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Research Article

Experiential Learning for Sustainability: A Catalyst for Global Change

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ABSTRACT

In a world confronted with unprecedented environmental challenges, the urgency for action to promote sustainability is paramount. This article explores the transformative potential of experiential learning in fostering sustainable practices, as highlighted in a keynote lecture. Through compelling case studies and real-life illustrations, the profound significance of experiential learning is illuminated, demonstrating its tangible impact as a catalyst for sustainable change. The article emphasizes the powerful connection between individuals and the environment, showcasing immersive experiences with nature as transformative agents that foster a deep sense of connection and responsibility towards the environment. Moreover, it underscores the pivotal role of education in effecting behavioral change, particularly through the incorporation of experiential learning into curricula. Examining successful programs like "Green Ambassadors in the Community," the lecture illustrates how such initiatives equip future generations with the tools and mindset needed for sustainable living. Additionally, it addresses strategies to empower and motivate youth to embrace sustainable behaviors, drawing insights from psychology and behavioral science. Through a survey administered to students before and after participating in a sustainability education activity, the effectiveness of such interventions in influencing behavior change was assessed. Analysis of the survey responses revealed a notable increase in the perceived importance of various sustainability practices following the activity, suggesting a positive impact on participants' perceptions and attitudes towards sustainability. While most sustainability practices experienced an increase in importance ratings post-activity, some areas of concern were identified, indicating the need for further exploration and clarification. Overall, the findings underscore the importance of experiential learning in nurturing sustainable behaviors and inspiring action towards building a better future for generations to come.

Index Terms—Environmental Education, Sustainability, Renewable Energy, Energy Efficiency.

I. INTRODUCTION

In a world grappling with unprecedented challenges related to sustainability and the environment, the imperative for urgent action has never been clearer. The pressing global issues we face demand innovative solutions and transformative approaches to foster sustainable practices. At the heart of this discourse lies the recognition of the transformative potential of experiential learning in addressing these challenges head-on.
This article explores the profound significance of sustainability education and its role in effecting behavioral change. Through a comprehensive examination of the efficacy of experiential learning methodologies, we aim to shed light on its tangible impact as a catalyst for sustainable change.
The introduction delves into the core themes of the discourse, beginning with an overview of the current global environmental landscape. It highlights the urgency of the situation, emphasizing the critical need for collective action to address sustainability challenges effectively. By framing the discussion within this context,

the introduction sets the stage for an exploration of the transformative potential of sustainability education [1].
Central to our exploration is the concept of experiential learning and its role in fostering sustainable practices. We delve into the powerful connection between individuals and the environment, recognizing immersive experiences with nature as transformative agents of change. Real-life illustrations and personal anecdotes underscore the tangible benefits of nature-based experiences, emphasizing their role in shaping attitudes and behaviors towards sustainability.
Education emerges as a pivotal instrument for change, with a particular focus on the incorporation of experiential learning into curricula. Drawing inspiration from successful programs like "Green Ambassadors in the Community" from the Holon Institute of Technology, we showcase how such initiatives equip future generations with the tools and mindset necessary for sustainable living [1,2].
Furthermore, the introduction addresses strategies to empower and motivate youth to embrace sustainable behaviors, drawing insights from psychology and behavioral science. By cultivating sustainable mindsets early on, we can drive long-lasting change and create a culture of sustainability. Emphasis is placed on the collective responsibility we share in shaping a sustainable future, encouraging collaboration and community engagement to tackle complex environmental issues.

II. ENVIRONMENTAL EDUCATION

A. Holon Institute of Technology (HIT)

In the pursuit of fostering environmental awareness and instilling a sense of responsibility towards the planet, higher education institutions have increasingly taken on the role of nurturing tomorrow's environmental leaders. One such institution, the Holon Institute of Technology (HIT), stands out with its innovative approach to integrating environmental education into its curriculum.
Established in 1969 as part of Tel Aviv University and later becoming an independent academic institution in 1999, HIT has emerged as a beacon of excellence in higher education in Israel. Certified by the Council of Higher Education, HIT boasts diverse faculties spanning sciences, engineering, digital medical technologies, computer science, technology management, learning technologies, and design. The institute prides itself on its commitment to multidisciplinary research, viewing innovative technologies through professional, scientific, economic, and cultural lenses.
Central to HIT's ethos is its emphasis on quality teaching and pioneering research. The institution introduces novel teaching and research methodologies, striving for excellence in both theoretical and practical realms. HIT's educational mission focuses on empowering students, harnessing their intellectual and professional potential to thrive in today's rapidly evolving technological landscape.

