



# Amitrakshar International Journal

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## On Promoting Environmental Education for Middle School Students Using Digital Tools

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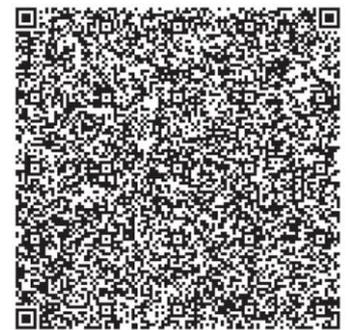
### Abstract

To provide experiential learning in environmental education the use of latest technologies can be a boon. Supporting environmental education through the use of technology can lead to innovative practices in formal and informal educational settings. Technologies can increase student interest while enabling them to capture experiences of local environments, to collect and share data with each other and with broader audiences. This paper highlights the result of an iNature project which was launched for grades 6, 7 and 8. The main objectives of the paper were to study the impact of using technology in green education and how to engage students in environmental education using technology. Google lens is a powerful technology which was used by the students to identify the local environment around them. In addition students could also use the seek app to identify the plants around them. The students were asked to post pictures of the identified plants on a padlet specifically created for this purpose. Padlet is a powerful educational technology that can be used for showcasing group work to enhance collaboration and communication. Students were also encouraged to comment on each other's pictures. Students were then asked about their opinion on the importance of plants and trees in keeping the environment clean. All the content had to be posted on the padlet. A pre and post survey was conducted to study the impact of the project on increase in student's learning in recognizing the flora and fauna around themselves, understanding the diversity of plants, understanding the role of plants to human and society and plants as symbol in our culture. Student attitudes related to experiential learning and self-efficacy about the project were also collected. Results of the survey are also presented in the paper. It was found that the project was successful in promoting experiential learning and self-efficacy.

**Keywords:** environmental education, technology, padlet, Google lens

### 1. Introduction

Environmental education for middle-grade students is essential for fostering an understanding of the natural world, awareness, knowledge, skills, and values promoting sustainable practices and empowering young individuals to become responsible environmental stewards. Tailoring environmental education to middle-grade students in an engaging, interactive, and interdisciplinary manner will not only impart knowledge but also nurture a lifelong appreciation for the environment and a sense of responsibility towards its preservation. There are many ways by which environmental education ideas and principles can be infused in the middle grade students like Project-Based Learning, Outdoor Classroom Activities, Community Involvement, Virtual Field Trips, Role-Playing and Simulations, using interactive technologies etc. This paper focuses on using digital technologies for promoting environmental education among the middle grade students. Digital technologies, such as mobile devices, online platforms, games, simulations, and sensors, can offer new opportunities and challenges for environmental education. Digital technologies can significantly enhance environmental education by providing interactive and engaging platforms to learn about environmental concepts, sustainability, and conservation efforts. Websites dedicated to environmental education, such as National Geographic Kids, EPA Student Center, or NASA Climate Kids, offer a wide range of educational resources, interactive games, videos, and articles on environmental topics. Apps like iNaturalist, EarthViewer, or



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Biodiversity Snap provide opportunities for students to explore and identify plants, animals, and ecosystems in their local area while fostering a deeper understanding of biodiversity. Brečka et al. (2022) proposed a digital support model for pupils' environmental education. Buchanan et al. (2018) found that digital technologies, mobile applications, and virtual reality can provide new ways of engaging pupils in environmental education so that they behave as responsible citizens. However teachers need to trained in using digital technologies for promoting environmental education among students (Záhorec et al. 2021). To provide experiential learning to students in environmental education digital technologies can serve as an aid. Digital technologies help to promote creativity, innovation, collaborative learning, communication and contextualized knowledge while students learn about environmental education. It can also serve as a motivation to students to learn about their surroundings and the community they live in. A STEAM (Science, Technology, Engineering, Arts and Mathematics) can also be easily planned while integrating technology in environmental education. This way, students can be prepared for future career pathways. In order to maximize potential gains of using both technology and environmental education, technology must be used in concert with outdoor hands-on experiences, and not just as an afterthought (Willis, Weiser, & Kirkwood, 2014). The National Education Policy 2020 (NEP 2020) also emphasizes on promoting holistic development of learners through environmental education. It also stresses on the use of different ICT tools for studying local environmental issues. In this paper we explore the use of Google Lens and Seek app which students used to identify the flora around them. The project was named iNature and was conducted on a sample of 150 students of different grades of middle school level of Demonstration Multipurpose School, Bhopal. We also used Padlet, a powerful education technology for students to promote collaborative learning in environmental education. The entire work of the students was showcased on a Padlet created for this project. After completing the project students participated in a survey on promotion of experiential learning and self-efficacy through the project.

