

A contextual teaching and learning experience through insects species collection program

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ABSTRACT

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This study investigated if there was significant difference in the appreciation and awareness of insects among the trainee students before and after the insects' species collection program. It also evaluated if contextual teaching and learning approach in the insects' species collection program assisted trainee students to learn insects. Respondents were 53 first-degree trainee students from mathematics option and science option. They learnt about insects through hands-on and minds-on activities, using contextual teaching and learning approach in the program. The study employed entrance survey, exit survey and program evaluation survey as the instruments. The entrance and exit survey consisted of 17 items with 5-point Likert-scale, where 10 items examined respondents' appreciation and seven items examined respondents' awareness on insects. The program evaluation survey consisted of nine items adapted from LAM-PUS03-03, the quality and procedure control manual of MS ISO 9001-2008. Open-ended item collected suggestions and comments. Data from the entrance and exit survey were analysed using Statistical Package for Social Sciences Software to check on the Cronbach's Alpha reliability coefficients and normality. Wilcoxon test showed that there was significant differences in the appreciation and awareness of insects among the trainee students before and after the insects' species collection program. Findings from the program evaluation survey showed that the program was successful (N= 53, mean = 4.84).

Keywords:

Contextual teaching and learning approach, Insects' species collection, Program evaluation

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1. Introduction

Teacher Training Institute Kent Campus (IPGKK) is one of the higher learning institution that trains primary school teachers in Malaysia, under the Malaysian Teachers Education Institute (IPGM), Ministry of Education Malaysia (MOE). Its new campus which started its operation in Jun 2015, is located at the edge of Kg Bakut km 27.2, Jalan Tuaran, Sabah, Malaysia (6.1235° N, 116.2197° E). Its land areas cover 93.52 acres, having abundances of biodiversity such as *Actias maenas*, a moth

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species which is found at the sub-Himalayan regions of north-eastern India and most of the Southeast Asian mainland [1].

2. Problem Statement

We observed the behaviors of our first-degree trainee students toward biodiversity from June to September 2015, when we moved to this new campus. A few of the reviews that we obtained were as the following:

While handling the moths, trainee students were rough to them. They covered them with their palms, and shake the moths violently. They told us this was the way they handled moths when they were young. Due to the rough handling, we observed that the moths' wings were damaged.

Source: Review 1 on 7 Sept 2015

At about 7:30am, plenty insects could be found either resting on the floor or on the walls of the buildings. However, while walking from their hostels to the lecture halls, most of our trainee students were busy reading or texting with their smartphones. They did not seem to aware of, or interested to observe any insects that appeared around them.

Source: Observation 1 from July - Sept 2015

("Cikgu... mengapa cikgu suka kaji rama-rama?")

"Teacher... why do you like to study moths?"

Source: ARA, science option first-degree trainee student on 2 July 2015

("Cikgu jangan main dengan moths, mereka jadi hantu waktu malam.")

"Teacher don't play with moths, they turn into ghost when night fall."

Source: JOH, science option first-degree trainee student on 4 Aug 2015

("Oh no... Nanti dia (serangga) gigit... tidak suka... geli.")

"Oh no... they (insects) will bite... don't like... scary."

Source: EC, mathematics option first-degree trainee student on 15 Aug 2015

("Tiada minat mo tinguk (sic) (serangga)... banyak (serangga) yang berbau busuk.")

"Not interested to observe (insects)... a lot of them (insects) smell bad."

Source: XXX, visual art option first-degree trainee student on 4 Sept 2015

From our reviews, we were concerned if our trainee students lacked appreciation and awareness of the biodiversity found in the campus. As future teachers who will be going to teach the primary school pupils, we doubted if they were aware of insects, appreciate insects and able to practice the moral values as stated in Primary School Standard Curriculum (*Kurikulum Standard Sekolah Rendah, KSSR*).

As the surroundings of the campus has the potential to offer meaningful learning through contextual learning, we decided to explore the possibility to model contextual teaching and learning to our trainee teachers.

3. Literature Reviews

Biodiversity is a treasure that will be inherited by future generations. Many biologists describe it as the wealth of living organisms from the ecosystem [2], and CVB 2010, as in [2] says that Malaysia is one of the twelve countries which is given the recognition in her mega-diversity. As educators, it is important for teachers to instil this awareness and appreciation among their pupils, as they will inherit this wealth.