B. The Faculty of Engineering

The Faculty of Engineering, the largest within HIT, is distinguished as one of Israel's leading producers of electrical engineers. With a commitment to staying abreast of technological advancements, the faculty offers a robust and continually updated curriculum to equip students with theoretical and practical knowledge demanded by industry.

The Department of Energy and Power Systems, within the Faculty of Engineering, addresses the global energy crisis through courses such as Energy Conversion, Electrical Motors, and High Voltage Systems. Additionally, the establishment of the Renewable Energy and Smart Grid Excellence Centre provides students with a platform to deepen their understanding of green energy technologies and the future of the electrical grid.
HIT's commitment to diversity and inclusivity is evident in its student body, which includes individuals from various backgrounds, including secular and religious, Israeli-born, and repatriating Jews from different countries. Collaborations with organizations like "Israeli Hope in Academia" have expanded accessibility, enabling Haredi, Arab, Druze, and Circassian students to pursue academic studies. Against this backdrop of academic excellence and diversity, HIT's initiative to engage higher education students in educating elementary school pupils on environmental conservation stands as a testament to its commitment to societal and environmental stewardship. Through initiatives like the "Green Ambassadors" course, HIT aims to cultivate environmentally conscious leaders who will lead efforts to safeguard the planet for future generations.

C. The "Green Ambassadors in the Community" program

The "Green Ambassadors in the Community" program serves as a pivotal case study, illustrating its impact on fostering ecological awareness and sustainable practices among different tribes within Israeli society. Implemented in various schools, the intervention employs a consistent methodology centered around experiential learning and monitoring consequences, aiming to provide valuable insights into the shared methodological approach and the diverse societal contexts [3].
Each case within the "Green Ambassadors in the Community" program involves a distinct Israeli tribe, highlighting the diversity of societal contexts. The methodology revolves around experiential learning, offering participants hands-on experiences to enhance their understanding of environmental issues, aligning

with educational principles that emphasize active engagement and practical application of knowledge.
The authors implemented experiential learning strategies in a school setting, involving immersive activities like eco-friendly projects, nature excursions, and collaborative initiatives to instill ecological awareness. The methodology integrated monitoring consequences, with students actively tracking and assessing the impact of their actions on energy consumption patterns [4].
Students engaged in a range of hands-on activities, from sustainable gardening to energy-saving initiatives, with monitoring consequences playing a crucial role in allowing participants to witness and analyze the direct effects of their environmentally conscious behaviors.
Participation in ecological projects and awareness campaigns contributed to a more sustainable school environment, with monitoring consequences systematically integrated to help tribe members understand the tangible outcomes of their collective efforts. The common thread across these cases lies in the methodological approach employed, emphasizing the participatory nature of the interventions and engaging students in activities that fostered a deeper connection with environmental issues [5].
The systematic monitoring of consequences allowed participants to observe the real-world impact of their actions on energy consumption patterns. The methodology used in these studies not only provides a background to the research but also yields valuable insights into the outcomes of the "Green Ambassadors in the Community" program. The utilization of a shared experiential learning approach suggests its potential adaptability across a range of societal contexts, indicating its possible role as a tool with transformative implications for shaping energy consumption patterns.

III. METHODOLOGY

The methodology employed in this study aims to explore the implementation and effectiveness of a unique educational initiative wherein higher education students take on the role of educators in teaching elementary school pupils about environmental conservation. The following outlines the steps taken to design and execute the "Green Ambassadors" course, facilitated by the Holon Institute of Technology (HIT) in Israel.
Course Design and Collaboration: Collaborative efforts were made between the Dean of the Students, the Social Involvement Unit, and the "Israeli Hope" initiative within HIT to conceptualize and structure the course curriculum. The course was tailored to engage HIT students with ecological and environmental issues, enlighten them about the importance of environmental quality, and educate them about basic energy efficiency principles.
Selection of Participants: Participants for the "Green Ambassadors" course were selected from among HIT students interested in environmental conservation and education. The course aimed to recruit a diverse group of students, including those from different academic disciplines and backgrounds, to enrich the learning experience and enhance inclusivity.
Course Content Development: The course content was developed to cover various aspects of environmental conservation and renewable energy. Topics included the definition of renewable energy, waste management, energy conversion processes, and the significance of renewable energy sources in mitigating climate change. The content was designed to be interactive, engaging, and suitable for elementary school pupils.
Practical Teaching Exercises: HIT students were tasked with conducting educational sessions for fifth and sixth-grade pupils at an Arabic elementary school, "El Omariya," located in Ramle, Israel. Practical teaching exercises, including games, activities, and demonstrations, were incorporated to illustrate concepts related to renewable energy and environmental conservation effectively.
Utilization of Moveable Laboratory: HIT students utilized a moveable laboratory containing demonstrations, experiments, and creative activities to enhance the learning experience. The moveable laboratory served as a dynamic learning environment where pupils could engage with hands-on activities and visualize abstract concepts in a tangible manner.
Descriptive Research: A descriptive research approach was employed to evaluate the effectiveness of the "Green Ambassadors" course in imparting knowledge and raising awareness among elementary school pupils. Qualitative data, including observations, feedback from teachers and pupils, and reflections from HIT students, were collected to assess the impact of the educational intervention.
Analysis and Interpretation: Data collected through observations, feedback, and reflections were analyzed to identify emerging themes, patterns, and areas of improvement. The analysis aimed to evaluate the success of the educational initiative in achieving its objectives and inform future iterations of the "Green Ambassadors" course.
The methodology adopted in this study combines collaborative course design, practical teaching exercises, and descriptive research to investigate the role of higher education students in educating elementary school pupils about environmental conservation. Through a holistic approach, the study aims to contribute to the development of future environmental leaders and promote sustainable practices in the community.

IV. METHODS AND MATERIALS

The researchers undertook a comprehensive investigation centered on the environmental education initiative, "Green Ambassadors in the Community," implemented by the Holon Institute of Technology (HIT). The study

aimed to provide a nuanced exploration of the program, focusing on its theoretical foundations, practical components, and its influence on both HIT students and elementary school pupils. The research methodology involved a thorough examination of the program's structure, implementation, and outcomes, with a particular emphasis on understanding its various aspects.

A. Setting and Participants:

The "Green Ambassadors" course, initiated by HIT, has been instrumental in shaping the environmental consciousness of students over the past seven years, beginning in the 2017 school year. The course, deeply rooted in multiculturalism and cultural competence, aligns with the broader framework of the "Israeli Hope" program, reflecting the institute's commitment to fostering positive change within diverse communities.

Commencing at the "Ravivim" school in Holon in 2017, the course expanded to the "Al Omaria" school in Ramla, representing the Arab society, and highlighting the program's commitment to inclusivity. Over the years, it extended to schools such as "Yeshuron" in Holon and "Neva Shalom" in Lod, eventually reaching ultra-Orthodox society schools like "Ben Menachem" and "Bnei Menachem" in Holon. In response to the COVID-19 pandemic in 2022, the program adapted by reaching schools in the geographical periphery of Israel, including "Ben Atar" and "Yitzhak Sade" in Dimona, and expanded further in 2023 to include the "Shalhavot" Chabad school in Gedera.

The study included 181 HIT students actively engaged in the "Green Ambassadors" program. The participants represented diverse backgrounds, including secular, religious, Haredi, and Arab communities, ensuring a broad perspective on the program's influence within varied cultural contexts [1,6,7].

B. Course Structure and Theoretical Component:

The curriculum encompassed topics such as ecology, electricity generation, energy efficiency, renewable energy, waste management, and recycling. The pedagogical approach emphasized interactive and engaging teaching methodologies, utilizing resources like textbooks, multimedia presentations, and guest lectures.

C. Practical Component:

The collaboration between HIT students and elementary school pupils involved detailed lesson plans, activity descriptions, and hands-on experiential learning activities, including experiments, demonstrations, and interactive games. The impact of experiential learning on knowledge retention was evaluated, along with the expected learning outcomes for both groups.

D. Expansion of Reach:

The study investigated logistical considerations for program expansion, response to the COVID-19 pandemic, and the inclusion of diverse partnerships, ensuring inclusivity across different demographics and cultural backgrounds.

E. Evaluation of the Impact:

Assessment tools, feedback mechanisms, and assessment of the effectiveness of these mechanisms were examined to measure the qualitative impact of the program. A "Kahoot!" trivia game was used to measure the effects of the "Green Ambassadors" course, combining both theoretical and practical components.

F. Combining Theory and Practice:

Strategies to seamlessly integrate theoretical knowledge and practical application, as well as facilitating the transition from theory to practice, were evaluated. The coherence between theoretical learning and practical implementation was assessed, considering any challenges or successes in bridging the gap between theory and practice.

G. Learning through Experience:

Experiential learning elements, including experiments, demonstrations, and interactive activities, were explored in detail. The impact of experiential learning on elementary school pupils' understanding and retention of environmental concepts was evaluated, along with its effectiveness in fostering environmental awareness.

