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FOSTERING AWARENESS OF COGNITIVE AND METACOGNITIVE READING STRATEGIES IN TWO FOREIGN LANGUAGES (ENGLISH AND ARABIC)

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ABSTRACT

This study attempted to find out the impact of Cognitive and Metacognitive Reading Strategy Instruction (CMRSI) in L2 (English) in increasing the awareness and use of these reading strategies not only in L2 in which the CMRSI was given but also in L3 (Arabic) in which no CMRSI was given as a result of transfer of reading strategies from L2 to L3. It also aimed to find out which strategy items were most and least improved both in L2 and L3 as a result of CMRSI in L2. Fifty five fourth-grade high school male students majoring in math-physics took part in this study. As the reading process is believed to be the same across languages (Mokhtari & Reichard, 2004), the participants were put into two groups of low and high awareness of reading strategies in L1 (Persian). Then, they were given reading comprehension tests in L2 and L3 as triggers for the main instrument (i.e., cognitive and metacognitive reading strategy questionnaire) in English and Arabic. After this pretest stage, the two groups underwent the CMRSI. The same pretest instruments were also given to the students as posttest. It was found that there was a significant difference in the awareness and use of cognitive and metacognitive reading strategies from pretest to posttest in English and Arabic for students of low and high strategic reading competence level. However, this improvement was not necessarily the same for different strategy items. It is important to teach reading strategies in L2 as it will have effect on increasing awareness of strategies both in L2 and in L3 as a result *of transfer of reading strategies from one language to another. However, as not all strategy items show the same improvement from pretest to posttest, more attention should be paid to the item by item analysis of strategies after CMRSI to maximize students' awareness of all strategy items equally.*

Keywords: *reading strategies, strategic competence, Arabic, English*

INTRODUCTION

The concept of communicative competence was put forward by Hymes (1966) as a reaction to the concept of linguistic competence introduced by Chomsky (1965). However, Canale and Swain (1980) identified four components of communicative competence including grammatical competence, sociolinguistic competence, discourse competence and strategic competence. Strategic competence refers to compensatory strategies in case of grammatical or sociolinguistic or discourse failures, such as the use of reference sources, grammatical and lexical paraphrase, requests for repetition, clarification, slower speech, or problems in addressing strangers when unsure of their social status or in finding the right cohesion devices (Peterwagner, 2005). However, the concept of strategic competence has been broadened by Bachman and Palmer (1996). In their theoretical model, language ability involves two components: language competence (or language knowledge) and strategic competence (or metacognitive strategies). The combination of language knowledge and metacognitive strategies "provide language users with the ability, or capacity, to create and interpret discourse, either in responding to tasks on language tests or in non-test language use" (Bachman & Palmer, 1996, p. 67).

"Learning strategies are specific actions taken by the learner to make learning easier, faster, more enjoyable, more self-directed, more active, and more transferable to new situations" (Oxford, 1990, p. 8). In studies of reading, strategies are defined as "ways of getting around difficulties encountered while reading" (Urquhardt & Weir, 1998, p. 95). Reading strategies indicate how readers conceive a task, how they make sense of what they read, and what they do when they do not understand (Singhal, 2001). One of the common classifications of reading strategies is the distinction between cognitive and metacognitive strategies. Koda (2005) posits that the acquisition of strategic reading depends on the development of cognitive and metacognitive resources. As Dole et al. (1991 as cited in Allen, 2003, p. 319) state, reading comprehension is a ‘constructive process’ that uses students’ cognitive and metacognitive strategies. Cognitive strategies are “actions or procedures readers use when working directly with the text” (Sheorey & Mokhtari, 2001, p. 436). Metacognitive strategies are, “Intentional and carefully planned techniques to monitor or manage reading task”. (Sheory & Mokhtari, 2001).

Metacognitive awareness (e.g., the knowledge of the nature or purpose of reading and the knowledge of the strategies that students should use for reading comprehension) of reading strategies plays an important role in enhancing the learning of reading and reading comprehension (Auerbach & Paxton, 1997; Baker, 2008; Carrell, Gajdusek & Wise, 1998). Chamot (1998) states that awareness of one’s own strategies is closely related to metacognition, and that more successful learners have better and more metacognitive awareness. Metacognition, or thinking about one’s own thinking (Anderson, 2002) is considered “a predictor of reading comprehension ability” (Baker, 2008, p. 25). Findings in research into reading strategies show that less successful readers enhance their reading proficiency through training and scaffolding based on the strategies that are used by more successful readers (Mokhtari & Perry, 2008). Successful and less successful readers may use similar strategies but they may differ in the frequency and variety of strategy use. (Anderson, 1991; Ikeda & Takeuchi, 2006).

Awareness of the learning process, especially in the earlier stages of language learning seems to improve language learning and strategy use (Chamot, 1998; Cohen, 1995). Lee and Oxford (2008) also show that strategy awareness has a significant main effect on strategy use. As Pressley et al. (1989) note, a learner can actively transfer a given strategy to a new learning situation only when they are aware of a strategy (i.e., when the learner has metacogntive knowledge of the strategy). Transfer of reading strategies from L1 to L2 is considered a sign of effective reading (Grabe & Stoller, 2002; Mokhtari & Reichard, 2004) and effective readers tend to regard reading in L1 or L2 as a single system and use similar strategies in their L1 and L2 when appropriate (Garcia, Jimenez & Pearson, 1998). Mokhtari and Reichard (2004) state that skilled readers in L1 and L2 are not, in fact different from each other in processing various reading materials and demonstrating metacognitive knowledge and strategies. However, research findings are not consistent with regard to this. For example, Alsheikh (2009) found that native speakers of Arabic used both problem-solving and support strategies more often in their L2 (English) than they did in their L1 (Arabic). Feng and Mokhtari (1998) also found that Chinese learners of English used problem-solving and support strategies more frequently when reading in L2 (English) than when they read in L1 (Chinese). In multilingual studies, Alsheikh (2011) found that participants tended to use more strategies in their L2 and L3 than in their L1.

The experience of learning a second foreign language is not a new experience and the learner already knows what learning a foreign language feels like. Thus, an interesting question in L3 learning is whether it draws upon L2 learning experience at all. Research has shown that L2 learning experiences and strategies affect the learning of an L3 (Hufeisen, 2000 as cited in Cenoz et al., 2003). Bartelt (1989 as cited in Chan, 2001) mentions that the role of L2 seems to be prominent in building L3 reading strategy. Hoffmann (2001) states that bilinguals may be able to acquire a third language more easily compared to monolinguals learning a second language. Chan (2001, p. 11) states, “The learning experience of L2 affects the acquisition process of L3 learners as they become skillful in both metalinguistic knowledge and general learning strategies”.

In the Iranian context, at high school level, there are two foreign languages taught. These two languages, namely English and Arabic are obligatory courses. However, despite the importance of reading strategy awareness in language learning studies, few studies have been conducted regarding the awareness of cognitive and metacognitive strategies in the learning of these two foreign languages simultaneously in the Iranian context. This study therefore mainly aimed to investigate the impact of CMRSI in L2 (English) on increasing the awareness and use of these strategies not only in L2 (English) but also in L3 (Arabic). It also aimed at finding out which individual cognitive and metacognitive strategy items were most and least improved in L2 and L3 as a result of this instruction in L2. Therefore, based on these goals, this study asked the following research questions:

1. Does reading strategy instruction in L2 affect awareness of reading strategies in L2 and L3 at high and low levels of strategic reading competence?

2. Which items of cognitive and metacognitive strategies show more improvement in L2 and L3 at high and low levels of strategic reading competence as a result of reading strategy instruction in L2?

METHODOLOGY

Participants

Fifty five fourth-grade high school male students, majoring in math-physics from a government-sponsored school were selected based on convenience sampling to take part in this study. They had already passed general Persian (L1), English (L2) and Arabic (L3) as well as science courses which were taught in Persian at grades one, two and three of high school, with the minimum passing score of 10 out of 20.

Hardin (2001) attempted to examine how 50 fourth-grade Spanish-dominant students utilized cognitive reading strategies to enhance comprehension of expository texts in Spanish and transfer strategic reading behaviors to reading in English. Results indicated that strategic behaviors in L1 undergird L2 reading behaviors and that the level of second language proficiency played a less prominent role in second-language strategic reading than did the level of strategy use in L1. Studies also showed a high correlation coefficient for the process of reading between different languages (Yamashita, 1999; Sarig, 1987). Mokhtari and Reichard (2004) stated that skilled readers in L1 and L2 were not that different from each other in terms of processing various reading materials or demonstrating metacognitive knowledge and strategies. These were the reasons for setting L1 strategic competence as a criterion to homogenize and group students. Therefore, in this study in order to set a level for comparing students so that their reading strategies awareness could be assessed in L2 and L3 as a result of the instruction of the reading strategies, the subjects were divided into two groups based on their reading strategies awareness in L1 (Persian). The questionnaire of reading strategies (see appendix for questionnaire) was employed to classify the participants into low and high L1 reading strategy awareness groups. Those who scored below the mean score were considered as the low group and those who scored above the mean score were considered as the high group (see Table 1).

Table 1: The Mean and Standard Deviation of Questionnaire Scores in Persian Reading Strategies

Grouping based on awareness of reading strategies in L1	M	SD	N
High	145.00	13.08	31
Low	118.00	10.02	24
Total	263.00	24.00	55

Instruments

Reading strategy questionnaire

Studies of reading generally take a process (strategic reading behavior) and/or product (reading score) view of reading. Product oriented studies use reading comprehension tests as a criterion for data collection while process oriented studies employ questionnaires, interviews or think-aloud techniques for this purpose. Questionnaires are the most popular tool to establish what students are like at the start of their language course (Robinson, 1991). Best (1987) maintains that a questionnaire is the most appropriate and useful data collection device in research projects. In this study, the strategic approach was measured by means of a five-point Likert scale ranging from strongly disagree to strongly agree reading strategies questionnaire which would offer an immediate retrospective picture of reading behavior. The instrument was in the participants' L1 (Persian) to make sure the items were well understood by the participants. The participants were informed of the purpose of the study and that there was no right or wrong answer for the items in the instrument. All the items in the questionnaire were adopted from some related questionnaires in research-validated studies (see Oxford, Cho, Leung & Kim, 2004; Sheorey & Mokhtari, 2001; Taillefer & Pugh, 1998).

