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ENERGY CONSERVATION PRACTICES FOR HIGHER SECONDARY SCHOOL STUDENTS: A CYBERGOGY FRAMEWORK

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Abstract:
In the face of escalating global energy demands and environmental degradation, fostering energy conservation practices among youth has emerged as a critical educational priority. This study explores the development and implementation of a Cybergogy-based instructional framework aimed at promoting energy conservation awareness and behavior among higher secondary school students. Cybergogy, an emerging pedagogical model tailored for digital learning environments, integrates cognitive, emotional, and social dimensions of learning to create engaging, participatory, and student-centered experiences. By leveraging digital tools, interactive content, and collaborative platforms, this framework seeks to bridge the gap between theoretical understanding and real-world application of energy-saving practices. The study adopts a mixed-methods approach, combining quantitative assessments of knowledge gain and behavior change with qualitative insights from student reflections and teacher feedback. The instructional design includes modules on energy sources, usage patterns, conservation strategies, and sustainability, delivered through multimedia content, gamified activities, simulations, and group projects. The primary objectives are to evaluate the effectiveness of the Cybergogy framework in enhancing students' knowledge, shaping pro-environmental attitudes, and encouraging responsible energy use behaviors. Findings from the study are expected to offer valuable insights into how digital pedagogies can be effectively harnessed for environmental education in the 21st century. The implications extend to curriculum designers, educators, and policymakers seeking to embed sustainability education within school systems. Ultimately, the study contributes to the broader goal of cultivating environmentally responsible citizens equipped to address contemporary ecological challenges through informed and sustainable practices.

Keywords: Cybergogy, Energy Conservation, e-content, environmental education.

INTRODUCTION

Educating children about the environment in school is one way to promote behaviour change. Although Energy Conservation has been integrated into some school curricula, such programs in schools are viewed as supplementary rather than a primary approach to public education. Previous researches highlight the importance of educating children about the environment to encourage them to become future stewards and promote sustainable practices in their communities. Energy Conservation Practices benefits children by instilling a sense of importance that they can make a difference in this world by protecting the environment. Similarly, research indicates that Environment Education bolsters intellectual, personal, and social growth.

The continued and growing need for new learning opportunities, linked with newer information systems and communication technologies, has pushed online learning into the centre of the discussion of educational practice. There is a need to establish a framework for generating meaningful and engaging learning experiences for distance students with diverse cultural and linguistic backgrounds. So,

"Cybergogy" as a descriptive label for the strategies for creating engaged learning online has three overlapping/intersecting domains: cognitive, emotive, and social. This model is a synthesis of current thinking, concepts, and theoretical frameworks on the extent and nature of the three domains in learner engagement online. The instructors can use this model to profile each learner and then design tactics to engage individuals accordingly, a process we call "customized engagement."

This study focused on Energy Conservation Practices among Higher Secondary School Students because consumer behaviour represents a significant portion of energy expenditure in our country. For this study, the researcher evaluated energy conservation knowledge and behaviours among children to gauge the efficacy of energy conservation curriculum in higher secondary schools and the school-based Cybergogy Framework-based program provides a structured and supportive environment for the students to learn about the different practices of energy conservation and its implementation in future.

NEED AND SIGNIFICANCE

The accelerating depletion of natural energy resources and the growing threat of climate change necessitate a radical shift in how societies understand and utilize energy. In this context, promoting energy conservation practices is not merely an environmental priority but a social and educational imperative. Adolescents, particularly Higher Secondary School Students, represent a crucial demographic poised to become informed citizens and responsible energy consumers. At this developmental stage, students form lasting habits and values, making it an opportune period to instill the principles of sustainable living. However, traditional pedagogical models often fall short of engaging digital-native learners effectively, thereby calling for a more innovative, technology-integrated instructional approach—hence the need for a Cybergogy framework.

Cybergogy, a modern learning theory designed to enhance cognitive, emotive, and social learning in digital environments, offers an ideal platform to teach energy conservation. It goes beyond conventional e-learning by actively involving learners through participatory, experiential, and collaborative activities. Employing cybergogical strategies like interactive simulations, gamified content, real-world problem-solving tasks, and reflective discussions can significantly increase students' motivation and retention of sustainability-related concepts. The integration of such a framework in the curriculum can help bridge the gap between theoretical knowledge and practical application in the field of energy conservation.

