC. It is important that new generation to be aware of the problems of global warming and environmental issues. Since these problems are human activity-based, new and effective methods to change human behaviors are essential. As described in detail in the methodology chapter, while control group only completed the surveys relevant to the study, experimental group completed the same surveys and played a mobile game designed and developed for this specific study. Significant results were found for gender, school type, and father's education level. Moreover, it was found that mobile game intervention is increasing the children's environmental attitudes. These results are important for further research since mobile game interventions in environmental attitude and behavior context are limited. Based on the procedure and results of the current study, limitations and future directions are presented in this chapter.

6.1 Limitations

The current study had several limitations. One limitation of this study was the online survey method. Due to Covid-19 quarantine and curfew rules and regulations, data collection was online. Necessary information and steps regarding the data collection were explained to the parents; however, online surveys can limit the research participation rates and reliability of the data since the interviewer

cannot observe and help participant as one would in face-to-face applications. Moreover, since the mobile game was only available on Android devices, it limited participation. Only those who have Android device with a suitable, updated version was able to play the game. Although the demographics of participants were diverse in terms of age, gender, and school type, including individuals who do not use Android devices can bring more variety to the data. Number of participants can be another limitation. Compared to previous studies investigating environmental attitudes and behaviors, this study had a very small sample size. Also, number of participants in control and experimental group was not the same. Even though the number of participants required to perform the tests has been provided and the tests that performed were strong enough to accommodate the imbalanced number of participants, having more participants would provide higher generalizability and better interpretation for the Health Belief Model and its moderator effect on the relationship between mobile game intervention and environmental attitude scores. Another limitation of the study was related to time. Game intervention lasted for two weeks only. Intervention took place at the end of the semester, and it is possible that the participants were less motivated to focus and play the game right before their exam period. Additionally, there is no follow-up study. It is unknown how long the positive change in the environmental attitudes of experimental group would last. Game design can also be limiting the study since it is a word puzzle game. Children might have found it boring and highly repetitive since there are more entertaining games available online with better visual support. Visual design was not dynamic. The mobile game's audio and visual components could not be improved due to the limited budget and limited opportunities. Children's game play time and attention to the material may be affected by a lack of variety in in-game sounds and static images. More importantly, gender inequality in education can be a big limitation for the study. Not all children have equal opportunities and resources to continue their education in North Cyprus. Differences in their daily lives as well as in their school can be a big factor affecting their environmental knowledge and attitudes as well as their focus on the study.

6.2   Future Suggestions

Future research could improve in several ways. Future studies should include a follow-up study with students after the intervention is completed to see if participants' environmental attitude levels are consistent with the help of the mobile game. Additionally, the intervention could be applied longer periods of time and take place during semester break to ensure children will give their attention to the game instead of their busy school schedules. Higher numbers of participants should be included in the future with various different devices and operating systems other than just Android. The study can be conducted in collaboration with a school for a longer period of time so that more participants can be tracked for a longer period of time. Differences between parent's education levels and school types should be investigated. Understanding age and gender differences and preference variances of children is important for game design to be more effective. If demographics of students in Northern Cyprus are understood better, more effective games can be designed and developed. More detailed socio-demographic information should be collected to understand their relationship environmental attitudes. Moreover, HBM subscales should be investigated more. They might be helpful to enhance the effects of mobile games on environmental attitudes and behaviors if the effects of subscales fully understood. HBM scales and demographic information of children can be compared to understand the variances on another level. Also, for further research, game design can be enhanced. More interactive games like simulations with better visuals and sounds can be developed and applied to make the gaming process more entertaining for the participants and attract more attention. Finally, further researchers could investigate whether this intervention would be effective for students in middle and high school and compare to see if the results differ between these age groups.

