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Original research article

Animation and Computer Games Design to Build Awareness of Energy Conservation

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ABSTRACT

This research is about the design of animation and computer games to build awareness of energy conservation tools. These are one of the ways that contribute to the conservation of energy because the main reason for the problems today is that people are not sufficiently aware of the need to conserve energy. Therefore, the solution to the sustainable energy question lies in educating people so that they will become much more aware of energy conservation issues. The promotion of energy conservation would seek to change people's behavior at the age of 7-12 years old; the process of education should be used to teach people about the importance of sustainability in energy, thereby developing eco-friendly human behavior.

Keywords: Energy conservation; Awareness; Animation; Computer games.

1. Introduction

Education is the best way to build awareness, so students, their families, and their teachers, must all be made aware of the need to consume energy in a sustainable manner. Training in sustainable energy use and the economic use of energy must begin from the elementary educational

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grades, when children first begin their compulsory education. When good habits are instilled in young children, it is very difficult to change these habits at a later age, and this is why it is so important to provide energy education at an early age, to build long-lasting patterns of responsible behavior. Given that the conservation of energy is such a vital topic, it is essential that education in saving energy is provided at every grade level, especially in Europe where the high demand for energy makes conservation critical. The review of the literature showed that there have been many projects which have focused on the efficient use of energy and schemes to save energy [1]. Awareness [2] means an expression of feeling, opinion, and recognition [3-4] such as the condition in which a person understands and assesses situations based on their own experience by referring to a period of time [5-7], an event, or an experience from the environment as the factors that lead people towards awareness [8]. According to this meaning, awareness refers to feelings in the mind, realizing the responsibility for the problem by evaluation and realizing the importance of their own actions which influence the situation. In this regard, awareness has degrees of relativity, since one can be partially aware, subconsciously aware, or wholly unaware of a situation or problem. Furthermore, one's awareness might be based on internal feelings, or on external events which are understood via the senses.

2. Measurement of Energy Awareness

The concept of awareness measurement requires behavior to be measured in such a manner that can show the cognition of the students with regard to the existence of the phenomenon or some entity. Awareness is strongly related to intelligence. An awareness of something or someone is a form of knowing that a thing or a person exists, although it is a superficial recognition [9]. In addition, Krathwohl also said of the extent of awareness that it is important to note that the range of awareness appears sequentially from the end of the superficial or cursory awareness to profound gratitude and deliberation. In the context of the teaching of art, an example of cursory awareness is the recognition by realization that there is a painting which has never been realized like that before. To build awareness about energy saving requires B.F. Skinner's theory of learning and Edward L. Thorndike's law of exercise or repetition. [10] Accordingly, this paper follows the conceptual model shown in Fig.1.

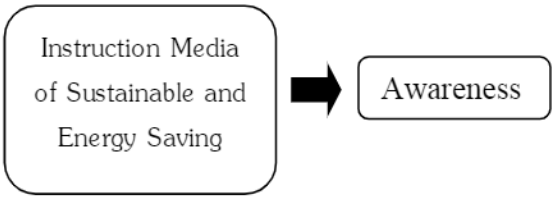

Fig. 1. Conceptual model for instructional media development for eco-friendly human behavior.

3. Knowledge Based Structure of Research and Result

Energy conservation and sustainable behavior and awareness can be increased through an awareness building approach regarding energy saving which should be taught to children from an early age at a time when they still have continuous ongoing development in all skill areas. In particular, in children aged between 7-12 years, their social development will change increasingly from self-centered to group-centered behavior [11]. Accordingly, the child will

build a systematic ability to use logical categories to conceptualize their current environment and thrive within it. Moreover, children and youth will be important role models for the nation for energy conservation in the future [12]. Therefore, an important target group of education for energy conservation should be the group of young people who are currently studying in school, especially those in the elementary level because this education level is the basic compulsory education for all students. An integrated curriculum to increase awareness of energy conservation for primary schools designed by the researcher is shown in Fig. 2.

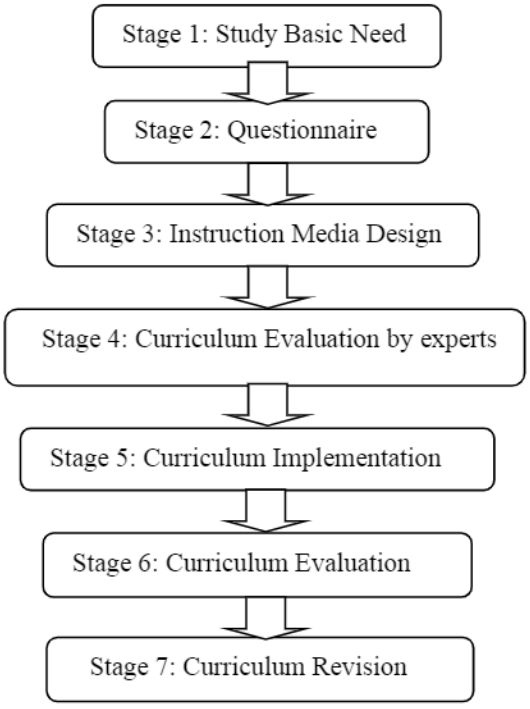

Fig. 2. The conceptual framework.

The education system assesses students on their knowledge of a balanced curriculum and on their ability to link concepts across subject areas and to apply the skill learned [13]. Standardized tests offer one means of measuring student attainment level. In Japan, the elementary grades run from age 6 to 11, with junior high school from 12 to 14.

Fig. 3. Animation and games computer design for sustainable energy conservation.

These nine years comprise the compulsory education in the country, which has a national curriculum standard first published in 1947, and modified every ten years thereafter to ensure the subject matter is up to date [14].

The subjects in this study are students in primary schools of Bangkok Metropolitan Administration from 50 districts. The target population was students from one group in primary, step one sampling 1 group from 7 groups get there "Department of Education Bangkok Metropolitan Administration", Classified as a small, middle and large school size. The sampling group in level 1 (Grade 1-3) was 405 students from 3 schools of different sizes and level 2 (Grade 4-6) was 360 students. Overall there were 765 students. The curriculum considered only the students with the pre-test results. Less than 70% were found in level 1, students with

pretest scores lower than 70% or 37.53%. The grade 1 students accounted for 35.38%, grade 2 students accounted for 47.76% and grade 3 students accounted for 29.79%. Less than 70% were found in level 2, students with pretest scores lower than 70% or 20.56%. The grade 4 students accounted for 20.59%, grade 5 students accounted for 17.36% and grade 6 students accounted for 23.36%, respectively. Table 1 shows the data collection details.

Table 1. Number and percentage students with lower than 70%

Level	Class	n	Score lower than 70%	
			Frequency	%
Level 1	Grade 1	130	46	35.38
	Grade 2	134	64	47.76
	Grade 3	141	42	29.79
	Over all	405	152	37.53
Level 2	Grade 4	102	21	20.59
	Grade 5	121	21	17.36
	Grade 6	137	32	23.36
	Over all	360	74	20.56

For students with lower than 70% results in the level 1 and level 2, the results can be compared. A pre-test and post-test by integrated curriculum to increase awareness of energy conservation were conducted for every student in each level and grade. There was a statistically significant difference in the energy saving after school at the .01 level and data collection such as mean, standard deviation and paired-sample T-test. Results are shown in Table 2.

In this research, the researcher considers the percentage difference of energy saving awareness scores before and after an integrated curriculum to increase awareness of energy conservation. The average and standard deviation are shown in Table 3.

The percentage of energy awareness score after the study, the statistical significance at 0.01 level, both overall and every year, are shown in Fig. 4.

Table 2. Comparison of energy efficiency before and after use integrated curriculum to increase awareness of energy conservation of students with lower than 70%

Level	Class	n	Score	Mean	SD	T	p
Level 1	Grade 1	46	Post test	29.652	0.526	29.708**	0.000
			Pre test	15.935	2.894		
	Grade 2	64	Post test	29.375	1.507	37.444**	0.000
			Pre test	17.656	1.845		
	Grade 3	42	Post test	29.262	1.191	21.346**	0.000
			Pre test	17.357	3.252		
	All Level 1	152	Post test	29.428	1.199	48.543**	0.000
			Pre test	17.053	2.711		
Level 2	Grade 4	21	Post test	141.238	12.625	17.071**	0.000
			Pre test	99.143	2.744		
	Grade 5	21	Post test	145.381	8.958	22.094**	0.000
			Pre test	99.619	2.037		
	Grade 6	32	Post test	145.906	9.230	26.856**	0.000
			Pre test	99.750	2.095		
	All Level 2	74	Post test	144.432	10.294	38.056**	0.000
			Pre test	99.541	2.265		

** Statistically significant at the 0.01 level

Table 3. Average and standard deviation of percentage of awareness energy saving points before and after school by integrated curriculum to increase awareness of energy conservation

Class	N	% Pre test		% Post test		T	P
		Mean	SD	Mean	SD		
Grade 1	130	70.563	15.675	98.667	2.140	19.894**	0.000
Grade 2	134	67.811	10.310	98.085	3.929	31.601**	0.000
Grade 3	141	71.631	11.482	98.133	3.070	26.914**	0.000
Grade 4	102	77.287	7.798	96.803	5.399	24.201**	0.000
Grade 5	121	77.906	7.293	96.650	5.601	22.327**	0.000
Grade 6	137	77.391	8.245	97.026	6.144	22.833**	0.000
Over all	765	73.558	11.320	97.605	4.611	53.970**	0.000

** Statistically significant at the 0.01 level

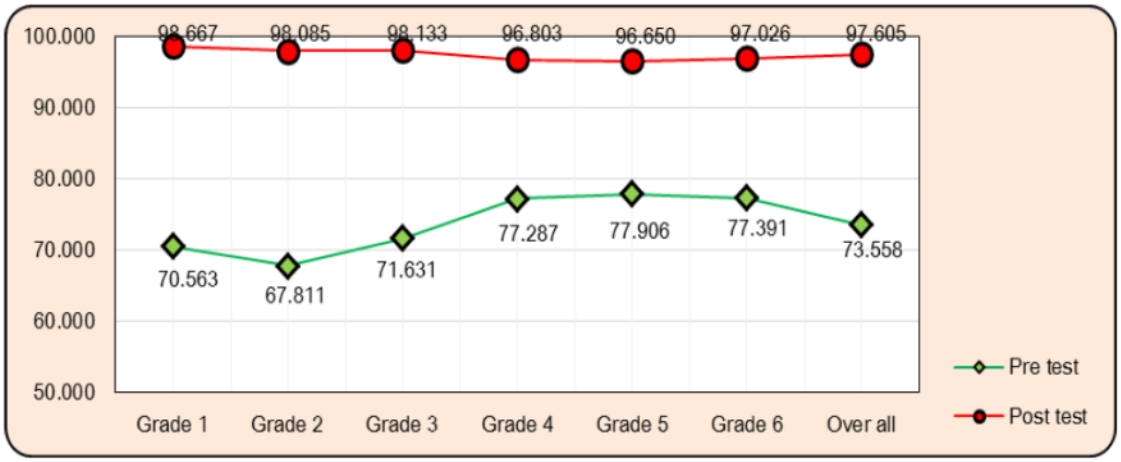

Fig. 4. Percent energy awareness rating before and after school.

Based on the results of the data analysis, an integrated curriculum to increase awareness of energy conservation can result in awareness mind saving energy after class change from the previous lesson in level 1 students (Grade 1-3) more than in level 2 students (Grade 4-6) by integrated curriculum to increase awareness of energy conservation it is suitable for level 1 students (Grade1-3), Students have a high energy saving score after high school by level 2 students (grade 4-6) there is a difference is slightly in energy awareness scores.

4. Conclusion

Studies investigating how children learn during their early years reveal that their initial experiences have a powerful influence upon their later learning and academic success. It is also important that schools take into account the need to meet the requirements of all their students, and in particular not only to focus on academic needs but also on the social, emotional, physical, and psychological needs which enable children to develop as rounded human beings [15]. Schools therefore have a significant responsibility, and as more is understood about child development, the greater that responsibility becomes, requiring schools to invest more time and resources to deliver high quality education. Furthermore, not all children learn in exactly the same way, and so schools must differentiate in the way lessons are provided in order to meet individual learning needs. For this reason, it is essential to deliver a balanced curriculum so that children's own personal strengths and weaknesses will be addressed as they develop their skills and knowledge. Researchers have designed an integrated curriculum to increase awareness of energy conservation, "Animation and computer games", as shown in Figs. 5, 6 and 7.

Fig. 5. Pre-test and post-test by integrated curriculum to increase awareness of energy conservation.

Fig.6. Experimental groups level 1 (Grade 1-3).

Fig.7. Experimental groups level 2 (Grade 4-6).

The research study is consistent with a review of the literature conducted to inform this study which confirms that cooperative learning approaches by "animation and games computer" can lead to greater environmental awareness among elementary school children. By working together, children can support each other in striving to achieve the group objective, but to use this method effectively within the classroom requires a skillful teacher who is adept at organizing group activities which fully engage learners and promotes participation from everyone involved. Theories of cooperative learning therefore offer a sound structure to examine the development of sustainable energy awareness in the classroom. This framework allows the key concepts from the field of sustainable energy to be applied through social learning techniques which stem from a solid theoretical foundation in education. This research is consistent with Hilal Aktamis, who sought to investigate the sustainable energy awareness in high school students along with their energy saving habits in order to examine the influence of socio-demographic factors upon energy-saving knowledge and behavior [16]. In this study, a survey was conducted in order to determine the nature of the status quo. There were 400 participants in the study, comprising students from the 6^{th} (162 students), 7^{th} (145 students), and 8^{th} (93 students) grades. Of these students, 191 were male, and 209 were female; 240 were from urban areas and 160 were from rural areas. The assessment scale used in the study for data collection was the "Energy Saving and Energy Awareness Scale" which comprised 21 items covering 4 factors. The reliability of the survey was tested using Cronbach's alpha, and the co-efficient was found to be 0.80. One way MANOVA analysis was employed to examine the data, using SPSS version 11.5. It was found that the level of energy awareness among high school Student was high.

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