The need for this study becomes even more pertinent when considering the rapid technological evolution and the ever-increasing screen time among youth. Rather than viewing technology as a distraction, the study repositions it as a powerful pedagogical tool that can be harnessed to raise awareness and instill conservation habits. A Cybergogy-based approach leverages this technological affinity to make learning about energy efficiency relevant, personalized, and action-oriented. It empowers students to take ownership of their learning process while becoming agents of change within their households and communities.

Current energy education practices in schools often lack systemic structure, interdisciplinary integration, and measurable outcomes. This study is significant as it attempts to create a structured, research-based instructional model grounded in cybergogical principles. It aims to assess not only knowledge acquisition but also behavioral change, skill development, and attitudinal shifts toward energy conservation. By focusing on Higher Secondary School Students, the study targets a critical phase in the educational journey where learners are preparing to transition into college, work, or civic engagement. Influencing their understanding and actions at this stage ensures a ripple effect, as students are likely to carry forward these practices into their future roles as responsible citizens.

The study addresses a vital gap at the intersection of environmental education and digital pedagogy. It contributes to the global discourse on sustainability by proposing an innovative instructional strategy tailored to the learning needs and preferences of 21st-century students. Its outcomes have the potential to inform curriculum developers, educators, policymakers, and technologists in designing more impactful educational interventions for a sustainable future.

RESEARCH QUESTIONS

1. What is the level of awareness among Higher Secondary School Students regarding the importance of energy conservation?
2. What role does the school curriculum play in shaping the energy conservation practices of Higher Secondary School Students?
3. What is the impact of Cybergogy framework- based programme on students' knowledge, attitudes, and behaviours related to Energy Conservation Practices?
4. How do the Cybergogy domains, such as, cognitive, emotive, and social contribute to its effectiveness in promoting Energy Conservation Practices among Higher Secondary School Students?

DEFINITION OF KEY TERMS

1. ***Energy Conservation Practices:*** Energy conservation practice refers to the act of reducing energy consumption by using less energy service or using more efficient technology.
2. ***Higher Secondary School Students:*** Higher Secondary (HS) or Senior Secondary is the last two years of secondary education for students aged 14 to 18.
3. ***Cybergogy Framework:*** Cybergogy is a framework for creating engaged learning online (Wang & Kang, 2006). This framework synthesises the fundamentals of pedagogy and andragogy to structure an approach to online learning (Carrier & Moulds, 2003).

OBJECTIVES OF THE STUDY

1. To find out the level of Awareness on energy conservation practices among Higher Secondary School Students.
2. To find out the effectiveness of Cybergogy framework in enhancing Awareness on Energy Conservation Practices among Higher Secondary School Students.

HYPOTHESES OF THE STUDY

1. Awareness on Energy conservation Practices among Higher Secondary School Students is low.
2. Cybergogy framework is effective in enhancing the Awareness on Energy Conservation Practices among Higher Secondary School Students.

METHODOLOGY

The present study was conducted employing the Quasi- Experimental Design. The research design used in the study was the Non- equivalent Groups Pretest Posttest Control Group Design. The Experimental group was taught through the Cybergogic Framework and the Control group was taught through the Activity Oriented Method of Teaching. Due to the inconvenience in the random assignment of subjects in the Experimental group and Control groups, intact classroom groups were selected for the study.

The sample consists of 38 students in the Experimental group and 40 in the Control group. The samples were taken from two divisions of Standard XII students from Kollam district.

TOOLS USED FOR THE STUDY

For the present study, following tools were used.

- E-Content based on Cybergogy Framework
- Lesson Transcripts based on Activity Based Instruction

 Awareness Test on Energy Conservation Practices

ANALYSIS AND INTERPRETTION

The descriptive statistical measures like Arithmetic Mean, Median, Mode, Standard Deviation, Skewness and Kurtosis of the pretest scores of Awareness on Energy Conservation Practices were calculated to identify the nature of distribution of data.

Table 1: Descriptive statistics of pre-test scores of students in the experimental and control groups with respect to Awareness on Energy Conservation Practices

Variable	Group	Mean	Median	Mode	S.D.	Skewness	Kurtosis
Awareness on Energy Conservation Practices	Experimental	10.93	11	11	2.95	-0.11	-0.63
	Control	10.1	10	11	3.17	-0.24	-0.14

Table 1 shows that, the measures of central tendencies were nearly equal for the pretest scores of Awareness on Energy Conservation Practices for both the experimental and control groups. The moderate values of standard deviation for the groups showed that there was only small variation in the scores of students. The Awareness on Energy Conservation Practices in the experimental group and control group were negatively skewed. This negative skewness indicated that students who secured high scores were comparatively more than those who secured low scores in the experimental and control groups.

The kurtosis values in the experimental group and control group were less than 0.263, thus it can be interpreted that the distributions were platykurtic in nature.

Table 2: Results of Test of Significance of Difference between the mean pretest scores of experimental and control groups with respect to Awareness on Energy Conservation Practices

Variable	Group	Mean	S.D.	t-value
Awareness on Energy Conservation Practices	Experimental	10.93	2.95	1.04
	Control	10.1	3.17	

Table 2 shows that the t- values obtained was 1.04 for the Awareness on Energy Conservation Practices which was not significant even at 0.05 level. Hence, there was no significant difference between the mean pretest scores of experimental and control groups with respect to Awareness on Energy Conservation Practices. This indicated that the pre-experimental status of the students in the experimental and control groups was the same with respect to Awareness on Energy Conservation Practices.

Table 3: Descriptive statistics of post-test scores of students in the experimental and control groups with respect to Awareness on Energy Conservation Practices

Variable	Group	Mean	Median	Mode	S.D.	Skewness	Kurtosis
Awareness on Energy	Experimental	17.56	17	17	2.88	0.35	-0.41

Conservation Practices	Control	11.9	12	11	3.41	-0.32	-0.23

Table 3 shows that, the measures of central tendencies were almost equal for the post test scores of Awareness on Energy Conservation Practices for both the experimental and control groups. The moderate values of standard deviation for the groups showed that there was only small variation in the scores of students. The Awareness on Energy Conservation Practices was positively skewed in the experimental group. This positive skewness indicated that students who secured low scores were comparatively more than those who secured high scores in the groups. The Awareness on Energy Conservation Practices was negatively skewed in the control group. This negative skewness indicated that students who secured high scores were comparatively more than those who secured low scores in the group.
All the kurtosis values for the Awareness on Energy Conservation Practices were less than 0.263, in the experimental group as well as in the control group, thus it can be interpreted that the distributions were platykurtic in nature.

Table 4: Result of test of significance of difference between the mean post-test scores of students in the experimental and control groups with respect to Awareness on Energy Conservation Practices

Variable	Groups	Mean	S.D.	t-value
Awareness on Energy Conservation Practices	Experimental	17.56	2.88	6.94
	Control	11.9	3.41	

Table 4 shows that the t – values obtained was 6.94 for Awareness on Energy Conservation Practices which was significant even at 0.05 level. Hence there was significant differences between the mean post test scores of experimental and control groups with respect to Awareness on Energy Conservation Practices. The mean post test scores of experimental group was significantly greater than the mean post test scores of control group. This clearly proved that ARCS Model of Motivational Design was more effective than Activity Based Instruction in enhancing Awareness on Energy Conservation Practices among Higher Secondary School Students.

Comparison of Mean Gain Scores of experimental and control groups with respect to Awareness on Energy Conservation Practices and Finding out Effect Size

The mean gain scores of the experimental and control groups with respect Awareness on Energy Conservation Practices were found out and compared for significance of the mean difference between the independent samples. The magnitude of effect ARCS Model of Motivational Design was also found out using effect size.

Table 5: Results of Test of Significance of Difference in mean gain scores and Effect Size of experimental and control groups with respect to Awareness on Energy Conservation Practices

Variable	Groups	Size	Mean	S.D.	t-value	Effect Size	Cohen's Category
Awareness on Energy Conservation Practices	Experimental	30	6.63	1.21	6.38	0.87	Large
	Control	30	4.5	1.37			

Table 5 shows that the t-value obtained was 6.38 for Awareness on Energy Conservation Practices which was significant at 0.05 level. Hence there were significant differences in the mean gain scores of the experimental and control groups with respect to Awareness on Energy Conservation Practices. The mean gain score of experimental group was significantly greater than the mean gain score of control group with respect to Awareness on Energy Conservation Practices. This clearly proves that ARCS Model of Motivational Design was more effective than Activity Based Instruction in enhancing Awareness on Energy Conservation Practices among Higher Secondary School Students.