The internal consistency reliability coefficient of the instrument at the piloting stage was 0.83 as it was piloted among 13 students. To make sure of the content validity of the questionnaire, the instrument was shown to two experts in the field to get their opinion about the items. They were also asked to give their opinions on the clarity of the translation. Cognitive strategies are about knowing what strategies to use and how to use them; on the other hand, metacognitive strategies are about understanding the rationale for applying a particular strategy in a particular context, and evaluating its usefulness in terms of appropriacy and effectiveness for that context. There are two reasons why students were tested about their knowledge of cognitive and metacognitive strategies (see Fogarty, 1994). First, through cognition, good readers construct their knowledge and through metacognition, they identify strategies. Therefore, constructing understanding requires both cognitive and metacognitive elements. Second, metacognitive strategies help students to successfully use and transfer these strategies cross-linguistically, as the ultimate goal of strategy instruction is transfer. As Auerbach and Paxton (1997) state, strategic reading can only become efficient when metacognitive strategies are actively used. There were 33 items in the questionnaire: items 9, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 26, 27, 31, 33 were cognitive strategies and the rest were metacognitive strategies in reading.

Reading tests

A. Reading comprehension test in Arabic. This test contained two passages, each with fifteen items. The items in terms of recognizing main ideas, vocabulary and inferencing were the same for the two passages in the reading comprehension test in Arabic. To construct the L3 (Arabic) reading comprehension test, the following features were borne in mind: length of texts, content, interest of students, format of the test (a multiple-choice format was used) and time (the time allotted was 30 minutes as determined in the piloting stage). It was then given to two Arabic teachers to obtain their opinion about the suitability of the text for this study. Both of these teachers were experts in Arabic Language and Literature. They had ten and thirteen years of experience respectively in teaching Arabic to high school students. After piloting the test with 13 students, the reliability of the test through the K-R21 formula was 0.71 . This test was validated against the 50 item reading section of the Arabic Proficiency Test (APT) (1994) which was developed by the University of Michigan and the Center for Applied Linguistics. The correlation coefficient was 0.70 which was appropriate for this study.

B. Reading comprehension test in English. The test of reading comprehension in English was from the reading component of the *Cambridge Preparation for the TOEFL Test*. The time allowed was 40 minutes as determined at the piloting stage. To ensure that this test was an appropriate one in terms of text difficulty level to be given to both groups of proficiency, first, two passages were randomly selected from the course books of the pre-university students taking part in this study. The readability formula was run to obtain an index of readability for them. The mean index was 19.87. Then the readability formula, after studying many texts, was run for the above-mentioned test of TOEFL, which turned out to be 20.80 and was suitable for the purpose of this study. Next, to check its reliability, it was piloted with 13 students and through the K-R21 formula, the reliability was 0.71. Then after calculating the correlation coefficient (0.75) between the Nelson test of proficiency and the test of reading in English in the piloting stage for the purpose of having a valid test, this reading test was deemed to be suitable for this study.

C. Reading comprehension test in Persian. The reading comprehension test in Persian contained two passages, each containing fifteen items. The items for the two passages in terms of recognizing main ideas, vocabulary knowledge and inference were the same. After administering this test to a similar group of 13 students, the reliability of the scores of this test according to the KR-21 formula was 0.92. This test was also shown to some experts in Persian language and literature to check the suitability of the text as well as the nature of the test items for students. Since to date, there has been no objective index for determining the difficulty level of Persian reading texts, the researcher relied on the experience of Persian language experts and his own experience in order to select suitable texts for the purpose of this study. The time allocated for the reading test in Persian was 30 minutes as determined at the piloting stage. The time factor was carefully controlled as too much time allowed would change rapid expeditious reading into slow careful reading.

PROCEDURES

First, the reading test in L1 (Persian) functioning as a trigger to the strategic reading behavior in L1 was administered to students. Therefore, the data from this test was not used in the data analysis and discussion of the study. Immediately after this test, a reading strategy questionnaire in L1 was employed to classify the subjects into two groups of low and high awareness of reading strategies in their L1 reading. Those who scored below the mean (24 students) and those who scored above the mean (31 students) were considered as low and high groups respectively.

After informing the participants of the purpose of the study, the reading strategy questionnaire as well as the reading comprehension tests in English and Arabic was administered to the students in the two groups during regular class time. Instructions were given to the participants on how to answer the questionnaire items and reading test batteries. They were asked to take the reading tests in English and immediately after that, they were given the strategy questionnaire as a retrospective measure in determining what strategies they used for reading in English. The same procedure was repeated for the reading test in Arabic in the following session. Time limitation was set for the reading tests but there was no time limit for answering the questionnaire and the researchers answered any possible questions raised by the participants who sought for more clarity. The questionnaire was delivered in Persian (L1) as it was thought to enable the participants to easily reflect on their strategic behavior.

After the pretest, the two high and low groups received reading strategy instruction with English language texts. In order to teach students how to read strategically, the five elements proposed by Winograde and Hare (1988 as cited in Carrell 1998) were used. They were: what the strategy is, why the strategy should be learnt, how to use the strategy, when and where the strategy should be used, and how to evaluate the use of the strategy. The texts used in the treatment were similar to the texts in the English reading tests in length, genre and general content. The course consisted of seven 35 or 40 minute sessions. After the treatment was over, each group was given the posttests in English and Arabic as had been done in the pretest stage. It should be noted that as this study was about raising awareness and use of reading strategies in two foreign languages (L2 and L3) as a result of teaching reading strategies in L2, and was not to see the effect of this instruction on their reading performance, the two reading tests in these two languages (English and Arabic) functioned as triggers for strategic reading behavior and the data from them was not used for statistical analysis and discussion in the study.

ANALYSIS OF DATA

Data were analyzed using paired samples t-test. The analysis of data shows there was a significant difference in the awareness and use of cognitive and metacognitive reading strategies from pretest to posttest in Persian and English for students of low strategic reading competence level in both languages, as the p-value observed did not exceed the .05 significant level (see Table 2).

Table 2: Paired Samples t-test for Pretest and Posttest Cognitive and Metacognitive Reading Strategies in Arabic and English for Students of Low Strategic Reading Competence Level in Both Languages

	Language	Domain	Mean		SD		Mean Difference	t	p
			Pre-test	Post-test	Pre-test	Post-test			
Low Level	Arabic	Cognitive	20.0333	50.2000	4.38	3.21	-30.16667	-31.534	.000
		Metacognitive	23.4	52.93	5.26	3.63	-29.53333	-28.064	.000
	English	Cognitive	19.57	50.63	3.56	3.20	-31.07	-32.042	.000
		Metacognitive	23.43	54.0	4.19	2.62	-30.57	-31.497	.000

The analysis of data shows that there was a significant difference in the awareness and use of cognitive and metacognitive reading strategies from pretest to posttest in Arabic and English for students of high strategic reading competence level in both languages, as the p-value observed did not exceed the .05 significant level (see Table 3).

Table 3: Paired Samples t-test for Pretest and Posttest Cognitive and Metacognitive Reading Strategies in Arabic and English for Students of High Strategic Reading Competence Level in Both Languages

	Language	Domain	Mean		SD		Mean Difference	t	p
			Pre-test	Post-test	Pre-test	Post-test			
High Level	Arabic	Cognitive	22.4333	54.1333	3.6358	3.4713	-31.7	37.184	.000
		Metacognitive	28.4000	57.4667	22.7423	3.3086	-27.06	-6.773	.000
	English	Cognitive	20.432	53.333	4.43	2.288	-32.898	-34-83	.000
		Metacognitive	30.45	50.987	6.12	4.133	-20.5	-38.32	.000

Post hoc Analysis for Friedman's Test to Rank Cognitive and Metacognitive Strategy Items

For more detailed studies, the Friedman's test was conducted to rank the degree of use of cognitive and metacognitive strategies in Arabic and English for both high and low strategic groups in reading (see Table 4) in the pretest and posttest.

For the low group, the p observed ($p=0.000$) the difference between the items of cognitive reading strategies in Arabic both before and after the treatment was significant ($p<0.05$). Analysis of mean scores showed that at the pretest stage, items 13 (I pay attention to the beginning and end of each paragraph) and 27 (I visualize information read) had the highest and lowest mean scores respectively. However, after treatment, items 33 (I go back to read the details of the passage to find the answers of some questions) and 31 (I make inferences after finishing reading the passage) showed the highest and lowest mean scores respectively.

For the high group, the p observed ($p=0.000$) between the items of cognitive reading strategies in Arabic both before and after the treatment was significant at .05 level. Analysis of mean scores showed that at the pretest stage, items 33 (I go back to read the details of the passage to find the answers of some questions) and 31 (I make inferences after finishing reading the passage) had the highest and lowest mean scores respectively. After treatment, items 33 (I go back to read the details of the passage to find the answers of some questions) and 31 (I make inferences after finishing reading the passage) also showed the highest and the lowest mean scores respectively.

Table 4: Friedman's Test to Rank the Degree of Awareness of Cognitive and Metacognitive Strategies for High and Low Groups in Arabic and English

Strategic Competence	Language	Reading Strategy Domain	Pretest		Posttest	
			Item showing highest mean score	Item showing lowest mean score	Item showing highest mean score	Item showing lowest mean score
High	Arabic	Cognitive	33*	31*	33*	31*
		Metacognitive	5	29	4	30
	English	Cognitive	33*	31*	33*	31*
		Metacognitive	5	32	4	29
Low	Arabic	Cognitive	13	27	33	31
		Metacognitive	2	32*	8	32*
	English	Cognitive	13	26	33	31
		Metacognitive	2	30*	4	30*

For the low group, the p observed (p=0.000) the difference between the items of cognitive reading strategies in English both before and after the was significant at 0.05 level. Analysis of mean scores showed that at the pretest stage, items 13 (I pay attention to the beginning and end of each paragraph) and 26 (I interpret the text -make inferences, draw conclusions, etc.) had the highest and lowest mean scores respectively. However, after treatment, items 33 (I go back to read the details of the passage to find the answers of some questions) and 31 (I make inferences after finishing reading the passage) showed the highest and lowest mean scores respectively.

For the high group, the p observed (p=0.000) the difference between the items of cognitive reading strategies in English both before and after the treatment was significant at 0.05 level. Analysis of mean scores showed that at the pretest stage, items 33 (I go back to read the details of the passage to find the answers of some questions.) and 31 (I make inferences after finishing reading the passage.) were the highest and lowest mean scores respectively. After treatment, items 33 (I go back to read the details of the passage to find the answers of some questions) and 31 (I make inferences after finishing reading the passage) still showed the highest and lowest mean scores respectively.

For the low group, the p observed (p=0.000) the difference between the items of metacognitive reading strategies in Arabic both before and after the treatment was significant at 0.05 level. Analysis of mean scores showed that at the pretest stage, items 2 (I read the topic or heading of the passage to help predict the contents) and 32 (I evaluate what is read) were the highest and lowest mean scores respectively. However, after treatment, items 8 (I read the questions before I read the passage carefully) and 32 (I evaluate what is read) showed the highest and the lowest mean scores respectively.

For the high group, the p observed (p=0.000) the difference between the items of metacognitive reading strategies in Arabic both before and after the treatment was significant at 0.05 level. Analysis of mean scores showed that at the pretest stage, items 5 (I determine what to read) and 29 (I try to understand text organization) were the highest and lowest mean scores respectively. However, after treatment, items 4 (I think about the reasons why I am reading the text) and 30 (I do questioning for clarification) showed the highest and lowest mean scores respectively.

For the low group, the p observed (p=0.000) the difference between the items of metcognitive reading strategies in English both before and after the treatment was significant at 0.05 level. Analysis of mean scores showed that at the pretest stage, items 2 (I read the topic or heading of the passage to help predict the contents) and 30 (I do questioning for clarification) had the highest and lowest mean scores respectively. However, after treatment, items 4 (I think about the reasons why I am reading the text) and 30 (I do questioning for clarification) showed the highest and lowest mean scores respectively.

For the high group, the p observed (p=0.000) the difference between the items of metacognitive reading strategies in English both before and after the treatment was significant at 0.05 level. Analysis of mean scores showed that at the pretest stage, items 5 (I determine what to read) and 32 (I evaluate what is read) had the highest and lowest mean scores respectively. However, after treatment, items 4 (I think about the reasons why I am reading the text) and 29 (I try to understand text organization) showed the highest and lowest mean scores respectively.

DISCUSSION AND CONCLUSION

Studies have shown that awareness of the learning process helps students learn a language and use strategies (Chamot, 1998; Cohen, 1995; O'Malley & Chamot, 1990; Oxford, 1990; Oxford & Cohen, 1992). A typical finding in research on reading strategies is that higher awareness is likely to lead to better reading comprehension, and that less successful readers can develop their reading proficiency via training and scaffolding based on the strategies that are used by more successful readers (Mokhtari & Perry, 2008). Dreyer and Nel (2003) found that students who received strategic reading instruction attained significantly higher marks for reading comprehension tests than the students in the control group.

This study has two main findings. First, it was found that there is a significant difference in the awareness and use of cognitive and metacognitive reading strategies from pretest to posttest in Arabic and English for students of low and high strategic reading competence level. Lee and Oxford (2008) have shown that strategy awareness has a significant main effect on strategy use. Mokhtari and Reichard (2004) state that less successful students who are often unaware of their own cognitive process must be helped to acquire and use reading strategies that have been found to be successful. As Pressley et al. (1989) note, a learner can actively transfer a given strategy to a new learning situation only when the strategy is in the learner's awareness (i.e., when the learner has metacogntive knowledge of the strategy). Regarding the effect of L1 on L2, transferring learning or reading strategies from one's mother tongue to L2 is considered a mark of efficient reading (Grabe & Stoller, 2002; Mokhtari & Reichard, 2004) as skilled L2 readers tend to regard reading as a single system (Garcia, Jimene & Pearson, 1998). Hoffmann (2001) states that bilinguals may be able to acquire an L3 more easily compared to monolinguals learning an L2. In line with the first finding of the study, Hufeisen (2000) states that L2 learning experiences and strategies affect learning of an L3. Bartelt (1989 as cited in Chan, 2001) mentioned that the role of the L2 seems to be prominent in L3 strategy building. Chan (2001, p. 11) states, "The learning experience of L2 affects the acquisition process of L3 learners as they become skillful in both metalinguistic knowledge and general learning strategies".

Second, for a more detailed study, the Friedman's test was conducted to rank the degree of awareness of cognitive and metacognitive strategies for high and low groups in Arabic and English in the pretest and the posttest (see Table 4).

The findings of this study showed an improvement in mean score from the pre-test to the post-test. However, generally, this improvement from the pretest to the posttest was not of the same degree for different strategy items. In other words, as a result of reading strategy instruction, items showing the highest or the lowest improvement in the post-test were not the same items which had the highest or the lowest mean scores in the pre-test. This happened for many groups as represented in Table 4. For example, for the low cognitive strategy group in Arabic, the highest score in the pretest pertained to item 13 (I pay attention to the beginning and end of each paragraph) and the highest score in the posttest pertained to item 33 (I go back to read the details of the passage to find the answers of some questions). However, some items as signified by asterisks in Table 4 remained the same from the pretest to the posttest and the treatment did not change the rank of these items. This happened to both groups: a) pretest and posttest for English and Arabic test for cognitive reading strategy for the high strategic competence group, and b) posttest only for English and Arabic test for metacognitive reading strategy for the low strategic competence group.

These findings are supported by past research. In a study about reading in L1 and L2 by Garcia, Jimenez and Pearson (1998), it was found that effective readers tend to regard reading in L1 or L2 as a single system and use similar strategies in their L1 and L2 when appropriate. Meanwhile, Mokhtari and Reichard (2004) stated that skilled readers in L1 and L2 are not, in fact, different from each other in processing various reading materials and demonstrating metacognitive knowledge and strategies. However, Alsheikh (2009) found that native speakers of Arabic used both problem-solving and support strategies more often in their L2 (English) than in their L1 (Arabic).

Feng and Mokhtari (1998) also found that Chinese learners of English used problem-solving and support strategies more frequently when reading in L2 (English) than when they read in L1 (Chinese). In multilingual studies, Alsheikh (2011) found that participants tended to use more strategies in their L2 and L3 than in their L1.

From the findings of this study, it is concluded that it is important to take the teaching of reading strategies in the "first foreign language" (L2) seriously as it has impact on fostering strategy awareness and use both in "the first foreign language" (L2) and "the second foreign language" (L3) as a result of transfer of reading strategies from one language to another. As Sheorey and Mokhtari (2001) stated it is important for reading strategies to be part of reading instruction in a foreign language. Such instruction can help promote an increased awareness of the mental processes involved in reading and the development of thoughtful reading.

Another conclusion is that in addition to the overall analysis of the strategies using the overall mean scores, it is important to conduct an item by item analysis of strategies to see which item is the most or the least affected as a result of reading strategy instruction. This will help teachers find out more detailed information about the effect of reading strategy instruction on fostering the awareness and use of each single reading strategy.

Thus, it is recommended that teachers should consider the processes involved in reading in a foreign language so that improvements in awareness of reading strategies are observed. In addition, an item by item analysis of reading strategies is strongly recommended as the instruction of reading strategies does not have an equal impact on the improvement of each single strategy. In doing so, different variables such as level of awareness of the strategy, strategy type (i.e., cognitive or metacognitive), language being learnt (L2, L3, etc.), and others should be considered as well as these variables have impact on the results.

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APPENDIX

READING STRATEGY QUESTIONNAIRE

Name: (Optional)
Gender:

Dear Participants,
The researchers of this study want to find out about your strategic reading behavior for reading in English/Arabic/Persian. Please read the statements carefully and tick the most appropriate answer according to the scale given.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Pre-reading activities					
1) I preview the text before reading.					
2) I read the topic or heading of the passage to help predict the contents.					
3) I look at the pictures, graphs, maps, diagrams, etc. of the passage.					
4) I think about the reasons why I am reading the text. (To get the main idea, obtain specific information, understand most or all of the message, enjoy a story, etc.).					
5) I determine what to read.					
6) I skim each paragraph for the main idea(s).					
7) I adjust my reading rate.					
8) I read the questions before I read the passage carefully.					
9) I use my background (world) knowledge to help me understand the passage.					
While-reading activities					

10) I pay attention to the parts of the sentence such as phrases and clauses.					
11) I pay attention to the sentence structure such as subjects and objects.					
12) I link information in one sentence with information from the preceding ones.					
13) I pay attention to the beginning and end of each paragraph.					
14) If I don't understand something such as a word or phrase, I guess its meaning using clues from the text such as parts of speech, surrounding words, verb tense, singular and plural, synonyms and antonyms, appositive, punctuation marks, contrasts, description, cause-effect, use of the, etc.					
15) If I do not understand some part of the text, I try to guess its meaning by activating my background knowledge.					
16) I propose some questions according to my thoughts about the article.					
17) I write comments or questions in the margins.					
18) I orchestrate various strategies.					
19) I read aloud when the text becomes hard.					
20) I re-read for better understanding.					
21) I take notes, highlight or underline the important points while I am reading the passage.					
22) I scan (read quickly) for the answer to some questions and for details.					
23) I check or evaluate my comprehension.					
24) I predict or guess text meaning.					
25) I check my predictions about the text while reading.					

26) I interpret the text (make inferences, draw conclusions, etc).					
27) I visualize information read.					
28) I do monitoring and clarifying.					
29) I try to understand text organization.					
30) I do questioning for clarification.					
Post-reading activities					
31) I make inferences after finishing reading the passage.					
32) I evaluate what is read.					
33) I go back to read the details of the passage to find the answers of some questions.					

THE EFFECT OF INNOVATIVE INSTRUCTIONS ON PRE-SERVICE SCIENCE TEACHERS' CONCEPTION ABOUT THE NATURE OF SCIENCE: A SCIENTIFIC INVESTIGATION

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ABSTRACT

Learning science without having a correct conception of the nature of science is a flaw in science education that warrants concern, all the more if science teachers teaching science have misconceptions about the nature of science. This paper is based on an action research carried out during Nature of Science (NOS)(SCE500) course for 56 pre-service science teachers in a science education programme. The study focuses on the learning outcomes on aspects of NOS that have been reported as common misconceptions among science learners. It specifically looks into the results of three aspects that are related to scientific investigation, i.e. its role, its demands on imagination and its process. The results show that after attending innovative lessons for a semester, the misconceptions of the pre-service science teachers regarding three aspects of NOS: experiments in science confirm scientific ideas, scientists use their imagination at the early stage of investigation only, and hypothesis-experiment-conclusion is a scientific method used by all scientists have reduced significantly.The paper also highlights in brief the innovative and creative elements pertaining to a variety of approaches used in the set induction of every class session based on the consensus mode of the Nature of Science. The paper concludes with the feedback on the course by the pre-service teachers.

Keywords: *Nature of Science, Scientific Investigation, Pre-service Science Teachers, Innovative Instruction*

INTRODUCTION

Science literacy encompasses not only knowledge of science, but also about the nature of science (NOS) in accordanc to the definition of science education reform (Enger & Yager 1998; American Association, 1990). Nature of Science that illuminates how scientific knowledge has developed and the roles which scientists have played during such a process are deemed two fundamental aspects that are considered necessary and essential for students to know. However, research in NOS has revealed that the level of misconception about NOS among science students as well as science teachers including pre-service teachers is high and needs immediate attention (Buaraphan & Sung-Ong, 2009; Khishfe & Lederman, 2006; Akerson & Hanuscin, 2007; Ling et al., 2008; Tan & Boo, 2003; Jain, Beh & Nabilah, 2013; Beh, 2011). This gives rise to concerns on how to address the misconceptions. Lederman and Abd-EL-Khalick (1998) suggest the explicit approach in introducing NOS to students. However, there is a lack of studies on the effects of learning outcomes of innovative instruction in NOS which this paper aimed to address.

