The Effect of Implementing the Green Skills Module on Design Technology Subject Assessing The Pupils' Green Skills Practices

by Widihastuti Widihastuti

Submission date: 11-Nov-2019 09:52AM (UTC+0700)
Submission ID: 1211113869
File name: hnology_Subject_Assessing_The_Pupils_Green_Skills_Practices..pdf (366.26K)
Word count: 3955
Character count: 20992

Journal of Engineering Science and Technology
Special Issue on ICEES2018, June (2019) 18 - 25

THE EFFECT OF IMPLEMENTING THE GREEN SKILLS MODULE ON DESIGN TECHNOLOGY SUBJECT: ASSESSING THE PUPILS' GREEN SKILLS PRACTICES

ARASINAH KAMIS[1,*], CHE GHANI CHE KOB[2], HARYANTI MOHD AFFAND[3], FAIZAL AMIN NUR YUNUS[4], PAIMAN[5], WIDIHASTUTI[6]

[1, 2]Faculty of Technical and Vocational, Sultan Idris Education University, Tanjong Malim, Perak Darul Ridzuan, 35900, Malaysia
[3]Centre for Engineering Education Research and Built Environment, Faculty Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[4]Faculty of Technical and Vocational Education, Tun Hussein Onn University, 86400 Parit Raja Batu Pahat, Johor, Malaysia
[5]Universitas PGRI Yogyakarta, Jl. IKIP PGRI I Sonosewu No.117, Sonosewu, Ngestiharjo, Kasihan, Bantul, Daerah Istimewa Yogyakarta, Indonesia, 55182
[6]Faculty of Engineering, Yogyakarta State University, Karangmalang Yogyakarta, Indonesia, 55281
*Corresponding Author: arasinah@ftv.upsi.edu.my

Abstract

This study examines the effect of implementing the Green Skill (GS) in Design and Technology (DT) subjects to assessing students' green practices. This quantitative study uses a quasi-experimental technique to evaluate 62 year-five primary school students: group of treatment utilising the GS Module, and the control groups without GS Module. A GS practice rubric test was conducted to measure the performance of the students after they had practised the GS. The GS practice - questionnaires were only answered by the treatment group after using the module for nine weeks. The analysis results of the t-test show that the level of GS practice between the male and female students is almost the same and at a good level. The MANOVA's findings show that there are no significant differences of the Waste practice, 3R and water usage of green skills between male and female students. These clearly shows that the practice of the two groups are at the same level and good. Conclusion, that GS can be integrated into DT subjects, and students can implement the practices related to environmental sustainability. In addition, the GS implementation inculcates positive practices among teachers and pupils, which in turn help preserve the environment for the future generations.

Keywords: Design technology, Environment education, Green skills, Green technology, Sustainability.

1. Introduction

Sustainability is an important agenda on the education transformation that will train pupils to be more responsible for the future of the Earth. The attitudes of individuals are one of the factors contributing to this environmental problem [1]. The National Solid Waste Department (JSPN) in Malaysia estimated that 25,000 tonnes of solid waste per day were generated in the year 2012, but only 5% of the waste is recycled even though many recycling campaigns have been promoted, and recycling bins are available in certain places. This is the adverse consequence of the lack of knowledge and skills in solid waste management systems, especially in waste separation [2-3]. Therefore, the curriculum should provide a holistic approach through which pupils will grow up appreciating the Earth and conserving the environment. Arasinah [4-8] suggests that different approaches need to be adopted even though environmental education has long been taught in schools, but the students are still unable to develop good behaviours towards the environment. In fact, in all curricula, the contents of subjects need to include green aspects that can be appropriately applied to the value of green skills [4, 9, 10, 11].

2. Practice

In terms of the practices of environmental education and sustainability, a research conducted by Alexandar [12] found that active learning involving project approaches had a profound impact on the students' practices and level of behaviour towards the environment increased after performing skills-based activities such as solid waste separation. The Schumm [13, 14] study shows show that the students' level of behaviour towards the environment before and after using the modules is the same, and the male students' level of practice is higher than that of the female students. On the contrary, the study by Goldman [15] found that the students' level of sustainable use practices is at a moderate level.