Cohen's d or Effect size is calculated to test the performance of experimental group over control group. The calculated effect size for Awareness on Energy Conservation Practices was greater than 0.8, the limit set by Cohen's category was Large. This means, ARCS Model of Motivational Design had a large effect in enhancing Awareness on Energy Conservation Practices when compared to Activity Based Instruction.

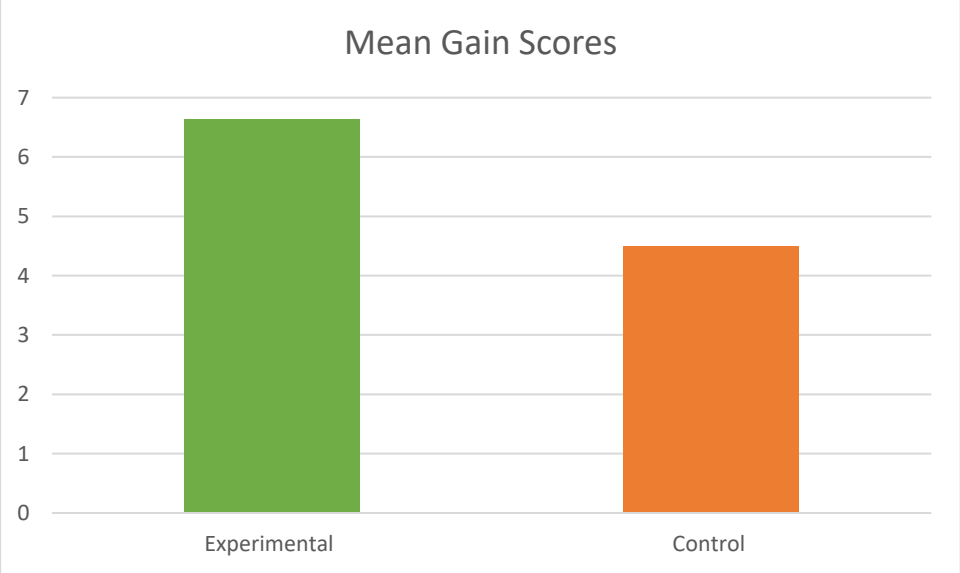

Figure 1: Comparison of mean gain scores of control group with respect to Awareness on Energy Conservation Practices

FINDINGS

Comparison of pre-test scores of Awareness on Energy Conservation Practices of the Experimental and Control Group

The obtained critical ratio is 1.04, which is less than the table value 1.96 at 05 level. So, it is not significant at 0.05 level. It means that the difference between the means of the pre-test scores of the students in the experimental and control group is not significant at 0.05 level. From this it is clear that the students of the two groups do not differ significantly in their initial Awareness on Energy Conservation Practices. That is, before the experiment, the two groups are more or less same Awareness on Energy Conservation Practices. But still there is slight difference between the means of the pre-test scores of the two groups.

Comparison of post-test scores of Awareness on Energy Conservation Practices of the Experimental and Control Group

The obtained critical ratio 6.94 which is greater than the table value 2.58 at 0.05 level. So, it is significant at 0.05 level. It means that there is a significant difference between the means of the post-test scores of students in the experimental and control groups. That is after the experiment, the students of the two groups differ significantly in their Awareness on Energy Conservation Practices. Since the mean of the post-test scores of the experimental group is greater than that of control group, the students in the experimental group are superior than the students in the control group in their Awareness on Energy Conservation Practices.

Comparison of Gain scores of Awareness on Energy Conservation Practices of the Experimental and Control Group

The obtained critical ratio is 6.38, which is greater than the table value 2.58 at 0.05 level. So, it is significant at 0.05 level. It means that the difference between the means of the gain scores of the students in the experimental and control group is significant at 0.05 level. From this it is clear that the students of the two groups differ significantly in their Awareness on Energy Conservation Practices. The significant value of the mean of the gain scores of the students indicates that the students in the experimental group is superior than the students in the control group in their Awareness on Energy Conservation Practices.

CONCLUSION

From the study, it can be concluded that the **Cybergogy Framework** has a great influence in improving the Awareness on Energy Conservation Practices among Higher Secondary School Students. The study is useful for improving the academic performance of the pupil drastically. It helps in acquiring content mastery in Physics for the teachers as well as the students. It also helps to reduce the instructional difficulty of teachers in this area to overcome pupil's interest in the subject.

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