In the science teacher preparation programme in the selected institution, a public university, the course, SCE500-Nature of Science (NOS) is included as a science based core subject in the curriculum in line with the reform in science education. In line with the constructivist movement, the instructional design of the NOS course includes among others, a strategy addressing explicitly the common misconception of NOS among students. This paper is based on an action research carried out by the author who was also the instructor of SCE500. The action research consisted of three phases: 1. Entrance Survey: Identifying misconceptions, 2. Innovative Instruction: The use of set inductions together with the chapters authored by Kosso(1997), and 3. Exit Survey: The changes in misconceptions.

This paper looked into classroom experiences and highlighted in detail the conceptual change with regard to misconceptions of NOS in three areas related to scientific investigation: its role, its demands on imagination and its process at the entrance level among pre-service science teachers taking SCE 500 course.

INNOVATIVE INSTRUCTION: THE SCE500 EXPERIENCE

SCE500-The Nature of Science is a core subject taken by all undergraduates enrolling in the pre-service science teacher programme at the institution in which this research was conducted. The course content is philosophically biased and the approach is inclined to constructivist approach. This approach is deemed appropriate as it ensures not only meaningful learning but also positive learning outcomes such as creative and critical thinking, leadership, communication, presentation, problem solving and research skills. These skills are deemed essential besides content mastery for students who aspire to become effective teachers.

The course content is based on the textbook, Reading the Book of Nature by Kosso (1997) to guide the students through the philosophical perspectives of the major ideas in science, such as Theory and Law, Explanation and Truth, and Observation and Confirmation. Kosso provides a view of science that mimics the constructivist approach in which observation relies on theory to give it meaning. However, many students find it challenging to capture this view because of the philosophical dimension. Hence, before the class embarked on the discussion of the above stated topics, the students were given readings to obtain an overview of The Nature of Science. The objectives of the overview were to provide a general framework of the Nature of Science to enhance understanding of the philosophical arguments set in the textbook, and to complement the content in Kosso's book. A topic on Religion and Science was included at the end of the course. The main objective was to enable students to internalize what is not science.

To enhance students' interest and conception about the Nature of Science, activities similar to those suggested by Lederman and Abd-EL-Khalick (1998) were incorporated in the class.The activities were conducted at the beginning of each of the weekly three hour class discussion by the instructor. This was named as "Induction". Students found the inductions interesting, illustrative and illuminating. The following is an example, one of the many inductions which was created (Refer to Beh, 2011 for more examples of inductions).

AN EXAMPLE OF INDUCTION

In this induction, students were asked to draw the magnetic field around a bar magnet. Many had no problem coming up with a drawing similar to the one in the science textbook (Figure 1).

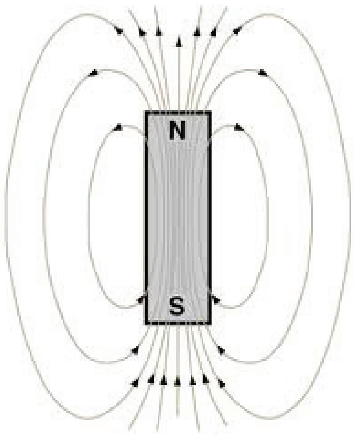

Figure 1

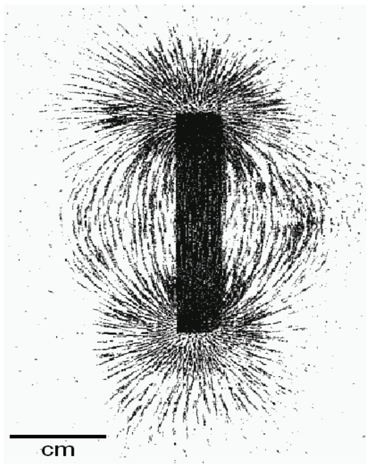

Figure 2

Then, a bar magnet was placed under a piece of transparency paper in the overhead projector. A student was asked to sprinkle iron filings over the magnet and then to gently tap the edge of the paper. The filings showed a pattern of magnetic field lines in the surrounding space as in Figure 2. Students were both intrigued and amazed with the visual image of the formation of the magnetic field pattern. Subsequently, the students were asked the following questions:

- Do you see Figure 1 in Figure 2? Where are N and S and the arrow signs in Figure 2?
- Do you see the lines of force in Figure 2?
- Do you think magnetic field has lines in its natural setting? If it does not, how do you get to see the pattern traced out by the filings?

In the class discussion relating to these phenomena of magnetic field pattern, the following ideas were introduced:

- The particular pattern is formed by the filings because each tiny iron filing has been induced into a temporary magnet. The iron filings with the magnetic property of "different poles attract and similar poles repel" align to form lines. The gaps between the lines are due to the repulsive force created between filings that are aligned side by side. The magnetic lines of force is a physic construct invented by scientists. This construct is just a representation of an invisible entity but useful in that it has predictive value.
- As for the labels N and S and the arrow signs which appear in Figure 1, these are conventions agreed by scientists in defining the direction of a magnetic field, i.e. the direction indicated by the needle of a compass when it is placed in the field.

The following features of nature of science were then introduced:

- Scientific constructs are generated to make the natural world comprehensible and intelligible.
- The constructs have predictive value. Based on these constructs, for example, the magnetic field pattern of two bar magnets placed side-by-side can be predicted.
- Scientific ideas are grounded in agreement among scientists.
- Since "magnetic lines of force" is a human construct, it can be subjected to change when a better representation is created in future.
- What constitutes observation is the effect of the unobservable scientific entity and not the scientific entity itself.

METHODOLOGY

An inventory (Refer to Appendix) was used to gauge students' conceptual change about the Nature of Science after they attended SCE500 course. The inventory was constructed based on the eight common misconceptions of the nature of science as indicated from previous research: Parker et al. (2008) on American students, Tan and Boo (2003) on Singaporean pre-service teachers, and its modification by Lin et al. (2006). Test-retest reliability on twenty pre-service science teachers showed a reliability index of 0.89. As for validity, content validity was carried out by a panel of three science instructors who had experience in teaching NOS.

The inventory comprising eight items was administered to 56 pre-service science teachers before (Entrance) they started and after (Exit) they took SCE500 course. The pre-service teachers were required to response to the Likert scale of 1-5 where 1 indicated Strongly Agree to 5 which indicated Strongly Disagree. However, this paper only looked into the responses of the pre-service science teachers for three items in the inventory, i.e. Items 1, 2 and 6 that were related to scientific investigation. The items were named as Statements 1, 2 and 3 as below:

Statement 1: Experiments in science confirm scientific ideas,
Statement 2: Scientists use their imagination only at the early stage of investigations, and
Statement 3: Hypothesis-experiment-conclusion is the scientific method used by all scientists.

Besides that, three pre-service teachers were interviewed to gauge their views for statements 1-3 before and after the course.

RESULTS AND DISCUSSION

Statement 1: Experiments in science confirms scientific ideas.

Table 1 shows the responses of the pre- service teachers for Statement 1 at the entrance and exit levels for SCE500 course.

Table 1: Pre- Service Teachers' Responses to Statement 1

Major		Entrance Mean	Exit mean	Gain
Mathematics	(n=22)	1.7	4.4	2.7
Physics	(n=16)	1.9	3.2	1.3
Biology	(n=18)	2.0	3.2	1.2
Overall	(n=56)	1.9	3.6	1.7

Scale: 1=Strongly Agree 2=Agree 3=Not Sure 4=Disagree 5=Strongly Disagree

Table 1 shows the average score of the pre-service teachers in accordance to their respective major before and after the course SCE500 in response to statement 1,"Experiments in science confirm scientific ideas**"**. Table 1 reveals that before the course, the majority of the pre-service teachers agreed with the statement. After years of studying science, the majority of the pre-service teachers had the misconception that scientific ideas can be confirmed through experiments despite under-determination in science, i.e. science can be disproven but cannot be proven according to Karl Popper's notion of falsification as the essential feature in the process of science (Kosso, 1997). In other words, experiments in science provide evidence for theories to be tested but the evidence obtained cannot be taken as confirmation and truth. However, after completing SCE500 course, the majority of them changed their views regarding the role of experiments. They now viewed that experimental data merely provides evidence for ideas to be tested. Table 1 shows an overall gain of 1.7 in scale with mathematics pre-service teachers leading with a gain of 2.7, followed by physics and biology pre-service teachers with gains of 1.3 and 1.2 respectively.

Table 2 shows three examples of explanations provided by three pre-service teachers (one from each major) who indicated a change in their view in response to Statement 1 (i.e. Agree/Strongly Agree before taking the course to Disagree/Strongly Disagree after taking the course). The explanations further substantiated the positive conceptual change from the misconception harbored before the course to the acquisition of the correct conception after the course by these pre-service science teachers. The correct conception is that experiments in science do not confirm scientific ideas; they only provide evidence for the ideas to be tested.

Table 2: Change of Views among Pre-service Teachers for Statement 1

	Change of views	
Major of pre-service teachers	**Before taking SCE500 course**	**After taking SCE500 course**
Biology	"For example, to prove that inertia exists, scientist carries out an experiment of spinning a "gasing" (top)."	"This is because there are no absolute "confirmation" in science as science never touches the truth."

Mathematics	"Yes, experiments in science must be related with scientific ideas to get the right conclusions."	"Experiment is to support the theory (idea), not to confirm/ prove."
Physics	"Because most of us believe in what we see. The same goes to experiments being done. The results obtained will prove the scientific ideas that we initiate."	"Experiments done are just to verify the ideas that scientists have."

A cross tabulation of individual responses to Statement 1 before (Q1) and after (PQ1) SCE500 course was carried out to reveal in detail the changes in pre-service teachers' responses to Statement 1. Table 3 shows the results.

Table 3: Cross Tabulation of Responses to Statement 1 before and after SCE500 Course

Major			PQ1				Total
			1.00	2.00	4.00	5.00	
Mathematics	Q1	1.00	0	1	0	8	9
		2.00	1	1	4	4	10
		3.00	0	0	0	3	3
	Total		1	2	4	15	22
Physics	Q1	1.00	0	1	1	3	5
		2.00	1	3	5	0	9
		3.00	0	1	0	0	1
		5.00	1	0	0	0	1
	Total		2	5	6	3	16
Biology	Q1	1.00	1	0	3	1	5
		2.00	0	6	3	0	9
		3.00	0	0	0	2	2
		4.00	1	0	1	0	2
	Total		2	6	7	3	18
Total	Q1	1.00	1	2	4	12	19
		2.00	2	10	12	4	28
		3.00	0	1	0	5	6
		4.00	1	0	1	0	2
		5.00	1	0	0	0	1
	Total		5	13	17	21	56

Scale: 1=Strongly Agree 2=Agree 3=Not Sure 4=Disagree 5=Strongly Disagree

Table 3 shows that the majority of the pre-service teachers (38/56; 67.9%) changed their responses from Strongly Agree and Agree (i.e. 1 and 2) to Disagree and Strongly Disagree (i.e. 4 and 5). Table 3 also reveals that the percentage of change for Mathematics major was the highest among the three groups with 86.4% (19/22), followed by Physics major (9/16;56.3%) and Biology major (10/18; 55.6%). It is also noted that a significant high percentage of students (16/56; 28.6 %) were positive with the statement before and after the course with a high percentage from Biology and Physics majors (i.e 7/18, 38.9% and 6/16, 37.5%) respectively. Mathematics majors had only 13.6% (or 3/22).

These students represented what research in the constructivist paradigm termed as the hard core in that they tenaciously held on to their misconception that the role of experiment was to confirm or prove scientific ideas. With the exception of Mathematics majors, it appears that Popper's idea using the mathematical logic of A=> B but B $\neq$>A; however, –B=> -A as part of the course content illustration appears to be too challenging for this group of pre-service teachers to internalize. This contradicted with what happened in the class, i.e. they appeared to understand when the following analogy, "Smart boys wear red shirts; but boys wearing red shirts are not necessarily the smart ones" was dealt with in the discussion with regard to a theory predicting a phenomena, but the phenomena that happens does not indicate that the theory is absolute right (i.e., proven or confirmed). The tenacity of the view that an experiment "confirms"an idea can be traced back to the rampant usage of the word "proven" in school science laboratory reports. Students had difficulty in differentiating the subtle meaning between phrases such as "seeking evidence to support scientific idea" with phrases that replace the word "support" with "verify/confirm/ or prove". Similarly, students had difficulty to fathom the subtle differences in meaning of other words or phrases such as "truth", "reflection of truth" and "indicator of truth". One has to admit that a good grasp of English is essential for a course such as NOS with its philosophical dimension. However, this demand on English language ability is an uphill challenge to many of the pre-service teachers. This is because many of them are rather weak in English as English is their second language. Table 3 further reveals that two pre-service teachers (3.6%) regressed from the scales of 4 and 5 (Disagree/ Strongly Disagree) to 1(Strongly Agree).

Statement 2: Scientists use their imagination only at the early stage of investigation.

Table 4 shows the responses of the pre-service science teachers for Statement 2 at the entrance and exit level for SCE 500 course.

Table 4: Pre-Service Teachers' Responses to Statement 2

Major		Entrance Mean	Exit mean	Gain
Mathematics	(n=22)	2.8	4.1	1.3
Physics	(n=16)	2.3	4.3	2.0
Biology	(n=18)	2.7	4.0	1.3
Overall	(n=56)	2.6	4.1	1.5

Scale: 1=Strongly Agree 2=Agree 3=Not Sure 4=Disagree 5=Strongly Disagree

Science is a blend of logic and imagination as thought and imagination are used in coming up with theories and creative insight is required to recognize the meaning of the unexpected in data analysis (AAAS, 1990). Hence, scientists use their imagination not only at the early stage of investigation but throughout the whole process of investigation. Table 4 shows the average score of the pre-service teachers in accordance to their respective major before and after the course, SCE 500 in response to Statement 2 "Scientists use their imagination only at the early stage of investigation". Table 4 reveals that the average scores were below 3 before the course. However, the average score was above 4 after the course. The results indicated that a vast majority of the pre-service teachers agreed with the statement before the course but after the course, their view changed to the correct conception that "Scientists use their imagination at all stages of investigation". Table 4 shows an overall gain of 1.5 in scale with Physics major leading with a gain of 2.0, followed by mathematics and biology majors with a gain of 1.3.

Table 5 shows three examples of explanations provided by three pre-service teachers (one from each major) who indicated a change in their view for Statement 2 (i.e., Agree/Strongly Agree before taking the course to Disagree/Strongly Disagree after taking the course). The explanations further substantiated the positive conceptual change from the misconception harbored before the course to the acquisition of the correct concept after the course by these pre-service science teachers. The correct concept is "Scientists use their imagination not only at the early stage of investigation but at all stages", such as during theory and hypothesis building, experimentation, and during data interpretation as ideas in science such as backholes, DNA, and chemical bonding are an abstract entity.

Table 5: Change of Views among Pre-service Teachers for Statement 2

	Change of views	
Major of pre-service students	**Before taking SCE 500 course**	**After taking SCE 500 course**
Biology	"Early imagination is needed to get ideas to investigate something. The end stage cannot use imagination but needs to be proven by a reason and proof".	"Use at the early stage to imagine and come out with a hypothesis; also use imagination at another stage to make people have "sense"(reason) and can imagine what they explain".
Mathematics	"Yes, because in the early stage of investigation, they only use their imagination before they do the experiments".	"Because the scientists always use their imagination when doing the investigation".
Physics	"I agree because scientists in the early stage lack devices for investigation, so they just use their critical thinking".	"Scientists use imagination at every stage of investigation".

A cross tabulation of individual responses for Statement 2 before (Q2) and after (PQ3) the pre-service teachers took the SCE 500 course was carried out to reveal in detail the changes in their responses towards Statement 2. Table 6 shows the result.

Table 6: Cross Tabulation of Responses to Statement 2 before and after SCE 500 Course

Major			PQ2			Total
			2.00	4.00	5.00	
Mathematics	Q2	**1.00**	0	2	1	3
		2.00	0	3	0	3
		3.00	2	5	6	13
		4.00	1	1	0	2
		5.00	0	0	1	1
	Total		3	11	8	22
Physics	Q2	**1.00**		1	3	4
		2.00		5	1	6
		3.00		3	1	4
		4.00		2	0	2
	Total			11	5	16
Biology	Q2	**1.00**	1	1	1	3
		2.00	0	6	1	7
		3.00	0	1	0	1
		4.00	1	4	2	7
	Total		2	12	4	18
Total	Q2	**1.00**	1	4	5	10
		2.00	0	14	2	16
		3.00	2	9	7	18
		4.00	2	7	2	11
		5.00	0	0	1	1
	Total		5	34	17	56

Scale: 1=Strongly Agree 2=Agree 3=Not Sure 4=Disagree 5=Strongly Disagree

Table 6 shows that the majority of the pre-service teachers (41/56; 73.2%) changed their responses from Strongly Agree, Agree, and Not Sure (i.e. 1, 2 and 3) to Disagree and Strongly Disagree (i.e., 4 and 5). Table 6 also reveals that the percentage of change for physics major was the highest among the three groups with 87.5% (14/16) followed by Mathematics (17/22;77.3%) and Biology major (10/18; 55.6%). Only a small percentage of the pre-service teachers (3/56; 5.4 %) were positive or not sure with the statement before and after the course. These three pre-service teachers were from Mathematics (2) and Biology (1). None was from Physics. These three represented what research in the constructivist paradigm termed as the hard core, i.e. that they tenaciously held on to their misconception pertaining to the role of imagination in the process of scientific investigation. It was revealed that a high percentage of the pre-service teachers indicated Not Sure (18/56; 32.1%), Strongly Agree or Agree (26/65; 46.4%) with Statement 2 before the course.

Those who stated Not Sure offered the following reasons: "Maybe depends on situations and condition","I am not sure, but I think it is no because the scientists need to imagine about the whole stage also to get the accurate result", and "I'm not sure about that, but for me when I was doing some experiments of science when I was in secondary school, I always used my imagination of what was going to happen after we conducted some experiments". It is interesting to note that in the third explanation, the pre-service teacher drew on her school science laboratory experience on the need for imagination.

Those who agreed with Statement 2 offered the following reasons: "Scientist(s) use their imagination at the early (stage) of investigation such as hypothesis", "Scientists use their imagination as the way to think before they start to investigate or study", "After the imagination, they will come up with the idea and prove it by experimenting or following other theory", and "Scientists always make hypothesis first before doing the investigation". From the explanations, it can be seen that to the pre-service teachers, ideas, hypothesis, and theory building involve imagination before carrying out an investigation.

Table 6 also reveals that before the course, 12 students (12/56; 21.4%) were not in favor of the statement and out of these students, 10 persistently disagreed. However, two apparently changed their view to "Agree". Investigation of these two students revealed that although these two students indicated "Agree" with the statement, "Scientists use their imagination only at the early stage of investigation", their explanations indicated otherwise. To illustrate, the students stated the following.

"Yes, because all the phenomena occur, will investigate by scientists. So scientists will use their imagination to explain the thing as long as it is logic" (Biology major)

"Yes, without imagination, how scientist could done an experiment" (Mathematics major).

The discussion of course content pertaining to the issues of underdermination and theory-laden observation may have led to the change in the pre-service teachers' conception, i.e. that imagination is needed not only in formulating theory/hypothesis but also in data interpretation in their observation report.

Statement 3: Hypothesis-experiment-conclusion is the scientific method used by all scientists.

Table 7 shows the responses of the pre-service science teachers for Statement 3 at the entrance and exit level for SCE 500 course.

Table 7: Pre-Service Teachers' Responses to Statement 3

Major	Entrance Mean	Exit Mean	Gain
Mathematics (n=22)	1.5	4.0	2.5
Physics (n=16)	1.8	2.4	0.6
Biology (n=18)	1.8	2.6	0.6
Overall (n=56)	1.7	3.1	1.4

Scale: 1=Strongly Agree 2=Agree 3=Not Sure 4=Disagree 5=Strongly Disagree

Although fundamentally, various scientific disciplines tend to rely on evidence, hypothesis, theory, logic, and imagination, there is no single universal step-by-step scientific method that all scientists follow. The mode of investigation is defined by the phenomena and the context it is being investigated. Hence, a variety of methods can be possibly used, such as historical, experimental, qualitative, and quantitative (AAAS, 1990). However, due to typical laboratory experiences that place great emphasis in writing laboratory reports in a particular form both at school and college levels, inevitably, students conceive that the scientific inquiry they experience is the only one. Hence, it is not surprising that Table 7 shows that the average score before SCE 500 course was low at 1.7 with Biology and Physics majors leading with a mean of 1.8, followed by Mathematics major with a mean of 1.5. However, after the course, improvement was very slight with an average gain of 1.4. The gain for mathematics major was high at 2.5, but the gains for Biology and Physics majors were minimal with 0.6 and 0.8 respectively. The vast difference may be that the mathematics majors were influenced by the project on misconception that they carried out pertaining to this notion.