Refer to the Malaysia Education Development Plan (Pelan Pembangunan Pendidikan Malaysia, PPPM 2013-2025), the first wave (2013-2015) focused on the supports of teachers and pupils' skills development. For science, technology, engineering and mathematics (STEM) subjects, extra teaching hours were allocated and much emphasis were given on the application of knowledge, practical work and project based learning. As for the second waves (2016-2020), it focuses on the efforts to draw attentions and awareness of the society in STEM through resources and information centers [3]. In the light of the reviews on the trends of education in Malaysia, it is important for the teacher training institutes to equip their trainee students with content knowledge, pedagogies and the awareness on STEM.

Reviews on the KSSR syllabus on science education, social and environment showed that the learning objectives of these subjects are to instil interests on science and environment among pupils, to assist them to master observation and investigation skills, to recognize and to appreciate environment, and to build positive attitudes through their daily life [4]. To conclude, trainee students in IPGKK need to have the competencies and moral values to deliver the learning outcomes of these subjects when they are appointed as primary school teachers in future.

According to contextual learning theory, learning occurs when learners process new information or knowledge in meaningful ways in their minds [5]. Contextual learning theory is based on a few elements such as culture, social, physical, psychological, diversified learning environment and daily life. It emphasizes that attentions should be given to the diversity of learning environments, as it would produce effective learning. It was said that natural resources offer good opportunities for contextual teaching and learning [6]. The findings from case studies showed that natural resources provided meaningful learning and improved the quality of education in the primary and secondary schools at Lake Victoria, Kenya [6]. As IPGKK has the strengths in terms of its location, natural resources and environment, contextual teaching and learning should be explored to its maximum capacities, to provide a meaningful learning experience to the trainee students.

4. Objective of the Study

The objectives of this study are as following:

- i. To investigate if there is significant difference in the appreciation of insects among the trainee students before and after the insects' species collection program
- ii. To investigate if there is significant difference in the awareness of insects among the trainee students before and after the insects' species collection program
- iii. To evaluate if contextual teaching and learning approach in the insects' species collection program assist trainee students learn about insects

5. Research Questions of the Study

The research questions of this are as following:

- i. Is there any significant difference in the appreciation of insects among the trainee students before and after the insects' species collection program?
- ii. Is there any significant difference in the awareness of insects among the trainee students before and after the insects' species collection program?
- iii. Does contextual teaching and learning approach in the insects' species collection program assist the trainee students learn about insects?

6. Research Hypotheses

Based on the research questions stated in i and ii, the following null hypotheses were constructed. The level of significance, $p < 0.05$ is set for data analysis using inferential statistics.

Ho₁: There is no significant difference in the appreciation of insects among the trainee students before and after the insects' species collection program

Ho₂: There is no significant difference in the awareness of insects among the trainee students before and after the insects' species collection program

7. Limitation of the Study

Data of the study was collected from 53 first-degree program trainee students from science and mathematics option in IPGKK. Therefore, the findings may not reflect the learning outcomes from the intervention clearly. As for the location of insects' collection, it was carried out within IPGKK campus. Therefore, the contextual learning experience offered to the trainee students were limited to the context of the campus. As there were no experts in entomology involved to conduct the content knowledge, only selected insects such as cicadas, beetles and moths were studied. The program only focuses on simple taxonomy of selected insects' species.

8. Methodology

8.1 The Research Design

This study was a quantitative study, employed Wilcoxon test to test the null hypothesis in the degree of significance, $\alpha = 0.05$. Descriptive statistics was employed to study the mean and standard deviation (SD) from the data obtained.

8.2 The Respondents

53 first-degree program trainee students from science and mathematics option were selected as the respondents for the study. Table 1 showed the distribution of the respondents.

Table 1

The demographic data of the respondents

Option	Frequency	Valid %
Mathematics Semester 1	15	28.30
Mathematics Semester 5	14	26.42
Science Semester 2	15	28.30
Science Semester 6	9	16.98
Total	53	100

8.3 The Program

Insects' collection program consisted of five activities.

8.3.1 Staff development discussions

Professional discussions were carried out among the organizers of the program, who were the science department's lecturers. Topics of discussion included program content and design, content

knowledge of entomology, apparatus and methods, logistics, budget and instructional strategy of contextual teaching and learning.

8.3.2 Study tours

Study tours to Entomology Department at Sabah Museum, Borneensis Institute for Tropical Biology and Conservation at *Universiti Malaysia Sabah* and International Conference Heart of Borneo (HoB) were arranged to gain insights and consultations to strengthen the program content design and the content knowledge of entomology. The study tours were attended by the program organizers and the trainee students.