### 2. Objectives

- To engage students in environmental education using technology
- To study the impact of using technology in green education

### 3. Research Questions

What is the benefit of using technology in environmental education?

What effect does use of technology have on student self-efficacy and experiential learning?

### 4. Methodology

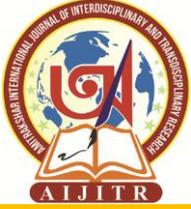
The iNATURE project used two technologies for the identification of flora. First one is the Google Lens. Google Lens is a powerful visual recognition tool developed by Google that uses artificial intelligence to identify objects, text, and more through a smartphone's camera. It can be a valuable tool for identifying flora and fauna. Each student had to identify 5 plants around them and cultural significance of their favourite plant along with the uses of the plants. Steps that had to followed by the students using Google Lens

- Install and Open Google Lens: Students had to install Google Lens application
- Open the Google Lens app. Activate the Camera: Allow the app to access your phone's camera. This is usually prompted when you open the app for the first time.
- Capture the Image: Point your phone's camera at the plant, flower, or foliage you want to identify. Tap the screen to focus and capture the image.
- Analyze the Image: Google Lens will analyze the image and provide information about the plant, including its common name, scientific name, and sometimes additional details like care instructions and habitat.
- Review Identified Plant: Check the information provided by Google Lens to identify the plant accurately.
- Access Additional Information: Google Lens may offer links to related articles, websites, or further information about the identified plant. You can explore these for a more in-depth understanding.

Google Lens can be a useful tool for plant enthusiasts, gardeners, students, or anyone interested in identifying different types of plants and learning more about them.

Seek by iNaturalist is a popular mobile app designed for identifying plants, animals, fungi, and other organisms. It's a powerful tool for nature enthusiasts, educators, and researchers. Seek uses image recognition technology and a vast database of observations contributed by users to identify plants accurately. It's a valuable tool for both beginners and experts in botany, environmental science, and nature appreciation.

All the information collected by the students had to be displayed on a padlet specifically created for this project. The project also involved pre and posttest of student groups divided as control group and experimental group. Also the



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students participating had to undertake a survey at the end for checking their self-efficacy and experiential learning through the project.

## 5. Sample

The research was conducted at Demonstration Multipurpose School (DMS), Bhopal. The respondents of the study were students of grades 6, 7 and 8 wherein the research was carried out. In total of 150 students were selected for the study, out of which the control group comprised of 75 students and experimental group comprised of 75 students. The students of experimental group were taught the use of Google Lens and the Seek application.

## 6. Tools

A pretest and posttest was developed for the students to understand the level of understanding about the flora around them, the uses of different plants and how plants help in environment conservation. Also a survey was conducted to check the self-efficacy and experiential learning of the students who participated in the project.

## 7. Results

Padlet is a powerful educational technology that can be used for showcasing group work to enhance collaboration and communication. This STEAM project effectively used the padlet for sharing the observations and art work made by the students. Commenting on each other posts promoted collaboration and communication between different teams working on the project. Many researchers have reported the effectiveness of using padlet in teaching learning (Haris et al., 2016; Momani, et al., 2022) and references therein. Figure 1, 2 and 3 show the images of padlet activity done by the students. Images of plants were taken using Google Lens and Seek app by the students.



Figure 1: Images of plants uploaded on the padlet by students

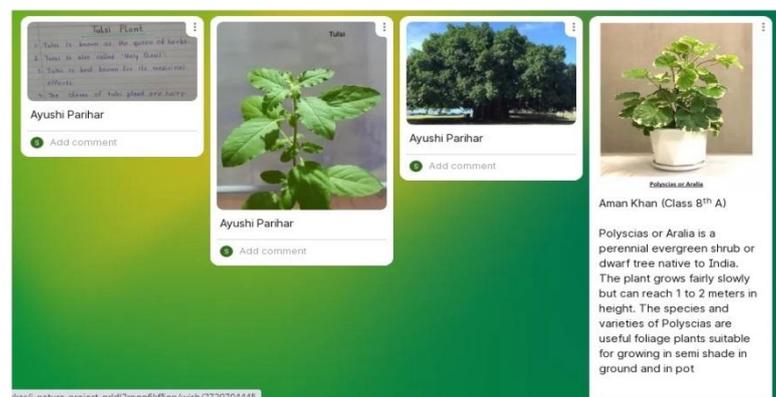


Figure 2: Uses of plants uploaded on the padlet by students



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Figure 3: Uses of plants uploaded on the padlet by students

Before the experimental study, the pre achievement test was administered to the two groups to find out their achievement in awareness of flora around them. The pretest comprised of multiple choice questions related to concepts of environmental education in general and local flora in particular.