Table 8 shows four examples of explanations provided by five pre-service teachers (two each from biology and chemistry majors and one from Physics major) who indicated a change in their view for Statement 3 (i.e., Agree/Strongly Agree before taking the course to Disagree/Strongly Disagree after taking the course). The explanations further substantiated the positive conceptual change from the misconceptions harbored before the course to the acquisition of the correct conceptions after the course by these pre-service science teachers, i.e. "Hypothesis-experiment-conclusion is the scientific method taught in school science; however, in reality, scientists from different disciplines may follow different methodology pathways depending on the area of study". For instance, geologists do on-site study and theoretical physicists make predictions based on their theoretical constructs. It is interesting to note that especially for the physics major, many who disagreed with Statement 3 after the course provided explanations that it was similar to the method used in schools (Table 8).

Table 8: Change of Views among Pre-service Teachers for Statement 3

	Change of Views	
Major of pre-service teachers	**Before taking SCE 500 course**	**After taking SCE 500 course**
Biology	"This scientific method is used by all scientists to explain something accurately and scientifically".	"It is not used by all scientists. Some might only observe the other experiment and make their explanation".
	"Many hypotheses are tested using this way as far as I am concerned".	Not necessary. Actually there in no scientific method. Scientific method that we always talk about is just a guideline. It is good to use this method though. For example, Issac Newton discovered gravity not through this scientific method".
Mathematics	"Because it is the most effective and systematic way when doing experiment".	"No, because there are other methods also used by scientists".
	"It can cover all data needed".	"There are many other ways can apply such as just to do observation to explain a phenomenon".
Physics	"I agree because hypothesis, experiment and conclusion are being used by scientists at the early stage".	"Hypothesis-experiment-conclusion is a scientific method used since we were in school till now".

A cross tabulation of individual responses to Statement 3 before (Q6) and after (PQ6) the course was carried out to reveal in detail the changes in the pre-service teachers' responses towards Statement 3. Table 9 shows the results.

Table 9: Cross Tabulation of Responses to Statement 3 before and after SCE500 Course

Major			PQ6					Total
			1.00	2.00	3.00	4.00	5.00	
Mathematics	Q6	1.00	1		2	4	5	12
		2.00	1		0	5	3	9
		3.00	0		0	0	1	1
	Total		2		2	9	9	22
Physics	Q6	1.00	2	4		1	0	7
		2.00	1	4		1	1	7
		3.00	0	0		0	1	1
		5.00	1	0		0	0	1
	Total		4	8		2	2	16
Biology	Q6	1.00	2	1		3		6
		2.00	1	7		1		9
		3.00	0	0		3		3
	Total		3	8		7		18
Total	Q6	1.00	5	5	2	8	5	25
		2.00	3	11	0	7	4	25
		3.00	0	0	0	3	2	5
		5.00	1	0	0	0	0	1
	Total		9	16	2	18	11	56

Scale: 1=Strongly Agree 2=Agree 3=Not Sure 4=Disagree 5=Strongly Disagree

Table 9 shows that only slightly more than half of the pre-service teachers (29/56; 51.8%) changed in their responses from Strongly Agree, Agree, and Not Sure (i.e. 1,2 and 3) to Disagree and Strongly Disagree (i.e. 4 and 5). Table 9 also reveals that the percentage of change for Mathematics major was the highest (18/22; 81.8%), followed by Biology (7/18, 38.9%) and Physics (4/16, 25.0%). The percentage of change for Mathematics major which far exceeded that of Biology and Physics majors may be the effect of the variation in the misconception project that the mathematics major had taken with an emphasis in this aspect of NOS. The majority of the Biology (11/18, 61.1) and Physics (11/16, 68.8%) majors retained their entrance misconception even after the course; or else, only about 9% of the mathematics major (2/22) did so. Below are examples of the explanations offered by this group of pre-service teachers.

Before SCE 500 course: "Hypothesis is just the first deduction of scientists. When the result is found, the conclusion is made".

After SCE 500 course: "Before doing the experiment, scientists will normally construct the hypothesis, which is the early prediction based on the existing theory".

It looks like the notion of the scientific method that the pre-service teachers experienced in science at school and at college was rather tenacious. This could be due to the fact that experience is more convincing than words.

CONCLUSION

The study reveals that before SCE 500 course, misconceptions pertaining to the three aspects of scientific investigation from the perspective of nature of science were high among the pre-service science teachers. However, after the course, most of the pre-service teachers' misconceptions were reduced significantly. The pre-service teachers responded positively to the innovation in the classroom instruction as can be seen from their feedback. To conclude, the following are samples of the feedback:

"Learning the Nature of Science was very interesting to me. It brought a whole new experience.... If science is the truth, then why sometimes there are still questions to ask. Is the truth itself not perfect? If science is the truth, why it is sometimes against my religious belief? All the answers, I discover them in this subject… now I am able to see science in a new different view.'' (Biology major)

"The lecturer has also shown us the picture that indicates a woman's face. This picture actually was a combination of a flower and a butterfly and not a woman's face. Through this image, one can come out with many theories to describe and explain the natural world... The lecturer also showed us the bar magnet. When he sprinkled iron over the bar magnet, the pattern of magnetic line was formed. It was so amazing and this pattern of lines formed due to different poles which attract and similar poles which repel each other. Other tangible products were shown to us in explaining the nature of science related to our study to better our understanding. From what we have learned, nature and process of science change over time when new observations are tested. So science is not always true which is called "the tentative nature of science." (Mathematics major)

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APPENDIX

Conception of Nature of Science Inventory

Name: Gender: Male Female

Please indicate with a tick (√) to what extent do you agree with these statements using the following: 1. Strongly agree 2. Agree 3. Not sure 4. Disagree 5. Strongly disagree

Please provide a brief explanation for the choice you have made.

		1	2	3	4	5
1	Experiments in science confirm scientific ideas. Explanation:					
2	Scientists use their imagination only at the early stage of investigation. Explanation:					
3	Science provides explanations with fact and proof. Explanation:					
4	Whatever content in science text is fact with certainty. Explanation:					
5	Theory becomes law with sufficient evidence. Explanation:					
6	Hypothesis-experiment-conclusion is the scientific method used by all scientists. Explanation:					
7	The same piece of evidence or data cannot be subjected to multiple interpretations. Explanation:					
8	Scientists are people with behaviour which is not normal as portrayed in most movies. Explanation:					

ENHANCING LEADERSHIP PRACTICES: AN OUTDOOR EDUCATION PERSPECTIVE

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ABSTRACT

Leadership skill is required to influence major decisions and the experience gained from a leadership role will be valuable for a lifetime. In many colleges and higher learning institutions, a college leader is thrown into a learning environment that encourages hands-on experience. This study aims to examine an outdoor education program as one of the useful tools that higher education could use to identify students' leadership practices. It is done by comparing students who participated in outdoor education program and those who did not participate. Using the convenience sampling technique, a total of 106 students from the Faculty of Sport Science and Recreation UiTM were selected for this study. Data was collected through the Students Leadership Practices Inventory questionnaire used to measure three leadership practices: 'Model the Way', 'Inspire a Shared Vision' and 'Challenge the Process'. Independent sample t-test was used in order to identify the significant difference of the three leadership practices between the two groups of students. The results showed that there were significant differences in all three leadership practices of the students who participated in outdoor education program. Thus, this study proposed that outdoor education program is one of the effective activities to develop experiential learning that could be offered to all students of higher education to equip them with leadership skills required for future employability.

Keywords: *Leadership practices, Outdoor education, Model the Way, Inspire a Shared Vision, Challenge the process.*

INTRODUCTION

Education in Malaysia is an ongoing effort towards developing potential individuals in a holistic and integrated manner. One important aspect in producing rounded individuals is acquiring good soft skills. Soft skills include aspects that involve cognitive elements associated with non-academic skills such as positive values, teamwork, lifelong learning, leadership skills and communication skills. All of these skills are necessary for students when they enter the workplace world (Sherman, 2008; Vance, 2007; Yulpisman, 2006). Among these skills, student leadership is arguably one of the most beneficial extracurricular activities a person can perform while in college. In line with this, in order to remain competitive, many higher education institutions are concerned to educate and equip their students with leadership skills (Langbein, 2009; McNaboe, 2011).

Leadership skill can be learned and taught in an academic surrounding and this situation has enhanced the leadership education program in education systems especially in higher education institutions. So, the purpose of this study was to examine the efficacy of outdoor education programs in developing significant leadership skills. It sought to identify the perceived level of leadership practices of university students who participated in an outdoor education program and those who did not participate as well as to examine the differences of perceived leadership practices between the two groups. Kouzes and Posner's (2002) Student Leadership Practices Inventory was used to determine the leadership practices of university students by focusing on three Leadership Practices namely: "Model the Way", "Inspire a Shared Vision", and 'Challenge the Process".

The following hypotheses were examined in relation to three aspects of leadership practices:

H1. Students who participated in an outdoor education program perceived themselves to engage more frequently in the leadership practices of "Model the Way" than those who did not participate.
H2. Students who participated in an outdoor education program perceived themselves to engage more frequently in the leadership practices of "Inspire a Shared Vision" than those who did not participate.

H3. Students who participated in an outdoor education program perceived themselves to engage more frequently in the leadership practices of "Challenge the Process" than those who did not participate.

The following leadership practices are the basis used to gather information about the students' perceptions of leadership behaviors (generally from the involvement in outdoor activities). They are:

1. Model the Way – sets a standard of excellence in a responsible manner.
2. Inspire a Shared Vision – engages others and reaches a win-win situation as a desired outcome.
3. Challenge the Process – takes risk, and searches for opportunities to change, grow and improve.

LITERATURE REVIEW

Previous studies have shown the importance of clear objectives and vision, together with effective communication in outdoor programs. A clear vision is an important element for a group or an organization to drive it to accomplish its mission. In a group, the leader needs to have an aspiration of what they want to achieve and accomplish for the future. According to Kouzes and Posner (2002), "Inspire a Shared Vision" is one of the important leadership practices. In order to be a leader, an individual needs to have a vision for his or her group or organization. This is important in order to motivate others in the group or organization to perform well in their work by understanding and having a clear picture of the purpose of the work or activity they are doing. A leader needs to give an explanation and understanding of the work or activities that a group or organization is doing by developing its own vision. The leader needs to clearly deliver the vision to the group or organization. Effective communication is necessary in order to make sure the vision would bring a positive outcome to the group or organization (Zaid, 2011).

During an outdoor education program, the educator or instructor sets goals and mission for students to achieve at the end of the activities. Thus, to ensure the activities and the program are successful, each person in the group needs to have the same understanding and share the vision of the team

(Lund, 2013). Generally, students who participate in any extra activities and programs outside the formal classroom experience a situation where they need to envision the future and communicate the vision to the group members or organization to ensure the goals of their activities and programs are achievable (Lund, 2013).

In an outdoor education program, students always seek and create new ideas and approaches to face challenges in every activity conducted (Ledermann, 2013; Shooter, 2008). This condition gives an opportunity for them to develop one of the leadership practices namely, "Challenge the process" (Kouzes & Posner, 2003; Abu-Tineh, Khasawneh & Omary, 2009). In this situation, leaders show their ability to challenge the current process and change it with their new ideas.

"Model the Way" leadership practices focus on the personal credibility of the leader. An individual who engages in "Model the Way" leadership practice is a leader who has his or her own voice and sets an example for others in order to achieve the goals of a group. A leader must be a person whom others can believe and share similar values with. In order to make others believe and trust a leader, credibility is an important quality for the leader (Kouzes & Posner, 2003; Matthews, 2010; Ramirez, 2002).

From previous studies, scholars identified that students' involvement in higher education gives an impact toward students learning and development (Astin, 1993; Pascarella & Terenzini, 2005; Nicoli, 2011). University students perceive that they can develop leadership skill through engagement in activities and programs during their study in higher education. Through their involvement in activities, students have a chance and opportunities to learn, observe and practice leadership skills (Anderson, 2012; Astin, 1993). In view of this, Astin's Students Involvement Theory is relevant in order to describe the process of student leadership development. Astin (1984) formulated the theory of student involvement and later, linked the development of leadership to the involvement of students (Astin, 1993).

Thus, this implies that involvement and participation in outside-of-formal-classroom activities and programs help students to engage in situations where they need to be visionary leaders and communicate the vision to others to make sure the goals and targets of the group are achievable. In this study, the outdoor education program is an activity where students need to have a vision and share it with others so they can achieve the target and goals of the program.

METHODOLOGY

This study is a quantitative research which used questionnaire to collect data. The "Student Leadership Practices Inventory" by Kouzes and Posner (2002) was used to gather the data on leadership practices of the students. They needed to indicate the frequency of their behaviors and actions based on a Likert Scale ranging from 1- Rarely, 2- Once a While, 3- Sometimes, 4- Often and 5- Very Frequently. The target population of this study was students from the Faculty of Sport Science and Recreation, University Teknologi Mara (UiTM). There were two groups of semester four students participating in this study: Minor 1 and Minor 2 students. The Minor 1 group consisted of students who participated in an outdoor education program while the Minor 2 group consisted of students who did not participate in an outdoor education program. These two groups of students were from UiTM Seremban, Negeri Sembilan campus and UiTM Arau, Perlis campus. The whole population of 106 students was used in this study. The distribution of the respondents is shown in Table 1.

Table 1: The Distribution of Respondents

Campus	Participated in outdoor education program	Did not participate in outdoor education program	Total
Seremban	23	19	42
Arau	35	29	64
Total	58	48	106

RESULTS AND DISCUSSION

Table 2 presented that the respondents who participated in an outdoor education program perceived a moderate mean score (3.1 – 4.0) for every item in "Model the Way" leadership practices. The items, "I build consensus on an agreed on set of values for our organization" and "I talk about the values and principles that guide my actions" (M = 3.95) showed the highest mean score. The item, “I set a personal example of what I expect from other people” had the lowest mean score in “Model the Way” leadership practice (M = 3.59).

Table 2: “Model the Way” Leadership Practices Perceived by Students who Participated in an Outdoor Education Program

	N	Min	Max	Mean	Std. Deviation
I set a personal example of what I expect from other people.	58	3	5	3.59	.650
I spend time and energy to make sure people in our organization adhere to the principles and standards we have agreed on.	58	3	5	3.76	.657
I follow through on the promises and commitments I make in this organization.	58	3	5	3.72	.615
I find ways to get feedback about how my actions affect other people’s performance.	58	3	5	3.91	.601
I build consensus on an agreed-on set of values for our organization.	58	3	5	3.95	.575
I talk about the values and principles that guide my actions.	58	3	5	3.95	.605

Scale : 1= Rarely, etc 2= Once a While, 3= Sometimes, 4= Often and 5= Very Frequently

Table 3 showed that the respondents who did not participate in an outdoor education program were less engaged in all six items in “Model the Way” leadership practices. However, the item, “I talk about the values and principles that guide my actions” (M = 2.79, SD= .582) had a slightly higher mean score compared to the other five items. The item, “I spend time and energy to make sure people in our organization adhere to the principles and standards we have agreed on” scored the lowest mean score (M = 2.56, SD= .769) for “Model the Way” leadership practices.

Table 3: "Model the Way" Leadership Practices Perceived by Students who did not Participate in an Outdoor Education Program

	N	Min	Max	Mean	Std. Deviation
I set a personal example of what I expect from other people.	48	1	3	2.60	.610
I spend time and energy to make sure people in our organization adhere to the principles and standards we have agreed on.	48	1	4	2.56	.769
I follow through on the promises and commitments I make in this organization.	48	1	4	2.73	.610
I find ways to get feedback about how my actions affect other people's performance.	48	1	4	2.67	.595
I build consensus on an agreed-on set of values for our organization.	48	1	4	2.60	.644
I talk about the values and principles that guide my actions.	48	1	4	2.79	.582

Scale : 1= Rarely, 2= Once a While, 3= Sometimes, 4= Often and 5= Very Frequently

The results in Table 4 showed the mean score for every item in "Inspire a Shared Vision" leadership practices for respondents who participated in an outdoor education program. The results showed the respondents scored high on the item "I am upbeat and positive when talking about what our organization aspires to accomplish" (M = 4.10, SD= .674), followed by the item "I look ahead and communicate about what I believe will affect us in the future" (M = 3.98, SD= .577), "I talk with others about sharing a vision of how much better the organization could be in the future" (M = 3.95, SD= .660), "I speak with conviction about the higher purpose and meaning of what we are doing" (M = 3.93, SD= .722) and "I describe to others in our organization what we should be capable of accomplishing" (M = 3.91, SD=.571). The lowest mean score was for the item, "I talk with others about how their own interests can be met by working toward a common goal" (M = 3.78, SD= .531).

Table 4: "Inspire a Shared Vision" Leadership Practices Perceived by Students who Participated in an Outdoor Education Program

	N	Min	Max	Mean	Std. Deviation
I look ahead and communicate about what I believe will affect us in the future.	58	3	5	3.98	.577
I describe to others in our organization what we should be capable of accomplishing.	58	3	5	3.91	.571
I talk with others about sharing a vision of how much better the organization could be in the future.	58	3	5	3.95	.660
I talk with others about how their own interests can be met by working toward a common goal.	58	3	5	3.78	.531
I am upbeat and positive when talking about what our organization aspires to accomplish.	58	3	5	4.10	.674
I speak with conviction about the higher purpose and meaning of what we are doing.	58	3	5	3.93	.722

Scale : 1= Rarely, 2= Once a While, 3= Sometimes, 4= Often and 5= Very Frequently

As presented in Table 5, the results showed that the respondents who did not participate in an outdoor education program perceived a moderate mean score for the item, "I am upbeat and positive when talking about what our organization aspires to accomplish" (M = 3.10, SD = .555) for "Inspire a Shared Vision" leadership practices. However, for the other five items in "Inspire a Shared Vision" leadership practices, the respondents scored low mean scores. These five items were "I speak with conviction about the higher purpose and meaning of what we are doing" (M = 2.81, SD=.673), "I talk with others about how their own interests can be met by working toward a common goal" (M = 2.73, SD= .644), "I look ahead and communicate about what I believe will affect us in the future" (M = 2.71, SD= ..617), "I talk with others about sharing a vision of how much better the organization could be in the future" (M = 2.67, SD=.595) and the lowest mean score was for the item, "I describe to others in our organization what we should be capable of accomplishing" (M = 2.48, SD= .772).

Table 5: "Inspire a Shared Vision" Leadership Practices Perceived by Students who did not Participate in an Outdoor Education Program

	N	Min	Max	Mean	Std. Deviation
I look ahead and communicate about what I believe will affect us in the future.	48	2	4	2.71	.617
I describe to others in our organization what we should be capable of accomplishing.	48	1	4	2.48	.772
I talk with others about sharing a vision of how much better the organization could be in the future.	48	1	4	2.67	.595
I talk with others about how their own interests can be met by working toward a common goal.	48	1	4	2.73	.644
I am upbeat and positive when talking about what our organization aspires to accomplish.	48	2	4	3.10	.555
I speak with conviction about the higher purpose and meaning of what we are doing.	48	1	4	2.81	.673

Scale : 1= Rarely, 2= Once a While, 3= Sometimes, 4= Often and 5= Very Frequently

As shown in Table 6, there were three items that scored high mean score for "Challenge the Process" leadership practices perceived by respondents who participated in an outdoor education program. The results showed that the items with the highest mean score were "I keep current on events and activities that might affect our organization" and "I make sure that we set goals and make specific plans for the projects we undertake" (M = 4.12) respectively. This was followed by the item, "I take initiative in experimenting with the ways we can do things in our organization" (M = 4.02, SD=.513). The lowest mean score was for the item, "I look for ways that others can try out new ideas and methods" (M = 3.78, SD= .650).

Table 6: "Challenge the Process' Leadership Practices Perceived by Students who Participated in an Outdoor Education Program

	N	Min	Max	Mean	Std. Deviation
I look around for ways to develop and challenge my skills and abilities.	58	3	5	3.98	.607
I look for ways that others can try out new ideas and methods.	58	3	5	3.78	.650
I keep current on events and activities that might affect our organization.	58	3	5	4.12	.595
When things do not go as we expected, I ask, 'What can we learn from this experience?	58	3	5	3.81	.712
I make sure that we set goals and make specific plans for the projects we undertake.	58	3	5	4.12	.595
I take initiative in experimenting with the ways we can do things in our organization.	58	3	5	4.02	.513

Scale : 1= Rarely, 2= Once a While, 3= Sometimes, 4= Often and 5= Very Frequently

The results in Table 7 presented the mean score of "Challenge the Process" leadership practices for respondents who did not participate in an outdoor education program. All six items in "Challenge the Process" indicated low mean score (less than 3.0). However, there were two items that scored slightly higher compared to the other four items in "Challenge the Process" leadership practices. The two items were "I make sure that we set goals and make specific plans for the projects we undertake" (M = 2.87, SD= .606) and "I take initiative in experimenting with the way we can do things in our organization" (M = 2.83, SD= .630). The lowest mean score was for the item "I look for ways that others can try out new ideas and methods" (M = 2.50, SD= .684).