Meanwhile, in a study, Puttick [16] show that the level of practice in preserving the environment for both groups is high. It is practicable to save energy in everyday life and people can be an agent to present to others about the importance of safeguarding the environment. There are some researchers who use the Knowledge, Attitudes and Practice Model (KAP) that is concerned with the environmental knowledge; it has a positive impact on individual attitudes and cultivates good practices towards the environment based on the structural model of sustainable environmental education development [17-19]. When knowledge is disclosed in the right way, it will lead to positive practices, and foster a good attitude or behaviour about something [3, 20].

The Reasonable Action Model (TRA) by Fishbein [21] related to the individual's attitude and subjective norms. Thus, to ensure a noble, good and positive behaviour, all individuals must be encouraged by a good attitude. This is a student's reaction after undergoing the environmental education. Attitudes also play a role in forming positive environmental practices or behaviours [21]. A good attitude towards the environment produces pro-environmental practices [22, 23]. This is the anticipated reaction of a student after going through the environmental education in the context of this study: the effects of GS module application should influence the behaviour and readiness of the student to practise green skills [20-23].

However, there are some researchers who argue that a high level of knowledge will not create a positive attitude and good practice towards the environment [24]. Although the level of knowledge of the environment is high, it may not enable a person to inculcate positive attitudes and good practices towards the environment. This study examines the effect of the GS Module on pupils' GS practices, through the studying of DT subjects in the primary schools. There are two null hypotheses to test: H_{o1}. There is no significant difference between the means of the Green skills practices of the male and female pupils in the treatment group after using the GS Module. H_{o2}. There is no significant difference between the means of the sub Practices- Waste, 3R and Water usage in the Green skills practices of the male and female treatment groups after using the GS Module.

3. Methodology

The study has used the quasi-experimental design [25], which is also known as the Pre-Post Test control groups. A quasi-experimental technique deals with two groups of subjects-the treatment group and control group. Samples are taken from an existing class without resorting to the random process; which chooses the subjects randomly in batches. The treatment group uses the GS Module and the control group does not use the Module *(pretest-posttest control group)* [26]. The study uses only two primary year-five classes: 30 of them form the control group and the remaining 32 form the treatment group. The sample size is sufficient and relevant for a quasi-experimental study as the proposed minimum size for satisfactory results is 30 individuals [27]. The dependent variable is the practice of GS, and the independent variable is the treatment group based on gender.

3.1. Instrument

The study uses the practice rubric tests to measure the students' level of practice of green skills and the behaviours towards the environment, after the students using the GS Module or when they are practising the green skills as instructed by the appraiser or the teacher. The Questionnaires for the GS practice are only answered by the treatment group only after using the GS Module. The analytical rubric of GS practice, adapted from the works of two authors, namely the rubrics created by Stergar [28] in Performance Tasks, Checklist and Rubric; and Crespo [29]. Three of the practice constructs are assessed: the level of practice in isolating solid waste, 3R practices, and water plumbing practices. The scoring of indicators for practice rubrics are based on three indicators: weak (score less than 6), medium (score 7 to 12) and good (score 12 to 18), with scales of 1 to 3 [29-31]. The development of the rubric is based on five tasks according to the GS practices available in the Module. The assignment provided in this practice rubric is based on the four criteria of sustainable development, namely environment, technical, social and community [32].

3.2. Data Analysis

Inference statistics are used to identify the differences in the practice of Green Skills based on the groups. According to Pallant [33], the use of covariate analysis can be determined through a pre-test if there is a pre-test difference between the treatment group and the control group. If there is no difference, the independent t-test analysis and the multivariate analysis of variance test (MANOVA) are used to

answer the questions of the study. In this study, the independent sample t-tests were conducted to see the differences between the treatment group and control groups. To evaluate the practice variables of Green Skills, the test was only performed on the treatment group using the GS Module, and based on gender, which is male and female groups.

4. Results

4.1. Hypothesis 1

From Table 1, the statistical analysis of the independent samples t-test shows that there is no significant difference in Green Skills practice with t = (0.699) and sig = 0.49 (p>0.05). The Levene test shows similar results in terms of variance across the practices of the gender groups, that is F = 0.039 and sig = 0.845 (p> 0.05). This shows that the practices of Green Skills for the boys and girls have similarities in the aspect of variance. In summary, the values of variance across the groups of male and female students are alike and there is homogeneity. The findings also show the mean values of the Green Skills practices among both genders are at the same level and good. The male group mean is (M = 12, SP = 2.69) while that of the female group is (M = 13, SP = 2.64). There is no difference between the mean scores of the practices between genders after using the GS Module. This result supports the acceptance of the hypothesis, nul 1 (Ho_1); there is no significant difference in the practices between the two genders of the treatment group after they were exposed to the GS Module. It can be concluded that the levels of practices of the green skills demonstrated by both genders are almost identical and at a good level, after using the Module.