8.3.3 Outsource efforts

Expert and credential entomologists were invited as speaker for staff development event, enable the organizers and the trainee students to gain more knowledge on insects.

8.3.4 Insects preservation session through contextual teaching and learning approach

The trainee students identified suitable locations, learnt to set up insects' trap, and to preserve insects through hands-on and minds-on activities guided by the program organizers, and referred to power point presentations [7,8, 9, 10], note on insects' preservations and collections [11] and reference book [12, 13, 14].

8.3.5 Setting up insects' collections session through contextual teaching and learning approach

Trainee students learnt to select good qualities preserved insects through hands-on and minds-on activities guided by the program organizers, referred to note on insects' preservations and collections [11] and reference book [12, 13, 14]. Selected specimens were demonstrated as show case, and a mini gallery of insects' collection was erected at the library of *IPGKK*.

8.4 The Instruments

Three instruments were used in this study.

8.4.1 Entrance survey

The entrance survey consisted of 17 close-ended items with 5-point Likert-scale, requiring respondents' degree of agreement/disagreement based on each statement given. 10 items were to explore the respondents' appreciation on insects while seven items were to explore the respondents' awareness on insects. There was open-ended item for respondents to provide comments and suggestions (if any). The survey was administrated to the respondents before the program started. (Appendix)

8.4.2 Exit survey

The exit survey consisted of 17 close-ended items with 5-point Likert-scale, requiring respondents' degree of agreement/disagreement based on each statement given. 10 items were to

explore the respondents' appreciation on insects while seven items were to explore the respondents' awareness on insects. There was open-ended item for respondents to provide comments and suggestions (if any). The survey was administrated to the respondents after the program was completed. (Appendix)

8.4.3 Program evaluation survey

The program evaluation survey consisted of nine close-ended items, with 5-point Likert-scale and an open-ended item to provide comments and suggestions (if any). It was adapted from the standard matrix competency evaluation form (LAM-PUS03-03), which is the quality and procedure control manual MS ISO 9001-2008, as the standardized reference for *IPGKK* to evaluate the programs organized by *IPGKK*. It required respondents' degree of agreement/disagreement based on each statement given. There was open-ended item for respondents to provide comments and suggestions (if any). The survey was administrated to the respondents after the program was completed. (Appendix)

8.5 Data Analysis Procedures

Data collected from the entrance survey and exit survey were analysed with statistical analysis package, IBM Statistical Packages for Social Sciences (SPSS) for Windows version 21.0. The significance level, $p = 0.05$ was used in data analysis, to allow an error of 5% according to the standard of statistical statistics in the field of social science. Wilcoxon Test was used to test the null hypothesis in the degree of significance, $\alpha = 0.05$. Before data analysis was conducted, the internal consistency of entrance survey and exit survey were examined using Cronbach's Alpha reliability test. The data distribution was examined on the normality, mean and SD. The open-ended item was examined to find if there were any relevant findings.

Data collected from the program evaluation survey were analysed to examine the mean and SD, as these measurements are the standardized requirement of the quality and procedure control manual in *IPGKK*. The open-ended item was examined to find if there were any relevant findings.

9. Findings and Discussion

9.1 Reliability Test of the Entrance Survey and Exit Survey

Data collected were analysed using the statistical analysis package "*IBM Statistical Packages for Social Sciences (SPSS) for Windows version 21.0*" to determine the reliability of the items from in the entrance survey and exit survey. Table 2 showed the Cronbach's Alpha reliability coefficients of each aspects of the instruments.

The Cronbach's Alpha reliability coefficients of each aspect of the instruments were 0.877, 0.733, 0.792 and 0.719 respectively. The overall Cronbach's alpha reliability coefficients for entrance survey and exit survey were 0.860 and 0.810 respectively, which confirmed that the values of Cronbach's Alpha reliability coefficients were sufficient in both the instruments.

Table 2

The items distributions and Cronbach's Alpha values of the instruments

Instrument	Aspect	No of items	Total no of items	Cronbach's Alpha reliability coefficients	Overall Cronbach's Alpha reliability coefficients
Entrance Survey	Appreciation	10	17	0.887	0.860
	Awareness	7		0.733	
Exit Survey	Appreciation	10	17	0.792	0.810
	Awareness	7		0.719	

9.2 Test of Normality of the Distribution of the Entrance Survey and Exit Survey

To examine if the data were a normal distribution, the Kolmogorov-Smirnov test was employed. The percentage on the entrance survey showed that $D(53) = 0.22$, $p < 0.05$. The percentage of the exit survey showed that $D(53) = 0.90$, $p > 0.05$. It was concluded that the data were not normally distributed. Table 3 showed the test of normality.