Table 7: "Challenge the Process" Leadership Practices Perceived by Students who did not Participate in an Outdoor Education Program

	N	Min	Max	Mean	Std. Deviation
I look around for ways to develop and challenge my skills and abilities.	48	2	4	2.79	.504
I look for ways that others can try out new ideas and methods.	48	1	3	2.50	.684
I keep current on events and activities that might affect our organization.	48	1	4	2.67	.663
When things do not go as we expected, I ask, "What can we learn from this experience"?	48	1	4	2.67	.595
I make sure that we set goals and make specific plans for the projects we undertake.	48	1	4	2.87	.606
I take initiative in experimenting with the way we can do things in our organization.	48	1	4	2.83	.630

Scale : 1= Rarely, 2= Once a While, 3= Sometimes, 4= Often and 5= Very Frequently

H1a: Students who participated in an outdoor education program perceived they engaged more frequently in the leadership practices of "Model the Way" than those who did not participate.

The independent samples t-test was run to determine the difference in leadership practices of "Model the Way" of the respondents, i.e the university students. The results, t (106) = 14.479, p-value = .000 indicated that there was a significant difference in leadership practices of "Model the Way" between students who participated in an outdoor education program and those who did not participate (Table 8). The results indicated that the average score of leadership practices of "Model the Way" of university students who participated in an outdoor education program (M = 3.81, SD = .386) was significantly different from university students who did not participate (M = 2.66, SD = .433). Therefore, university students who participated in an outdoor education program were reported to engage more frequently in the leadership practices of "Model the Way" compared to those who did not participate. Therefore, this hypothesis is proven.

Table 8: Independent Sample t Test of "Model the Way" Leadership Practices

	Participated (Mean)	Did not Participate (Mean)	t test	p-value
Model the Way	3.81	2.66	14.479	.000

The findings of this study revealed that university students who participated in an outdoor education program were more frequently engaged in "Model the Way" leadership practices compared to those who did not participate. In line with the leadership practices, a personal quality that can be developed by the university students who participated in the outdoor education program is credibility to ensure he is trusted and followed (Matthews, 2010). They have clear values and principles that guide their behaviors and actions in order to achieve the mission and goal of the program.

Survival activity is one of the example of activities in the outdoor education program where the students had to build a shelter, prepare their own meal, and make a campfire and other task. These tasks required the students to trust each other and believe in the group members to complete the tasks given to them to make sure they achieve their goal with limited resources. Indirectly, this activity engaged the students more frequently with the leadership practices and at the same time, developed their leadership skills. Those students who did not participate in the outdoor education program might have less involvement in such activities that require cooperation and teamwork. This may result in less development of their credibility.

To develop university students with strong credibility, continuous participation in outdoor activities can be seen as an effort in the development of certain leadership traits for potential leaders. Many of the respondents who participated in the outdoor education program were first timers. This means that they only have one experience in getting involved in an outdoor education program. So, they are still developing their leadership skills. If they continue to participate in any outdoor activity more frequently, it is believed that they can develop potential credibility and at the same time, improve their leadership skills.

This finding implies that higher education institutions need to consider outdoor education program as one of the compulsory activities for university students. This is because participation and involvement in an outdoor education program may help university students to explore and discover the potentials that they have especially their leadership skills.

H2a: Students who participated in an outdoor education program perceived they engaged more frequently in the leadership practices of "Inspire a Shared Vision" compared to those who did not participate.

The independent samples t-test was run to determine the difference in leadership practices of "Inspire a Shared Vision" of the university students. The results, t (106) = 14.181, p-value = .000 (Table 9) indicated that there was a significant difference in the leadership practices of "Inspire a Shared Vision" between students who participated in the outdoor education program and those who did not participate. The results indicated that the average score of leadership practices of "Inspire a Shared Vision" of university students who participated in an outdoor education program (M = 3.93, SD = .407) was significantly different from university students who did not participate in an outdoor education program (M = 2.75, SD = .450). Therefore, university students who participated in the outdoor education program were reportedly engaged more frequently in the leadership practices of "Inspire a Shared Vision" compared to those who did not participate. Therefore this hypothesis is proven.

Table 9: Independent Sample t Test of "Inspire a Shared Vision" Leadership Practices

	Participated (Mean)	Did not Participate (Mean)	t test	p-value
Inspire a Shared Vision	3.93	2.75	14.181	.000

A clear vision is an important element for a group or an organization to drive it to accomplish its mission for success. During an outdoor education program, the instructor sets goals for students to achieve. In order to make sure the activities and program are successful, each person in the group needs to have the same understanding and shared a vision of the team (Lund, 2013). One of the activities that the students in this study did during an outdoor education program was kayaking. For example, the students were given the task to reach from check point A to check point B within three hours. They needed to communicate among their group members on how to achieve the goal without leaving any members behind. The students also had to communicate with their partner to give a clear picture of their mission to reach the check point within three hours even though they faced some challenges, for example, bad weather condition. Thus, clear understanding will make them more enthusiastic to accomplish the goal and target in any way (Zaid, 2011).

Generally, students who are involved in any other extra activities and programs outside the formal classroom experience a situation where they need to envision the future and communicate the vision among the group members or organization to ensure the goals of their activities and program are achievable (Lund, 2013). In this study, those who did not participate in an outdoor education were less engaged in situations where they needed to set goals and targets for a group.

Thus, this implies the involvement and participation in outside of formal classroom activities and programs help students to be engaged in situations where they need to be a visionary leader and communicate the vision to others to make sure the goals and targets of the group are successful and achievable. In this study, an outdoor education program is one of the activities that offer the situation where students need to have a vision and share it with others to make sure they achieve the targets and goals at the end of the program and activities.

H3a: Students who participated in an outdoor education program perceived they engaged more frequently in the leadership practices of "Challenge the Process" compared to those who did not participate.

The independent samples t-test was run to determine the difference in leadership practices of "Challenge the Process" of the university students. The results, t (106) = 15.769, p-value = .000 (Table 10) indicated that there was a significant difference in the leadership practices of "Challenge the Process" between students who participated in an outdoor education program and those who did not participate. The results indicated that the average score of leadership practices of "Challenge the Process" of university students who participated in the outdoor education program (M = 3.71, SD = .407) was significantly different from university students who did not participate (M = 2.72, SD = .404). Therefore, university students who participated in the outdoor education program were reported to engage more frequently in the leadership practices of "Challenge the Process" compared to those who did not participate. Therefore, this hypothesis is proven.

Table 10: Independent Sample t Test of "Challenge the Process" Leadership Practices

	Participated (Mean)	Did not Participate (Mean)	t test	p-value
Challenge the Process	3.71	2.72	15.769	.000

Participation and involvement in outdoor education programs give opportunities for students to develop their critical thinking skills since they are exposed to various situations and conditions in an outdoor education environment. Students are always seeking and creating new ideas and approaches to face challenges in every activity conducted (Ledermann, 2013; Shooter, 2008) through outdoor experiential learning.

The findings of this study show university students who participated in an outdoor education program were frequently engaged in leadership practices compared to those who did not participate. This study shows that university students who participated in an outdoor education program always took the initiative in looking and searching for new ideas to develop their skills and abilities. Most outdoor education programs depend on the environment and the weather. There are always immediate or ad-hoc changes with an earlier planning because of bad weather condition, etc. Thus, this is where critical and fast decisions need to be made in order to accomplish the target even though it is not in the earlier plan.

Students must be brave enough to experiment and to seek new outcomes, take positive challenges and think out of box to complete tasks in different ways without ignoring safety precautions in order to prevent injuries. There will be failures or mistakes along the way to accomplish all the tasks given. Sometimes, they need to try more than once to solve a problem. This is the opportunity for them to learn and gain as much experience they can from their failures and mistakes. This leadership practice is called “Challenge the process” (Kouzes & Posner, 2003; Abu-Tineh, Khasawneh & Omary, 2009). This situation indirectly gives an opportunity for students develop their leadership skills. The involvement and participation in an outdoor education program provide an engagement of leadership practices; thus, making an outdoor education program a way to develop critical thinking skills through exploring and creating new ideas to accomplish the goals and objectives of the targetted activities.

CONCLUSION

The findings of this study revealed that university students who participated in an outdoor education program were more frequently engaged in all three leadership practices namely, “Model the Way”, “Inspire a Shared Vision” and “Challenge the Process”. On the other hand, university students who did not participate in an outdoor education program scored low in the three leadership practices. The lowest leadership practice engaged by students was “Model the Way” leadership practices. This result revealed that many of the activities conducted in the outdoor education program were teamwork activities which required participants to accomplish tasks together with their teammates.

For the inferential statistics of independent sample t-test, the results, t (106) = 17.562, p-value = .000 indicated that there was a significant difference in leadership practices between the students who participated in an outdoor education program and those who did not participate.

These findings are supported by the theory of Astin’s Student’s Involvement and Kolb’s Experiential Learning. Students develop their personalities and skills during their university experiences (Nicoli, 2011) and the involvement in activities in higher education give an impact on students’ learning and development (Astin, 1993; Pascarella & Terenzini, 2005). University students perceive that they develop the leadership skills through their engagement and experiences in activities and programs during their studies in higher education. Therefore, through the involvement and participation in outdoor education programs, students develop opportunities to learn, observe and practice leadership skills (Anderson, 2012; Astin, 1993).

Some recommendations from this study are as follow. Higher education institutions should create outdoor education programs not only for students, but also for university management staff and executives. Besides implementing outdoor education programs as part of the curriculum, more outdoor leadership programs can also be organized for university staff especially for top management executives to enhance their leadership skills. The program content can be improved from time to time following the needs of the universities.

Besides this, hiring qualified educators or lecturers who have qualifications in outdoor programs with wide experience and knowledge is very important. The qualified educators will make sure that the programs conducted by the university are effective to meet the required standards and to achieve the needs in developing students' leadership skills. Educators or lecturers who have a lot of experience in outdoor education programs can relate their knowledge and experiences rather than teach and concentrate on theories only in classrooms.

Moreover, higher education institutions can expand their effort by collaborating with the Recreation Department of the Ministry of Youth and Sports that engages field experts on outdoor education. Higher education institutions may cooperate with the Ministry to engage these experts. Besides that, the experts may become mentors to lecturers for education transformation programs.

Furthermore, the management of university needs to encourage more lecturers and educators to conduct more research on the effectiveness of outdoor education programs in the development of leadership skills. By conducting more studies, understanding of the relationship between outdoor education programs and students' leadership skills will be more in-depth.

Students should also be encouraged to participate in outdoor education or recreation clubs and associations outside the class so they can meet and work with different people from different backgrounds in various situations, which help to develop maturity and leadership skills.

To conclude, this study is hoped to be a potential reference to provide better understanding especially among educators and university administrators on the significant roles and practices of outdoor education programs in the development of university students' leadership skills and practices.

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