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APPENDICES

A. Word List

Zorluk Seviyesi	Çöplük ve Geri Dönüşüm	Termik Santral	Kanalizasyon ve Deniz Atıkları	Kentleşme	Tarım İlaçları
1	Çöp	Gaz	Çöp	Kent	Ada
	Cam	-	Göl	Ses	-
	Pil	-	Kir	Sel	-
2	Atık	Baca	Balık	Beton	Ağaç
	Atmak	Çevre	Deniz	Işık	Arsa
	Bardak	Doğa	Kıbrıs	Gece	Bahçe
	Çevre	Duman	Yaşam	İnsan	Çevre
	Çözüm	Enerji	Baraj	Yangın	Çiçek
	Kağıt	Filtre	Bulut	Deprem	Dikmek
	Metal	Hava	Doğal	Güneş	Fidan
	Plastik	İnsan	Yapay	Mevsim	Hava
	Yakmak	Kaynak	Rüzgar	Hayvan	Lale
	Lastik	Kirli	Yağmur	Çadır	Tarım
	Naylon	Temiz	-	-	Toprak
	-	Sıcak	-	-	Canlı
	-	Soğuk	-	-	Meyve
	-	Petrol	-	-	Piknik
	-	Zehir	-	-	Bitki
	-	Buhar	-	-	Cansız
	-	-	-	-	Sebze
	-	-	-	-	Zeytin
3	Ayırmak	Uçurtma	Kanalizasyon	Araba	Güzelyurt
	Cam Şişe	Gökkuşağı	Kaplumbağa	Apartman	Orkide
	Kavanoz	Yerküre	Buharlaşma	Bisiklet	Portakal
	Depolamak	Nükleer	Erime	Gürültü	Kuraklık
	Kirlilik	Radyasyon	Fırtına	Otobüs	Kimyasal
	Konserve	Doğal Kaynak	Plastik	Yürümek	Deterjan
	Pet şişe	Ozon Tabakası	Alagadi Plajı	Teknoloji	Tarım İlacı
	Su şişesi	Fırtınalı Hava	İçme Suyu	Sanayi	Yok Olmak
	Teneke	Temiz Çevre	Yeraltı Suları	Ulaşım	Çevre Kirliliği
	Korumak	Fosil Yakıt	Su Döngüsü	Sanayileşme	Yeşil Alan
	Geri Dönüşüm	Güneş Enerjisi	Su Kirliliği	Bisiklet Sürmek	-
	Çevre Kirliliği	Hava Kirliliği	-	Toplu Taşıma	-
	-	Rüzgar Enerjisi	-	-	-

B. Informed Consent Form

<div align="center">

Aydınlatılmış Onam Formu

</div>

Lütfen aşağıdaki bilgileri okuyup, sorunuz olan yerde aşağıda iletişim bilgileri verilen kişilerle iletişime geçiniz.

Genel Bilgilendirme:

"Çocukların Çevre Tutumlarının Geliştirilmesinde Mobil Oyun Uygulamalarının Etkisi" isimli araştırma çalışması Aslıhan Mecbure Tok'un lisansüstü tez projesidir ve çocuğunuzu bu çalışmaya katılmaya davet etmekteyiz. Bu formun amacı, çocuğunuzun bu araştırma çalışmasına katılmasına izin verip vermeyeceğinize dair kararınızı etkileyebilecek bilgileri size sağlamaktır. Araştırmayı yapan kişi size çalışmayı anlatacak ve tüm sorularınızı cevaplayacaktır. Aşağıdaki bilgileri okuyun ve çocuğunuzun katılmasına izin verip vermeyeceğinize karar vermeden önce sorularınızı sorun. Çocuğunuzun bu çalışmaya dahil olmasına izin verirseniz, bu form izninizi verdiğinize dair kanıt olarak saklanacaktır.

Çalışmanın Amacı:

Kabul ederseniz, çocuğunuzdan çevresel tutumlar hakkında bir araştırma çalışmasına katılması istenecektir. Bu çalışmanın amacı, çevre ile ilgili mobil oyunların ilkokul çocuklarının çevresel tutumları üzerindeki etkisini araştırmaktır.

Çocuğumdan ne yapması istenecek?

Çocuğunuzun bu çalışmaya katılmasına izin verirseniz, bir mobil oyun oynamadan önce çevre ile ilgili 25 sorudan oluşan bir çevresel tutum ölçeğini doldurması istenecektir. Mobil oyunun linki araştırmacı tarafından size gönderilecek, telefonunuza nasıl yükleyeceğinizi ve uygulamanın nasıl kullanılacağı hakkında araştırmacı size rehberlik edecektir. Çocuğunuzdan oyunu iki hafta boyunca oynaması istenecek ve oyunu oynama süresi sizin tercihlerinize göre düzenlenecektir (örneğin, yalnızca hafta sonları veya her gün, günde bir saat şeklinde). Oyunu iki hafta oynadıktan sonra, çocuğunuzdan aynı çevresel tutum ölçeğini tekrar tamamlaması ve sağlık inanç modeli ölçeğini doldurması istenecektir. Bu çalışma toplamda iki hafta sürecektir.

Bu çalışmada yer alan riskler nelerdir?

Bu çalışmaya katılımda öngörülen bir risk yoktur.

<div align="center">

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</div>

Çocuğum çalışmaya katılmak zorunda mı?

Hayır, çocuğunuzun bu çalışmaya katılımı isteğe bağlıdır. Çocuğunuz istediği zaman çalışmadan çekilmeyi talep edebilir. Çocuğunuzun şimdi çalışmada olmasına izin verebilir ve daha sonra herhangi bir yükümlülük olmadan fikrinizi değiştirebilirsiniz.

Çocuğum çalışmaya katılmak istemiyorsa ne olur?