Overall, the methodology encompassed a comprehensive examination of the "Green Ambassadors in the Community" program, providing valuable insights into its structure, implementation, and impact on HIT students.

V. Results

The survey participants represented a diverse range of demographics, academic backgrounds, and lifestyles, offering valuable insights into the intersection of environmental awareness, education, and everyday behavior.

The majority of participants fell within the 21-25 age group, with both male and female representation across various faculties, including Sciences, Digital Medical Technologies, Design, and Electrical and Electronics Engineering. This demographic diversity reflects the broad reach of the "Green Ambassadors" program within

the Holon Institute of Technology (HIT), engaging students from different academic disciplines in environmental education initiatives.

Interestingly, a significant proportion of participants were enrolled in morning study programs, indicating a commitment to academic pursuits alongside other responsibilities. Additionally, some participants reported part-time employment, demonstrating a balance between academic studies and work commitments.

In terms of transportation habits, car ownership was prevalent among participants, with a notable proportion relying on cars for everyday transportation. However, there was also a substantial number of participants who utilized public transport or preferred walking, highlighting a spectrum of transportation choices within the HIT community.

Regarding environmental practices, the vast majority of participants reported recycling waste, indicating a conscientious approach to environmental conservation. Moreover, many participants indicated a preference for reusable bottles, emphasizing sustainability in everyday habits.

Overall, the personal details of the survey participants underscored the diverse nature of the HIT community and provided valuable insights into the intersection of academic pursuits, environmental consciousness, and daily lifestyle choices.

Before the commencement of each lesson, students were presented with a set of five multiple-choice questions related to the topic of the upcoming session. These questions aimed to assess students' baseline understanding of the subject matter based on their prior knowledge or assumptions. Following the completion of the lesson, the same set of questions was presented to the students to evaluate the impact of the instructional content on their knowledge retention and comprehension.

The analysis of pre-course assessments revealed certain gaps in students' understanding, particularly concerning renewable energy sources and distributed systems. However, the post-course assessments showcased a significant improvement in students' knowledge levels. Notably, there was a notable enhancement in students' ability to differentiate between various renewable energy sources such as solar, wind, and hydroelectric power [8].

For instance, a pre-course question regarding renewable energy sources demonstrated limited understanding among students, with varied and often incorrect responses. However, post-course assessments depicted a marked improvement, with students showcasing comprehensive knowledge and accurately identifying the different renewable energy sources. This improvement underscores the positive impact of the "Green Ambassadors" course in enhancing students' understanding of renewable energy and distributed systems, thereby contributing to their environmental literacy and awareness.

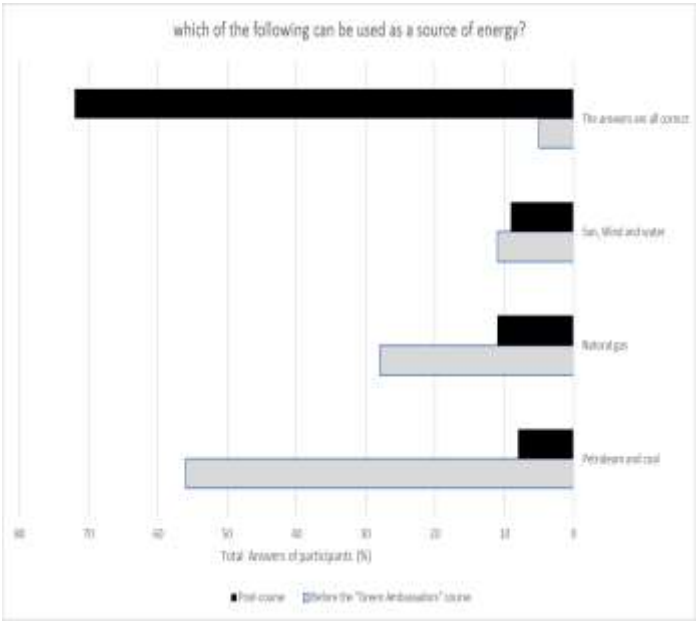

Fig. 1. Distribution of answers to question “which of the following can be used as a source of energy?”.

The effectiveness of sustainability education in influencing behavior change was examined through a survey administered to students before and after participating in an activity aimed at promoting sustainable practices. The survey assessed the perceived importance of various sustainability initiatives before and after the activity, providing insights into the impact of the educational intervention.

Before the activity, participants were asked to rate the importance of different sustainability practices on a scale from 1 to 5, with 1 indicating "Not Important" and 5 indicating "Very Important." Following the activity, the same participants were surveyed again to gauge any changes in their perceptions.

To analyze the differences between before and after the activity, let's compare the responses before and after for each question:

Preference of non-motorized means of transport over motorized vehicles: Before the activity, the average importance rating was 4. After the activity, it remained the same at 4.
Preference of public transportation over a private vehicle: Before the activity, the average rating was 3. After the activity, it increased to 3.6.
Waste separation into designated bins: Before the activity, the average rating was 4. After the activity, it increased to 4.2.
Writing lecture summaries on an iPad instead of a notebook: Before the activity, the average rating was 2.6. After the activity, it increased to 3.2.
Use of reusable utensils: Before the activity, the average rating was 3.8. After the activity, it increased to 4.
Buying products with an efficient energy rating: Before the activity, the average rating was 3.6. After the activity, it increased to 4.
Using natural light instead of turning on lighting: Before the activity, the average rating was 4. After the activity, it remained the same at 4.
Using the sun to dry laundry instead of using a dryer: Before the activity, the average rating was 4. After the activity, it remained the same at 4.
Sealing the place before turning on the air conditioner: Before the activity, the average rating was 3.8. After the activity, it increased to 4.
Buying clothes in second-hand stores: Before the activity, the average rating was 2.6. After the activity, it increased to 3.4.
Purchasing food according to the list and not according to special offers: Before the activity, the average rating was 3.8. After the activity, it remained the same at 3.8.
Educating the future generation for sustainability: Before the activity, the average rating was 4.6. After the activity, it remained the same at 4.6.
Each person is only responsible for themselves regarding sustainability: Before the activity, the average rating was 3.2. After the activity, it decreased to 2.8.
Only laws and imposition of policies will lead to a sustainable state: Before the activity, the average rating was 3.8. After the activity, it remained the same at 3.8.
The ecological situation of the whole world will improve in the coming years: Before the activity, the average rating was 4. After the activity, it remained the same at 4.
A behavior change will lead to an improvement in the quality of the environment: Before the activity, the average rating was 3.6. After the activity, it increased to 4.
Integrating renewable energy sources is not the solution to the pollution problem: Before the activity, the average rating was 3.4. After the activity, it increased to 3.8.
From this analysis, it's clear that the activity had a positive impact overall, as most of the importance ratings increased or remained the same after the activity. Notably, there were increases in ratings for various sustainability practices, indicating a potential shift towards greater awareness and commitment to sustainability among the participants. However, there were some fluctuations and slight decreases in a few ratings, suggesting areas where further attention or clarification may be needed in future activities or discussions. Overall, the activity seems to have influenced the perceptions and attitudes of the participants towards sustainability positively.
Quantitative surveys were conducted as part of the research to evaluate the effectiveness of the "Green Ambassadors" course in enhancing students' understanding of environmental conservation, particularly focusing on renewable energy sources. The surveys incorporated trivia quizzes administered before and after each lesson, serving as a tool to gauge students' knowledge retention and comprehension.

CONCLUSION

The conclusion drawn from the research unequivocally highlights the transformative potential of environmental education, particularly exemplified by the success of the "Green Ambassadors" course initiated by the Holon Institute of Technology. The findings underscore not only the acquisition of knowledge but also substantial behavioral changes among participants, indicating a broader societal impact.
The results reveal that participants experienced a significant shift in their perceptions and attitudes toward sustainability practices after engaging in the educational intervention. Key sustainability initiatives saw increased importance ratings post-activity, indicating a heightened awareness and commitment to sustainable behaviors. Notably, the program's success extended beyond individual behavior change, permeating into the communities from which participants originated.
The effectiveness of the "Green Ambassadors" course in addressing targeted environmental issues, such as enhancing awareness of renewable energy sources, showcases the potential of educational initiatives to address specific challenges. Moreover, the program's ability to bridge cultural divides and foster collaboration among participants from diverse backgrounds underscores its role in promoting inclusivity and societal cohesion.
In the broader context of global sustainability challenges, initiatives like the "Green Ambassadors" course serve as beacons of hope, emphasizing the importance of environmental education in shaping attitudes,

behaviors, and societal structures. The success of such programs highlights the potential for fostering a more environmentally aware and interconnected world.

The "Green Ambassadors" course not only imparts knowledge but also ignites a commitment to environmental stewardship, paving the way for the emergence of tomorrow's environmental leaders. As society grapples with the complexities of environmental conservation, initiatives like these offer a promising path toward a sustainable and harmonious future.

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