Table 3

The test of normality

	Kolmogorov-Smirnov ^a		
	statistic	df	sig.
Entrance survey	0.22	53	0.00
Exit survey	0.90	53	0.20

9.3 The Mean Scores of Entrances Survey and Exit Survey

The findings showed that there was an increment 6.78 in the mean value of appreciation in the exit survey compared to the entrance survey. There was an increment of 3.98 in the mean value of awareness in the exit survey compared to the entrance survey. Table 4 showed the mean and SD distribution for the entrance and exit survey.

Table 4

The mean and SD distribution for the entrance survey and exit survey

Aspect	Survey	Mean	Difference in mean value	SD
Appreciation	Entrance	32.09	6.78	3.35
	Exit	38.87		7.81
Awareness	Entrance	27.00	3.98	2.59
	Exit	30.98		1.86

9.4 The Wilcoxon test on the Entrance Survey and Exit Survey

Based on the data analysis through the Wilcoxon test, it was found that the significance value for appreciation was less than 0.05 ($\text{sig} = 0.00$), hence H_{01} which stated that "there is no significant difference in the appreciation of insects among the trainee students before and after the insects' species collection program" was rejected. To conclude, this study showed that there was significant difference in the mean scores of appreciations in the entrance survey and exit survey ($z = -4.58$; $\text{sig} = 0.00$). The increment of mean value was significant and hence, the program had positive influence on the appreciation of insects among the trainee students. Table 5 showed the Wilcoxon test on appreciation.

Based on the data analysis through the Wilcoxon test, it was found that the significance value for awareness was less than 0.05 (sig = 0.00), hence H_0 which stated that “there is no significant difference in the awareness of insects among the trainee students before and after the insects’ species collection program” was rejected. To conclude, this study showed that there was significant difference in the mean scores of awareness in the entrance survey and exit survey ($z = -5.58$; sig = 0.00). The increment of mean value was significant and hence, the program had positive influence on the awareness of insects among the trainee students. Table 6 showed the Wilcoxon test on awareness.

Table 5
 The Wilcoxon test on appreciation

Test statistics ^a	
Exit App – Entrance App	
Z	-4.58 ^b
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon signed ranks test
 b. Based on negative ranks.

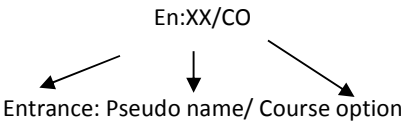
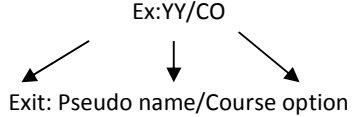
Table 6
 The Wilcoxon test on awareness

Test statistics ^a	
Exit Awa– Entrance Awa	
Z	-5.58 ^b
Asymp. sig. (2-tailed)	.000

a. Wilcoxon signed ranks test
 b. Based on negative ranks.

Relevant data obtained from the surveys were coded as in Table 7.

Table 7
 The source of data and the code given

Source of data	Code
Entrance survey	En:XX/CO 
Exit survey	Ex:YY/CO 

Responses from open-ended item of the entrance survey showed that respondents had negative views on insects. They did not like insects and insects were a nuisance to them. Responses from open-ended items were showed as below:

(“Hapuskan semua serangga di kampus... haha.”)
 “Get rid of all the insects in the campus... haha.”

En:JOH/ScSem6

("Dapatkan perkhidmatan Rentokil.")

"Get service from Rentokil (pest control service company)"

En:EMM/ScSem2

("Benci betul ...")

"I hate them (insects) ..."

En:KEL/ScSem6

While responses obtained from the open-ended item of the exit survey showed the acceptances and awareness of the respondents on insects. Responses from open-ended items were showed as below:

("Takut...tapi ok lah...")

"Scary... (insects) but its ok."

Ex:PN/ScSem6

("cantik juga moth dan kumbang")

"Moths and beetles are pretty too."

Ex:DH/MtSem5

("...penting juga untuk saya tahu serangga.")

"...it is important for me to know about insects."

Ex:LCC/MtSem5

Therefore, it was concluded that the program had succeeded to instill some awareness and appreciation of insects among the trainee students.