İzninize ek olarak, çocuğunuzun çalışmaya katılmayı kabul etmesi gerekir. Çocuğunuz katılmak istemiyorsa, çalışmaya dahil olmayacak ve ceza almayacaktır. Çocuğunuz başlangıçta çalışmada olmayı kabul edip, daha sonra herhangi bir yükümlülük olmadan fikrini değiştirebilir.

Çalışmada herhangi bir teşvik olacak mı?

Oyunu tamamladıktan sonra çocuğunuz yaşına uygun bir kitap alacaktır.

Çalışmanın gizliliği ve katılımcıları koruma politikası nedir?

Anketlerden üçü ve mobil oyun, herhangi bir tanımlayıcı bilgi yerine kodlanmış bir kullanıcı adına sahip olacak ve kimlikler ayrı bir belgede tutulacak ve bu belgeye erişimi kısıtlanacaktır.

ODTÜ NCC BAYEK'in çalışma kayıtlarını incelemesi gerekirse, çocuğunuzla bağlantılı olabilecek bilgiler yasaların izin verdiği ölçüde korunacaktır. Çocuğunuzun araştırma kayıtları, yasa veya mahkeme kararı gerekmedikçe izniniz olmadan açıklanmayacaktır. Çocuğunuzun katılımından elde edilen veriler, bu onay formunda yer almamış olan başka bir araştırma amacıyla gelecekte diğer araştırmacılara sunulabilir. Bu gibi durumlarda, veriler çocuğunuzla veya çocuğunuzun herhangi bir çalışmaya katılımıyla ilişkilendirebilecek tanımlayıcı bilgiler içermeyecektir.

Çalışmayla ilgili sorular için kimlerle iletişime geçebilirim?

Katılımınız sırasında veya sonrasında herhangi bir sorunuz olması durumunda araştırmacı Aslıhan Mecbure Tok ile (533)864 64 96 numaralı telefondan veya tok.aslihan@metu.edu.tr adresinden iletişime geçebilirsiniz.Bu çalışma ODTÜ NCC BAYEK tarafından incelenmiş ve onaylanmıştır.

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Ebeveyn Onayı:

Çocuğunuzun bu çalışmaya katılmasına izin verme konusunda bir karar vermektesiniz. Aşağıdaki onayınız, yukarıda verilen bilgileri okuduğunuzu ve çocuğunuzun çalışmaya katılmasına izin vermeye karar verdiğinizi gösterir. Daha sonra çocuğunuzun çalışmaya katılması için izninizi geri çekmek istediğinize karar verirseniz, herhangi bir zamanda katılımını durdurabilirsiniz.

Ebeveyn Onayı*

☐ Yukarıdaki bilgileri okudum ve çocuğumun katılmasına onay veriyorum.

Ebeveyn İsim ve Soyadı*

_____

C. Demographic Information Form

Demografik Bilgi Formu

Bu formun amacı, "Çocukların Çevre Tutumlarının Geliştirilmesinde Mobil Oyun Uygulamalarının Etkisi" başlıklı araştırma için toplanacak verilerin özellikleri hakkında fikir edinmemizi sağlayacak katılımcı hakkında demografik bilgiler toplamaktır.

Bu çalışmanın amacı, iç ve dış mekan etkinliklerinin yanı sıra çevresel tutumların artırılması için verimli bir yöntem geliştirmektir. Çocuğunuzun bu çalışmaya katılmasına izin verirseniz, cep telefonu ile dil tabanlı egzersizleri oynayıp tamamlamadan önce çevresel tutum hakkında bir anket tamamlaması istenecektir. Mobil oyunu tamamladıktan sonra, yukarıda belirtilen çevresel tutum hakkında aynı anketi tamamlamaları istenecektir. Oyunun içeriğindeki egzersizler, yazılı sözcüklerdeki hatayı bulmayı ve düzeltmeyi içerir. Tüm kelimeler çevre sorunları ve çevresel unsurlarla ilgilidir.

Araştırmayı yapan kişi size çalışma hakkında bilgi verecek ve tüm sorularınızı cevaplayacaktır. Çocuğunuzun bu çalışmaya dahil olmasına izin verirseniz, bu form çevresel tutum anketinden toplanan verilerin özelliklerini belirlemek için kullanılacaktır.

Doldurduğunuz formlarla ya da çalışmanın herhangi bir aşamasıyla ilgili bir sorunuz olduğunda araştırmayı yürüten yüksek lisans öğrencisi Aslıhan Mecbure Tok'la (533) 864 64 96 numaralı telefon numarasından veya tok.aslihan@metu.edu.tr adresi üzerinden iletişime geçebilirsiniz.

Çocuğunuzun katılımı ve/veya haklarının korunması ile ilgili sorularınız varsa veya herhangi bir risk veya strese maruz kalabileceğine inanıyorsanız, (392) 661 34 24 numaralı telefon numarası veya nccbayek@metu.edu.tr adresi üzerinden Orta Doğu Teknik Üniversitesi Kuzey Kıbrıs Kampüsü Bilimsel Araştırma ve Yayın Etik Kurulu (BAYEK) ile iletişime geçebilirsiniz.

Katılımınız için teşekkür ederiz.

Soyadınız* (*Doldurulan bütün formların aynı kişiye ait olduğunu teyit etmek için istenmektedir.*)

_____

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1. Çocuğunuzun Cinsiyeti:

☐ Erkek

☐ Kız

2. Çocuğunuzun Yaşı:

☐ 7

☐ 8

☐ 9

☐ 10

☐ Diğer

    Diğer'i seçtiyseniz lütfen belirtin : _____

3. Çocuğunuzun eğitim gördüğü okul hangisidir?

☐ Devlet

☐ Özel

4. Çocuğunuz kaçıncı sınıfa gitmektedir?

☐ 2

☐ 3

☐ 4

☐ 5

☐ Diğer

    Diğer'i seçtiyseniz lütfen belirtin : _____

5. Çocuğunuzun kardeşi var mı?

☐ Evet

☐ Hayır

6. Çocuğunuzun ana dili/dilleri nelerdir?

☐ Türkçe

☐ İngilizce

☐ Diğer

    Diğer'i seçtiyseniz lütfen belirtin : _____

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7. Evinizde hangi dil/diller konuşulmaktadır?

☐ Türkçe

☐ İngilizce

☐ Diğer

    Diğer'i seçtiyseniz lütfen belirtin : _____

8. Eğitim durumunuz nedir?

☐ Eğitim tamamlanmadı

☐ İlkokul mezunu

☐ Lise mezunu

☐ Ticaret/teknik/mesleki eğitim

☐ Lisans derecesi

☐ Yüksek lisans derecesi

☐ Doktora derecesi

☐ Diğer

    Diğer'i seçtiyseniz lütfen belirtin : _____

9. Eşinizin eğitim durumu nedir?

☐ Eğitim tamamlanmadı

☐ İlkokul mezunu

☐ Lise mezunu

☐ Ticaret/teknik/mesleki eğitim

☐ Lisans derecesi

☐ Yüksek lisans derecesi

☐ Doktora derecesi

☐ Diğer

    Diğer'i seçtiyseniz lütfen belirtin : _____

10. Çocuğunuz haftada kaç saatini ekran başında geçirmektedir?

☐ 1-5 saat

☐ 6-10 saat

☐ 11-15 saat

☐ 16-20 saat

☐ Diğer

Diğer'i seçtiyseniz lütfen belirtin : _____

11. Evde beslediğiniz evcil hayvanınız var mı?

☐ Evet

☐ Hayır

12. Evinizde geri dönüşüm yada yeniden değerlendirme yapar mısınız?

☐ Evet

☐ Hayır

13. Toplu taşıma araçları ya da bisiklet kullanıyor musunuz?

☐ Evet

☐ Hayır
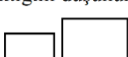
14. Evinizde güneş panelleri sistemi var mıd?
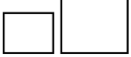
☐ Evet

☐ Hayır

D. Environmental Attitude Survey

Aşağıda "ama" ile ayrılmış olan cümle gruplarını okuyup her biri için sağdaki cümlenin mi yoksa soldaki cümlenin mi sizi tanımladığını seçin. Seçiminizi yaptıktan sonra eğer cümlede anlatılanın size çok benzediğini düşünüyorsanız büyük olan kutuya, size az benzediğini düşünüyorsanız küçük kutuya "x" işareti koyun.

	Çocuklarda Çevre Tutum Ölçeği		
1	Bazı çocuklar dişlerini fırçalarken suyu açık bırakmayı sever.	ama	Diğer çocuklar dişlerini fırçalarken suyu her zaman kapatır.
2	Bazı çocuklar çizerken ya da yazarken kağıdın iki tarafını da kullanır.	ama	Diğer çocuklar çizerken ya da yazarken kağıdın sadece bir tarafını kullanır.
3	Bazı çocuklar işimiz bittiğinde eşyaları atmamız gerektiğini düşünür.	ama	Diğer çocuklar eşyaları geri dönüştürmemiz gerektiğini düşünür.
4	Bazı çocuklar bitkilere ve hayvanlara zarar verdiği için akarsuların üstündeki barajların kötü olduğunu düşünür.	ama	Diğer çocuklar selleri önlediği için akarsuların üstündeki barajların iyi olduğunu düşünür.
5	Bazı çocuklar dışarıda buldukları bitkileri ya da böcekleri eve getirmeyi sever.	ama	Diğer çocuklar bitkilere ve böceklere dışarda bakmayı sever ama onları asla eve getirmez.
6	Bazı çocuklar kuş yemliği ya da kuş evi yapmayı sevmez.	ama	Diğer çocuklar kuş yemliği ya da kuş evi yapmayı sever.
7	Bazı çocuklar elektrik harcadıkları için geceleri dışarıdaki ışıkların kapatılması gerektiğini düşünür.	ama	Diğer çocuklar bizi daha güvende tuttuğu için geceleri dışarıdaki ışıkların açık kalması gerektiğini düşünür.
8	Bazı çocuklar insanların hayvanlardan daha önemli olduğunu düşünür.	ama	Diğer çocuklar insanlarla hayvanların eşit derecede önemli olduğunu düşünür.

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9	Bazı çocuklar yağmur ormanlarıyla ilgili endişe duyar.	ama	Diğer çocuklar yağmur ormanlarıyla ilgili endişe duymaz.
10	Bazı çocuklar çöplerimizi koymak için daha fazla arazi inşa etmemiz gerektiğini düşünür.	ama	Diğer çocuklar çöplerimizle başetmek için başka yollar bulmamız gerektiğini düşünür.
11	Bazı çocuklar milli parkları gezmeyi sever.	ama	Diğer çocuklar milli parklara gitmeyi sevmez.
12	Bazı çocuklar hayvanların neslinin tükenmesi konusunda endişelenmez.	ama	Diğer çocuklar hayvanların neslinin tükenmesi konusunda endişelenir.
13	Bazı çocuklar işimiz bittiğinde eşyaları atar.	ama	Diğer çocuklar eşyaları yeniden kullanır ya da kullanması için başka insanlara verir.
14	Bazı çocuklar bahçelerimizde kimyasallar ve gübreler kullanmamız gerektiğini düşünür.	ama	Diğer çocuklar bahçelerimizde kimyasallar ve gübreler kullanmamamız gerektiğini düşünür.
15	Bazı çocuklar çöpleri yerden alır ve çöpe atar.	ama	Diğer çocuklar kokan çöpleri yerden almayı sevmez.
16	Bazı çocuklar çöplerini sınıflandırmaz.	ama	Diğer çocuklar çöplerini sınıflandırır ve geri dönüştürür.
17	Bazı çocuklar bir sürü bitki ve hayvanın olduğu yerlerde yaşamayı sever	ama	Diğer çocuklar bir sürü insanın olduğu yerlerde yaşamayı sever

18	Bazı çocuklar yabani hayvanlara dokunur ya da yakalar.	*ama*	Diğer çocuklar yabani hayvanlara asla dokunmaz ya da yakalamaz.
19	Bazı çocuklar kalabalık arabalarda olmayı sevmedikleri için toplu taşıma kullanmayı sevmez.	*ama*	Diğer çocuklar biraz kalabalık olsa bile toplu taşıma kullanmayı sever.
20	Bazı çocuklar güneş enerjisi konusunda heyecanlıdır.	*ama*	Diğer çocuklar güneş enerjisini önemsemez.
21	Bazı çocuklar insanların nerede isterlerse yaşamaları gerektiğine inanır.	*ama*	Diğer çocuklar hayvanların evlerini yoketmeme konusunda insanların dikkat etmeleri gerektiğine inanır.
22	Bazı çocuklar hava kirliliği konusunda endişe duyar.	*ama*	Diğer çocuklar hava kirliliği konusunu umursamaz.
23	Bazı çocuklar tüm vahşi hayvanları avlayabilir olmamız gerektiğini düşünür.	*ama*	Diğer çocuklar hayvanların korumaya ihtiyacı olduğunu düşünür.
24	Bazı çocuklar çıkarken ışıkları kapatır.	*ama*	Diğer çocuklar ışıkları açık bırakır.
25	Bazı çocuklar istedikleri yerlere ailelerinin arabasıyla gider.	*ama*	Diğer çocuklar uygun olduğu zamanlarda bisiklet sürer ya da yürürler.

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E. Health Belief Model Survey

Sağlık İnanç Modeli Ölçeği

Aşağıdaki cümlelerin karşısındaki kutulardan size uygun olduğunu düşündüğünüz seçeneği işaretleyin. Her cümle için bir kutucuk işaretlemeniz gerekmektedir.

	Kesinlikle Katılıyorum	Katılıyorum	Katılmıyorum	Kesinlikle Katılmıyorum
1-) Küresel ısınmanın beni etkileyeceğini düşünüyorum.				
2-) Işıkları kapatmazsam bunun bana bir zararı olmaz.				
3-) Karbon salınımını azaltmak çevre ve insan sağlığına olumsuz etkileri azaltır.				
4-) Doğayı korumak benim için eğlencelidir.				
5-) Hayvanlar ve bitkilerle ilgilenmek beni rahatlatır.				
6-) Doğayı korumak arkadaşlarımla ilişkilerimi güçlendirir.				
7-) Doğayı korumak beni daha sağlıklı yapar.				
8-) Geri dönüşüm yapmak küresel ısınmayı durdurabilir.				
9-) Geri dönüşüm yapmak doğayı güzelleştirir.				
10-) Daha az elektrik ve su kullanmak çok yorucudur.				
11-) Doğayı korumayı düşünmek beni yorar.				
12-) Doğayı korumaya çalışmak çok utanç vericidir.				
13-) Arkadaşlarım doğayı koruma konusunda beni desteklemezler.				
14-) Geri dönüşüm yapmak çok yorucudur.				

15-) Geri dönüşüm yapmak zaman kaybıdır.				
16-) Doğayla ilgili film ve belgeseller izlerim.				
17-) Doğayla ilgili sorunları ailem ve arkadaşlarımla konuşurum.				
18-) Araba yerine bisiklet ya da toplu taşıma kullanmayı tercih edeceğim.				
19-) Evde elektrik kullanımıma dikkat edeceğim.				
20-) Evde su kullanımıma dikkat edeceğim.				
21-) Evde geri dönüşüm yapacağım.				
22-) Geri dönüştürülemeyen eşyaları almamaya çalışacağım.				
23-) Çöpleri kategorize etmeyi ve geri dönüşüme hazırlamayı biliyorum.				
24-) Yakın yerlere arabayla gitmek yerine yürüyebilirim.				

F. Debriefing Form

<div align="center">

Katılım Sonrası Bilgilendirme Formu

</div>

Öncelikle çalışmaya katıldığınız için size ve çocuğunuza teşekkür ederiz. Bu araştırma, daha önce de belirtildiği gibi ODTÜ Kuzey Kıbrıs Kampüsü Sürdürülebilir Çevre ve Enerji Sistemleri Bölümü Yüksek Lisans öğrencisi Aslıhan Mecbure Tok tarafından yüksek lisans tezi kapsamında yürütülmektedir. Araştırmanın amacı, çevreyle ilgili tasarlanmış mobil oyunların ilkokul çağındaki çocukların çevre tutumları üzerindeki etkisini araştırmak ve aynı zamanda çocukların çevre tutumlarıyla yaş ve cinsiyet gibi demografik bilgileri arasında nasıl bir ilişki olduğunu görmektir.

Daha önce yapılan çalışmalarda sınıf içi eğitimin ve doğada yapılan aktivitelerin çocuklardaki çevre tutumunu pozitif yönde etkilediği bulunmuş olsa da mobil oyun ve benzeri teknolojik gereçlerin çevre tutumuyla olan ilişkisi henüz detaylı bir şekilde incelenmemiştir. Ancak mobil oyunların matematik, fen ve okuma bozuklukları gibi konularda öğrencilerin performansını yükseltmek için kullanıldığı bilinmektedir. Bu araştırmalar ışığında çalışmada kullanılan oyunun katılımcıların çevre tutumlarını olumlu yönde etkileyeceği öngörülmektedir.

Çalışmada sizden herhangi bir kimlik bilgisi alınmadığını ve sizin ve çocuğunuzun sağladığı bilgilerin tamamen gizli tutulacağını hatırlatırız. Elde edilen bilgiler sadece bilimsel araştırma ve yazılarda kullanılacaktır.

Araştırmanın sonuçlarını öğrenmek ya da daha fazla bilgi almak için aşağıdaki e-posta adresiyle iletişime geçebilirsiniz. İlginiz ve katkınız için teşekkür ederiz.

<div align="right">

Aslıhan Mecbure Tok

e-posta: tok.aslihan@metu.edu.tr

</div>

☐ Yukarıdaki bilgileri okudum.

Ebeveyn İsim ve Soyadı*

_____

G. First e-mail

İyi günler,

Bu mail Aslıhan Mecbure Tok'un lisansüstü tez projesi olan "Çocukların Çevre Tutumlarının Geliştirilmesinde Mobil Oyun Uygulamalarının Etkisi" isimli çalışmaya katılımınızla ilgili izlemeniz gereken adımları açıklamak için yollanmıştır.

Çalışmanın birinci aşamasıyla ilgili izlemeniz gereken adımlar aşağıda belirtilmiştir. İkinci aşamayla ilgili mail 2 hafta sonra gönderilecektir. Herhangi bir adımda problem yaşadığınızda mailin en altında verilen iletişim adreslerinden ulaşabilir, Zoom görüşmesi talep edebilirsiniz. Zamanınızı ayırdığınız için teşekkür ederiz.