Table 1. Independent t-test analysis for practice.

Attitude	N	M	SD	Levene test		T value	Sig
Group					Sig		
Male	15	12	2.69	0.039	0.845	(-0.699)	0.49
Female	17	13	2.64				

4.2. Hypothesis 2

Before carrying out the MANOVA's analysis, the Box's M tests were conducted to determine the homogeneity value of the variants. The Box's M test is important because this procedure is a prerequisite for the use of MANOVA statistical tests. The Box's M findings; there is no significant difference in the variances of the dependent variables for all the independent variables, with $F = 0.027$, $p = 1.00$ ($p>$ 0.05). The findings of the MANOVA test in Table 2 clearly show that there is a difference between the independent variables for the both genders in the treatment group that had used the GS Module. The results of the Pillai's Trace multivariate test show that overall, there is no significant independent group-effect, with a Pillai's Trace value of 0.489, which is the value of [F (1,30) = 0.490, $p>$ 0.05].

Table 2. MANOVA tests based on groups.

Effect		n	*Pillai's Trace*	F	*Hypothesis df*	*Error df*	*p*
Group	Male	15	0.016	0.489	1	30	0.490
	Female	17					

The MANOVA test yielded insufficient results; hence, a detailed study was conducted to find out the differences between the three variables (waste, 3R and water). Prior to that, the Levene's tests were carried out to ascertain the value of each variable across the category in both genders. The result shows that homogeneity exists for the male and female groups. This is indicated by the Levene Test value of $p > 0.05$ for all the variables tested; all the values are not significant with $p = 0.854$. Next, the effect sizes are shown in order to explain the sizes of the effect of variables on the group. Based on Table 2, there is no significant difference in all the practices scores between the two groups: the value of Waste is [$F(1,30) = 0.489$, $p > 0.05$]; 3R is [$F(1,30) = 0.489$, $p > 0.05$]; and Water is [$F(1,30) = 0.489$, $p > 0.05$]. The findings in terms of the effect sizes of the variables in relation to genders show the same effect between all the practices with a Partial Eta Square value of $\eta 2p = 0.016$ for all the variables. This finding shows that sex contributes significantly to the small effect, the value of 0.01 shows that the size of impact is small [33] (Table 3). This finding supports the second null hypothesis (Ho_2) that there is no significant difference in the mean scores of Waste Substance, 3R and Water in the practices of GS of the male and female groups. In conclusion, the use of the GS Modules can nurture good practices of GS.

Table 3. MANOVA test between group based on sub-practices.

Variables	Group	M	SD	*df*	Error	Chi *square*	*F*	*p*	Partial eta square
Waste	Male	13	3.131	1	30	3.542	0.489	0.49	0.016
	Female	13	3.127						
3R	Male	12	2.690	1	30	3.542	0.489	0.49	0.016
	Female	13	2.680						
Water	Male	11	2.883	1	30	3.542	0.489	0.49	0.016
	Female	12	2.887						

5. Discussion

This study examines the effects of implementing the Green Skills Module (GS) in the Design and Technology (DT) subjects to assess the students' green practices. The findings show that there is no difference in the practices of green skills between the two gender groups after conducting a quasi-experiment. This finding is in line with the study of [12-14, 16], which states that the green skills of pupils are at a high level after they had received the treatment. However, in a research conducted, [2-3] found that the level of solid waste management and practice was low. The study of [15] also has the same insights that the level of student practice towards the sustainable environment is at a moderate level. Thus far, all the module-based studies have shown that there is an improvement in the practices after the respondents had undergone the green skills trainings, such as waste separation, energy resource usage, and other educational programmes that mitigate the impact of global warming. This demonstrates that good practices of clean environmental management can be inculcated if taught in the right way. This study found that when pupils had acquired a high level of knowledge, they exhibited good green practices towards the environment. The findings of this research are quite similar to those of the environmental sustainability research carried out by [18-19]. Based on the KAP Model by [20] it is evident that people will manifest good actions or behaviours towards the environment when they have good knowledge of the green skills. There

is a correlation between knowledge, practices and attitudes as far as the Green Skills are concerned. The findings show that when the students have a high level of knowledge, their attitudes about the Earth change for the better and they carry out more environment-friendly practices. When an individual's level of green knowledge increases, his or her attitudes about the Earth will be more positive and the daily-life practices will be kinder to the environment. This confirms the theory that if a good attitude is formed, good practices will follow in a person's life [21-22]. This statement debunks the argument of [24] which states that high level of knowledge cannot create positive attitudes and good practices towards the environment.

6. Conclusions

This study has shown the positive effects of the GS module on students' practices of green skills by gender. It is clearly demonstrated that the application of the GS module produces good green skill practices among the students. The implementation provides new experiences and exposure to the DT teachers when the Green Skills or green concepts are integrated in the Science or Geography subjects. This augurs well for the fourth agenda of the Sustainable Development Goals to provide quality education in the sustainability development. The findings of this study are expected to give a fresh direction to the DT and TVET curriculum in introducing a new green element in education. The positive results of this study also provide opportunities for all related parties, especially the educational institutions, to focus on the elements of green skills that serve to preserve and conserve the environment for the future generations. Green Skills are part and parcel of the Green Technology, which will drive all types of developments and the world economy in the future.

Acknowledgement

The author would like to express her deepest gratitude to the Sultan Idris Education University for providing the financial assistance to complete this research under the University Research Grant, 2015-0166-107-02 (FRGS/1/2015/SS109/UPSI/03/13) year 2015-2018.

References

1. Trukšāns, D. (2017). Towards municipal environmental development: environmental management systems for local formal education establishments. *Regional Formation and Development Studies*, 23(3), 175-185.
2. Licy, C. D.; Vivek, R.; Saritha, K.; Anies, T. K.; and Josphina, C. T. (2013). Awareness, attitude and practice of school students towards household waste management. *Journal of Environment*, 2(6), 147-150.
3. Festus, M. O.; and Ogoegbunam, O. (2012). Imperatives of environmental education and awareness creation to solid waste management in Nigeria. *Journal of Educational Sciences*, 3, 254-258.
4. Kamis, A.; Alwi, A.; and Yunus, F. A. (2017). Integration of Green Skills in Sustainable Development in Technical and Vocational Education. *Int. Journal of Engineering Research and Application*, 7(12), 08-12.
5. Kamis, A.; Ismail, B.L.H.; and Alwi, A. (2018). *Green technology in development country, community awareness and the implementation in TVET*,

In Comparative Issues and Research Concerns in the National Landscapes of Vocational Education & Training: Emergent Issues in Research on Vocational Education & Training Vol. 2. Premiss forlag, Stockholm Sweden, pp. 126-150.

6. Tal, T.; and Peled, E. (2017). The philosophies, contents and pedagogies of environmental education programs in 10 Israeli elementary schools. *Environmental Education Research*, 23(7), 1032-1053.
7. Teoh, E.S. (2016). *An evaluation of Enviromental Education In Selected Primary Schools In Pahang, Malaysia*. Tanjung Malim: Universiti Pendidikan Sultan Idris.
8. Jasmi, N.; and Kamis, A. (2019). Importance of Green Technology, Education for Sustainable Development (ESD) and Environmental Education for Students and Society. *Journal of Engineering Research and Application,* 9(2), Series-I, 56-59.
9. Okereke, E.C.; Onokpaunu, M.O.; and Ikonomwan, B.A. (2018). Business educators' perception on green skills needed in Business Education curriculum for creating a sustainable society in Nigeria. *Nigerian Journal of Business Education (NIGJBED)*, 5(1), 30-39.
10. Kamis, A.; Mustapha, R.; Wahab, N.A.; and Ismail, B.L.H. (2016). Green Skills as an added-value element in producing competent students. *International Journal of Engineering Research and Applications*, 6(11), 12-21.
11. CEDEFOP. (2012). *Green skills and environmental awareness in vocational education and training.* European Centre for the Development of Vocational Training, Luxembourg. Retrieved November 5 2018, from http://www.cedefop.europa.eu/files/5524_en.pdf.
12. Alexandar, R.; and Poyyamoli, G. (2014). The effectiveness of environmental education for sustainable development based on active teaching and learning at high school level-a case study from Puducherry and Cuddalore regions, India. *Journal of Sustainability Education*, 7, 1-20.
13. Schumm M. F.; and Bogner F. X. (2016). How Environmental Attitudes Interact with Cognitive Learning in a Science Lesson Module. *Hindawi Publishing Corporation Educational Research International*, 4, 1-7.
14. Murbangun, N.; Endang, S.; and Nofiyanti. (2018). Problem based learning on environmental chemistry with article products to improve student knowledge. *Journal of Engineering Science and Technology*, Special Issue on ICETVESS 2017, 23-30.
15. Goldman, D.; Ayalon, O.; Baum, D.; and Weiss, B. (2018). Influence of 'green school certification' on students' environmental literacy and adoption of sustainable practice by schools. *Journal of Cleaner Production*, 183, 1300-1313.
16. Puttick, G.; Kies, K.; Garibay, C.; and Berstein, D. (2015). Learning and Behaviour change in a Girls Scout Program focused on Energy Conservation: Saving energy to save the planet. *Journal of Sustainability Education*, 8(3), 24-23.
17. Munirah, G. (2017). *An Intervention Study Using "Sustainability Module" On Teachers ESD Knowledge, Attitude and Practices*. 10th Asia-Pacific RCE Meeting. New Delhi: India.

18. Alwi, A.; and Kamis, A. (2019). Using The ADDIE Model to Develop Green Skills Teaching Module. *Int. Journal of Engineering Research and Application,* 9(1), Series -II, 53-57.
19. Chien-Yun, D.; Wan-Fei, C.; Yu-His, Y.; and Chia-Hung, Y. (2012). A Study on Modification of Knowledge, Attitude and Practice on Vocational High School Electronics Courses Integrated with Nanotechnology Concept. *Int. J. of Thermal & Environmental Engineering*, 4(1), 73-79.
20. Palmer, J.; and Neal, P. (1998). *The Handbook of Environmental Education.* London: Routledge.
21. Fishbein, M.; and Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research, reading*. Addison-Wesley: Publishing Company.
22. Hungerford, H.R.; Bluhm, W.J.; Volk, T.L.; and Ramsey, J. (1998). *Essential readings in environmental education*. Illinois: Stipes Publishing, Champaign.
23. Sterling, S.; and Cooper, G. (1992). *In Touch: environment education for Europe*. Surrey, UK: WWF, Panda House.
24. Onwezen, M. C.; Antonides, G.; and Jos Bartels. (2013). The Norm Activation Model: An exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. *Journal of Economic Psychology*, 39, 141-153.
25. Jackson, S. (2016). *Research Methods and Statistics: A Critical Thinking Approach*. USA: Thomson Higher Education.
26. Shadish, W.R.; Cook, T.D.; and Campbell, D.T. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference* (2nd ed.). New York: Houghton Mifflin Company.
27. Frankael, J.R.; Warren, N.E.; and Hyun, H.H. (2012). *How to Design and Evaluate* Research *in Education* (8th ed). USA: McGraw Hill Humanities.
28. Stergar, C. (2005). *Performance Taks, Checklist, and Rubrics*. USA: Corwin.
29. Crespo, B.; Míguez-Álvarez, C.; Arce, M. E.; Cuevas, M.; and Míguez, J. L. (2017). The Sustainable Development Goals: An Experience on Higher Education. *Sustainability*, 9(1353), 1-15.
30. Kamis, A.; Hussain, M. A. M.; Kob, C. G. C.; Yunus, F. A. N.; and Rahim, M. B. (2018). Validity and Reliability of Green Skills Instrument. *Sains Humanika*, 10(3-3), 73-80.
31. Alwi, A.; Kamis, A.; and Ismail, B. L. H. (2018). Effects of Green Skills Module in Design and Technology Subjects on The Student's Knowledge in Primary School. *International Journal of Academic Research in Business and Social Sciences*, 8(11), 1701-1712.
32. Eftah, H.A.; and Abd Aziz, A.S. (2014). *Pentaksiran Prestasi & Pentaksiran Rujukan Standard Dalam Bilik Darjah*. Ipoh: Harkam Enterprise.
33. Pallant, J. (2011). *SPSS survival manual: A step by step guide to data analysis using the SPSS program* (4th ed). Berkshire: Allen & Unwin.

The Effect of Implementing the Green Skills Module on Design Technology Subject Assessing The Pupils' Green Skills Practices

ORIGINALITY REPORT

3%	5%	0%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.tiikm.com Internet Source	3%

Exclude quotes	On	Exclude matches	< 2%
Exclude bibliography	On		

The Effect of Implementing the Green Skills Module on Design Technology Subject Assessing The Pupils' Green Skills Practices

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8