During the period of study, the experimental group was exposed to the iNATURE project and coding as discussed in section 4.

The t test was used to determine if there was difference between the experimental and control groups in their:

- a. Pre achievement scores in environmental education
- b. Post achievement scores in environmental education

The pre achievement test was conducted to find out if both groups of respondents possess the same cognitive level before the conduct of the study. The t ratio of 1.607 has an associated probability of .122. The obtained t value is less than table t value at 0.05 level of significance. This means that the null hypothesis is accepted. Hence, there is no significant difference between the pre-test mean scores of the two groups of respondents. This only means that the two groups had the same cognitive level before the study was conducted.

After the study, the experimental group was exposed to the iNATURE project. The scores of the two groups were used for the study. As shown in the table, the students exposed to project based learning had a post-test mean score of 45.50 and a standard deviation of 3.419 while the group which was not exposed to the project had a mean score of 29.95 and a standard deviation of 5.744. The t ratio of 4.134 has an associated probability of .000. The t value obtained is greater than the table t value at 0.01 level of significance hence the null hypothesis is rejected. Hence, there is a significant difference between achievement scores of the two groups after the study.

After the treatment, the two groups of study varied statistically in terms of their learning achievement. Hence we can say that project based learning using technology was more effective in teaching environmental education as compared to the traditional approach.

Technique	Test	Group	Mean	SD	df	t	p
Traditional approach for environmental education	Pre test	Control	26.67	3.284	148	1.607	.122
	Pretest	Experimental	24.31	3.987			
project based learning using technology	Post test	Control	29.95	5.744	148	4.134	0.000
	Post test	Experimental	45.50	3.419			

Table 1: Difference between Pre-Achievement Scores of Experimental and Control Groups

Self-efficacy refers to an individual's belief in their ability to successfully perform a specific task or achieve a particular goal. Self-efficacy plays a crucial role in human motivation, behaviour, and overall well-being. The survey was based on the items in the Likert Scale. Five survey questions were included in the category of experiential learning. Table 1 shows self-efficacy of the students through the project.

Self efficacy	Statement	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
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After participating in the iNATURE project I can take up learning and work collaboratively with my team members.	140	10
I enjoyed taking the project and it made me want to learn new things	148	2
I am willing to take up challenging learning	135	15
The learning during the course makes me feel happy	145	5

Table 2: Student’s self efficacy for the iNATURE project survey responses (n=75)

Experiential learning is commonly used in various educational settings, including schools, colleges, and vocational training programs. It is believed to promote critical thinking, problem-solving skills, creativity, teamwork, and a deeper understanding of subject matter compared to more passive learning methods.

Experiential Learning	Statement	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
	Participating in the environmental project was a rich and interesting experience for me	142	8			
	It increased my learning about flora around me and overall about environmental education	149	1			
	I participated in all the activities with great enthusiasm	142	8			
	Observing and reflecting on different padlets of different teams was an enriching experience for me	145	5			
	Through this project I could understand what types of flora exist around me and how they promote environmental conservation	148	2			

Table 3: Student’s experiential learning for the iNATURE project survey responses (n=75)

## 7. Discussion

The results presented in section 6 clearly indicate that technology supports students learning in environmental education. The project formed can also be considered a STEAM project as it promoted the integration of science and technology. Students actively participated in the activities of the project and were happy to take up the activities of the project. They gained ownership of their learning. Through the padlet activity they were involved in a process of information sharing and collaborative learning with each other. This strategy can also be considered as place based learning as students were involved in learning about the flora around them. Hougham et al. (2015) found that technologies used in place-based education programs allow students to collect local observations both in physical locations and digitally, generate their own research and information. The activities also provided opportunity for experiential learning. With the help of Google lens and the seek app they could easily identify the flora around them. They also found the cultural importance of plants and other uses of plants. Plants hold immense cultural importance across various societies and throughout history. Their significance encompasses a wide range of aspects, including religious, spiritual, medicinal, economic, ecological, and social dimensions. Understanding the cultural importance of plants allows for a deeper appreciation of the intricate relationships between humans and the natural world, emphasizing the need for sustainable practices to preserve plant diversity and the benefits they bring to societies worldwide. Wijanarko et al. (2024) conducted a meta-analysis related to environmental education and technology of



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770 documents published from 2014 to 2023. They found that technology can support environmental education in a big way and can play an important role in improving students' learning processes, learning outcomes, interests, motivation, and attitudes toward caring for the environment. The success of many environmental education programs integrated with technology like the educational robotics program in elementary education, use of educational games in environmental education have been reported in research works (Nunes et al., 2024). Padlet is a powerful educational technology which can be used for collaborative learning, can be used for brainstorming and online dialogue. Results presented in section 7 demonstrate that Padlet can support environmental education in an effective manner. Due to its dynamic and interactive nature it can be helpful in promoting creativity, critical thinking and collaboration among the learners. Students can be engaged in environmental projects and their work can be showcased through Padlet. This project used digital tools like Google Lens, Seek app and the educational technology Padlet to give meaningful experiences to the students in Environmental Education in the local context. This project promoted experiential learning and self-efficacy among the students as can be seen from results presented in Tables 2 and 3. This project also promoted place based learning as it helped them connect with their local ecosystem. This was a unique opportunity for them to connect with local environment while enhancing digital literacy.

### 8. Conclusion and Future implications

Environmental education and sustainability is one of the cross cutting themes identified by National Education Policy 2020 (NEP 2020) and NCFSE 2023. Similarly Digital and Technological Integration is also an important cross cutting theme mentioned in both NEP 2020 and NCFSE 2023. Through this project we got an opportunity to embed two cross cutting themes in one project. As such in environmental education other cross cutting themes can be also be embedded like Indian values and rootedness, inclusion. If the activities of environmental education are engaging, interactive and interdisciplinary in nature then students can enjoy learning while gaining knowledge about the environment. Technology plays a pivotal role in environment conservation and sustainable development, offering innovative solutions to address pressing environmental challenges. By integrating technology with environmental education we can work towards a more sustainable and harmonious relationship between humanity and the environment, ensuring a better future for all. However teachers and students need to be properly trained in using technology for environmental education. Also technology integration projects should be made part of the curriculum so that they do not burden the students. Teachers should be given proper training in promoting interdisciplinary learning through environmental education projects. This can be done through STEAM integration in environmental education projects. These type of projects are helpful in promoting interdisciplinary thinking in science, technology and environment. Not only students can be made aware of their local environment but using digital tools they can also come up with innovative solutions of local environmental issues.

### 9. References

- Buchanan, J., Pressick-Kilborn, K., & Maher, D. (2018). Promoting environmental education for primary school-aged students using digital technologies. *Eurasia Journal of Mathematics, Science and Technology Education*, 15(2), em1661.
- Záhorec, J., Hašková, A., & Munk, M. (2021). Self Reflection of Digital Literacy of Primary and Secondary School Teachers: Case Study of Slovakia. *European Journal of Contemporary Education*, 10(2), 496-508.
- Peter Brečka, Monika Valentová, Ivana Tureková, Digital Technologies in Environmental Education, *TEM Journal*. Volume 11, Issue 2, pages 726-730, ISSN 2217, 8309, DOI: 10.18421/TEM112-28, May 2022.
- R. Justin Hougham, Karla C. Bradley Eitel and Brant G. Miller, Technology-Enriched STEM Investigations of Place: Using Technology to Extend the Senses and Build Connections to and Between Places in Science Education, *JOURNAL OF GEOSCIENCE EDUCATION* 63, 90–97 (2015).
- Wijanarko, Tiok, Sukma, Dewi, Shinta, Novitasari Wijayanto, Atika Ulya Akmal, Digital Technology to Support Environmental Education in Schools, *AIP Conf. Proc.* 3220, 020021 (2024) <https://doi.org/10.1063/5.0234689>.
- NUNES, Wanderlei Batista; PEREIRA, Leonardo Gonçalves; MILLI, Claudio Giovane Prando; DE SOUZA, Átila; PASSOS, Guilherme Martins; BRITO, Rosana Sara da Silva; MOTA, Maria Helena Abreu Pedrosa; BARBOSA, Leonardo Martins. ENVIRONMENTAL EDUCATION IN THE DIGITAL AGE: PROMOTING SUSTAINABILITY THROUGH TECHNOLOGY AND INNOVATION. *LUMEN ET VIRTUS, [S.l.]*, v. 15, n. 43, p. 7761–7775, 2024. DOI: [10.56238/levv15n43-010](https://doi.org/10.56238/levv15n43-010).