1- Katılımcı çocuğun ebeveyni olarak linki verilen "Aydınlatılmış Onam Formu"nu okuyup çocuğunuzun katılımına onay verdiğinizi işaretlemeniz gerekmektedir;

   Link: https://forms.gle/xBfUdkWKd48Y7MWi6

2- Katılımcı çocuğun ebeveyni olarak linki verilen "Demografik Bilgi Formu"nu okuyup gerekli alanları doldurmanız gerekmektedir;

   Link: https://forms.gle/1CCPyhixLyNWd4Fa7

3- Aşağıda linki verilen "Çocuklarda Çevre Tutum Ölçeği"ni **çocuğunuzun** okuyup gerekli işaretlemeleri yapması gerekmektedir. Her bir soru için 4 boş kutu bulunmaktadır. Çocuğunuz kendine uygun bulduğu seçeneği işaretlemesi gerekir.

   Link: https://forms.gle/UainxVpoLgrCdEyk9

4- Yukarıdaki formları doldurduktan sonra Android cihazınızdan şu adımları izlemeniz gerekmektedir;

   Türkçe Telefonlarda: Ayarlar >> Biyometrik Veriler ve Güvenlik >> Bilinmeyen Uygulamaları Yükle >> Drive >> Bu Kaynağa İzin Ver "AÇIK"

   İngilizce Telefonlarda: Settings >> Privacy Protection >> Special Permissions >> Install Unknown App >> Drive >> Allow from this source "ON"

   Cihazınızın **Ayarlar** menüsünü açın. Açılan menüden **Biyometrik Veriler ve Güvenlik** ve daha sonra da **Bilinmeyen uygulamarı yükle** seçeneklerine sırasıyla tıklayın. Karşınıza bir uygulamalar listesi çıkacak. Bu listeden **Drive** uygulamasını bulup üstüne tıklayın. Açılan ekranda **Bu Kaynağa İzin Ver** seçeneğinin açık olduğundan emin olun.

   Android telefonlarda menüler versiyondan versiyona değişiklik gösterebilmekte. Bu sebeple yukarıda bahsedilen herhangi bir sekmeyi bulmakta zorlanıyorsanız, **Ayarlar** menüsüne girdiğinizde arama çubuğuna **Bilinmeyen Kaynaklar** veya **Unknown App** yazarakta işlemi gerçekleştireceğiniz sayfayı kısa yoldan bulabilir ve aynı şekilde **Drive** uygulamasına erişim izni verebilirsiniz.

5- Drive uygulamasına gerekli izni verdikten sonra aşağıda linki verilen **Wordy's World** mobil oyununu android cihazınıza kurmanız gerekmektedir. Kısaca şu adımları takip etmeniz yeterli olacaktır;

Link: https://drive.google.com/drive/folders/1VWtgnH6OLsr5G6l21dzCnLb-EbjYBcNt?usp=sharing

Linke tıklayın. Açılan sayfadan **Wordy's World.apk** isimli dosyanın üzerine tıklayın. Birkaç saniyelik yüklenme sayfasından sonra karşınıza **Bu uygulamayı yüklemek istiyor musunuz?/Do you want to install this application?** uyarısı çıkacaktır. Kutucuktaki **Yükle/Install** seçeneğine tıklayın. Uyguluma hızlı bir şekilde telefonunuza yüklenecektir. Telefonunuzun ana ekranında **Wordy's World** ismiyle oyunu bulabilirsiniz.

Oyunun nasıl oynanacağıyla ilgili hazırladığımız kısa videoyu aşağıdaki linkten bulabilirsiniz;

Link: https://youtu.be/k4h0Xcpk-80

Yukarıda bahsedilen adımlarla ya da formlardaki bilgilerle ilgili herhangi bir sorunuz olması durumunda araştırmacı **Aslıhan Mecbure Tok** ile **+90 (533) 864 6496** numaralı telefondan veya **tok.aslihan@metu.edu.tr** adresinden iletişime geçebilirsiniz ve yükleme süreçleriyle ilgili Zoom görüşmesi talep edebilirsiniz.

Katılımınız için teşekkür ederiz.

Sevgiler,

Aslıhan M. Tok

H. Second e-mail

İyi günler,

Bu mail Aslıhan Mecbure Tok'un lisansüstü tez projesi olan "Çocukların Çevre Tutumlarının Geliştirilmesinde Mobil Oyun Uygulamalarının Etkisi" isimli çalışmaya katılımınızla ilgili izlemeniz gereken adımları açıklamak için yollanmıştır.

Çalışmanın ikinci aşamasıyla ilgili izlemeniz gereken adımlar aşağıda belirtilmiştir. Herhangi bir adımda problem yaşadığınızda mailin en altında verilen iletişim adreslerinden ulaşabilir, Zoom görüşmesi talep edebilirsiniz. Zamanınızı ayırdığınız için teşekkür ederiz.

1- Aşağıda linki verilen "Çocuklarda Çevre Tutum Ölçeği"ni **çocuğunuzun** okuyup gerekli işaretlemeleri yapması gerekmektedir. Her bir soru için 4 boş kutu bulunmaktadır. Çocuğunuz kendine uygun bulduğu seçeneği işaretlemesi gerekir.

   Link: https://forms.gle/UainxVpoLgrCdEyk9

2- Aşağıda linki verilen "Sağlık İnanç Modeli Ölçeği"ni **çocuğunuzun** okuyup gerekli işaretlemeleri yapması gerekmektedir. Her bir soru için 4 boş kutu bulunmaktadır. Çocuğunuzun kendine uygun bulduğu seçeneği işaretlemesi gerekir.

   Link: https://forms.gle/8HaCfKsLDxB4GSGy9

3- Aşağıda linki verilen "Bilgilendirme Formu" çalışma hakkında bilgileri içermektedir. Çocuğunuzun velisi olarak formu okuyup, okuduğunuza dair onay vermeniz gerekmektedir.

   Link: https://forms.gle/R4atGg3h8KxzFM7t5

4- Yukarıdaki üç adımı da tamamladıktan sonra çalışma tamamlanmış olacaktır. Dilerse çocuğunuz oyunu oynamayı sürdürebilir. Ancak bu maili aldığınız andan itiberen artık çocuğunuzun çalışmayla ilgili herhangi bir verisi tutulmayacak ve çalışmayı tamamlamış sayılacaktır.

Yukarıda bahsedilen adımlarla ya da formlardaki bilgilerle ilgili herhangi bir sorunuz olması durumunda araştırmacı **Aslıhan Mecbure Tok** ile **+90 (533) 864 6496** numaralı telefondan veya **tok.aslihan@metu.edu.tr** adresinden iletişime geçebilirsiniz ve bir Zoom görüşmesi talep edebilirsiniz.

Katılımınız için teşekkür ederiz.

Sevgiler,

Aslıhan M. Tok

I. Ethical Approval

Scientific Research and Publication Ethics Committee (BAYEK)

Dear Aslihan Mecbure Tok,

The METU Northern Cyprus Campus Scientific Research and Publication Ethics Board has completed the evaluation of your application for ethics clearance of your research.

Title of the study:
Investigating the Change in Children's Environmental Attitudes by an Intervention of Mobile Game-App

Your application has been approved and has been found to be in compliance with the code of ethics within 03/02/2020 - 03/08/2020 dates.

On behalf of the Scientific Research and Publication Ethics Committee, I wish you success in your research. Please feel free to contact to Committee should you have any queries reading this approval.

Yours truly,

Assoc. Prof. Dr. Murat SÖNMEZ
Head of BAYEK

TEZ İZİN FORMU / THESIS PERMISSION FORM

PROGRAM / PROGRAM

Sürdürülebilir Çevre ve Enerji Sistemleri / Sustainable Environment and Energy Systems ☑

Siyaset Bilimi ve Uluslararası İlişkiler / Political Science and International Relations ☐

İngilizce Öğretmenliği / English Language Teaching ☐

Elektrik Elektronik Mühendisliği / Electrical and Electronics Engineering ☐

Bilgisayar Mühendisliği / Computer Engineering ☐

Makina Mühendisliği / Mechanical Engineering ☐

YAZARIN / AUTHOR
Soyadı / Surname : Tok

Adı / Name : Aslıhan Mecbure

Programı / Program : Sustainable Environment and Energy Systems

TEZİN ADI / TITLE OF THE THESIS (**İngilizce** / English) : INVESTIGATING THE CHANGES IN CHILDREN'S ENVIRONMENTAL ATTITUDES THROUGH MOBILE GAME INTERVENTION

TEZİN TÜRÜ / DEGREE**:**   **Yüksek Lisans** / Master ☑   **Doktora** / PhD ☐

1. **Tezin tamamı dünya çapında erişime açılacaktır. /** Release the entire work immediately for access worldwide. ☐

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Tez Danışmanı / Thesis Advisor Full Name: …………………………….

Tez Danışmanı İmzası / Thesis Advisor Signature: ……………………..

Eş Danışmanı / Co-Advisor Full Name: ……………………………….

Eş Danışmanı İmzası / Co-Advisor Signature: ……………………..

Program Koordinatörü / Program Coordinator Full Name: ……………………………

Program Koordinatörü İmzası / Program Coordinator Signature: …………………..