9.5 The Mean and SD of the Program Evaluation Survey

Based on the analysis of the data, the highest mean was obtained from #item 1 and #item 9 (N =53, mean =4.91, SD = 0.30). The lowest mean was obtained from #item 7 (N=53, mean= 4.79, SD = 0.41). Table 8 showed the means and SD of each item, and the overall mean value.

Table 8

The descriptive statistics of the program evaluation survey

Item	Description	Mean	SD
#1	This program assisted me to obtain knowledge about insects	4.91	0.30
#2	This program assisted me to gain skills on handling insects	4.81	0.40
#3	This program offered meaningful learning experience to me	4.83	0.38
#4	This teaching and learning approach in this program is suitable	4.83	0.38
#5	The content of the program is relevant	4.83	0.38
#6	The activities of the program used the campus context as learning resource	4.81	0.40
	The references used in this program is good		
#7	The duration of the program is sufficient	4.79	0.41
#8	The overall evaluation of this program is good	4.87	0.34
#9	Overall mean	4.91	0.30
		4.84	

Relevant data obtained from the program evaluation survey was coded as in Table 9.

Responses obtained from the open-ended item the respondents agreed that this program was relevant to them. They have learnt much about insects through contextual teaching and learning approach, using insects which were natural resources from the environment of the campus.

("Satu pengalaman yang baik untuk saya.")

"It was a very good experience to me."

ProEva:TYY/MtSem5

("Seronok hiking sikit di hutan sana.")

"It is fun to hike at the jungle there (jungle of the campus area)."

ProEva:FM/MtSem1

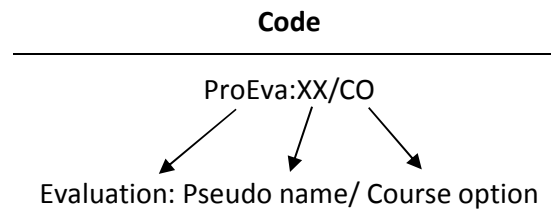
("... peluang untuk melakukan pengawetan serangga ...")

"... opportunity to preserve insects ..."

ProEva:JM/MtSem1

Table 9

Code given for the program evaluation survey



10. Conclusion and Recommendations

The finding showed that contextual teaching and learning through Insects species collection program has offered a meaningful learning experience to the trainee teachers. The program was a success as the trainee students showed appreciation and awareness on insects after the program. The teaching and learning using environmental experiences, and relevant context in this program has offered an option to improve the educational relevance, in response to the awareness on STEM and to uphold the *KSSR* syllabus. It is recommended the nature resources in the campus to be explored to examine its potentials and maximum capacities. Other contextual teaching and learning approaches should be explored to provide contextual teaching and learning experience.

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Appendix

ID: _____ Entrance survey Exit survey

Option: M1 M5 S2 S6

This survey has two parts. Part A and part B.

Part A: Answer the items based on the scale given as below.

Scale

1 -----2-----3 -----4-----5 very agree very disagree
--

No	Item	Scale				
		1	2	3	4	5
A	Appreciation					
1	I doubt the existence of insects in the campus					
2	Insects are ugly animals					
3	Insects are slimy animals					
4	Insects are scary animals					
5	Insects smell bad					
6	Insects are animals that bite					
7	I am phobia with insects					
8	I hate insects					
9	Insects in the campus are nuisance to me					
10	I prefer to ignore insects					

Part B: Answer the items based on the scale given as below.

Scale

1 -----2-----3 -----4-----5
very disagree very agree

Bill	Item	Scale				
		1	2	3	4	5
B	Awareness					
1	Insects have a lot of importance to the environment					
2	Insects have a lot of importance to mankind					
3	Insects have a lot of importance to biodiversity					
4	Insects play an importance role to the ecosystem					
5	It is important to be knowledgeable in insects					
6	There are many insects' species exist on planet earth					
7	I have the responsibility to convey knowledge on insects to my pupils					

Other comment (if any):

PROGRAM EVALUATION SURVEY

ID: _____

Option: M1 M5 S2 S6

Answer the items based on the scale given as below.

Scale

1 -----2-----3 -----4-----5 very disagree very agree
--

No	Item	Scale				
		1	2	3	4	5
1	This program assisted me to obtain knowledge about insects					
2	This program assisted me to gain skills on handling insects					
3	This program offered meaningful learning experience to me					
4	This teaching and learning approach in this program is suitable					
5	The content of the program is relevant					
6	The activities of the program used the campus context as learning resource					
7	The references used in this program is good					
8	The duration of the program is sufficient					
9	The overall evaluation of this program is good					

Other Comments/ suggestions:
