EXPLORING TEACHERS’ EXPERIENCES ON INTEGRATION OF HIGHER ORDER THINKING SKILLS (HOTS) IN TEACHING OF SCIENCE

Adawati Binti Hj. Subaili

13038109

Master of Science
(Learning Sciences)
2014
Statement of Originality

The work described in this Final Year Project, entitled “EXPLORING TEACHERS’ EXPERIENCES ON INTEGRATION OF HIGHER ORDER THINKING SKILLS (HOTS) IN TEACHING OF SCIENCE” is to the best of the author’s knowledge that of the author except where due reference is made.

_________________  ___________________
(Date Submitted)    (Student’s signature)

ADAWATI BINTI HJ. SUHAILI
13030109
ACKNOWLEDGMENT

I would like to take this opportunity to convey my sincere appreciation to the valuable contribution of several individuals in making this research report a success. I would not have accomplished this project without their precious contribution of time and effort.

First and foremost, I would like to express my thankful to Allah S.W.T for blessing me throughout the completion of this research project. I am sincerely grateful for the abundant love received.

From the deepest of my heart, I wish to extend my profound gratitude to my mentor and supervisor, Associate Professor Dr. Norsiah Fauzan for her continuous guidance, wonderful suggestion, constructive advices, wise opinions, endless support, understanding, and encouragement that were provided to me in accomplishing this study. She was a cheerful person, optimistic, caring and helpful. I learned a great deal from her throughout of this course.

Besides that, I would like to express my deepest appreciation and gratitude to my coordinator, Mr Mohd Hafizan bin Hashim for his thoughtful and creative comments, constant guidance and skills taught in during my year of study. Without his assistance, I may not able to complete this study.

Meanwhile, I would like to extend a special thank you to my most beloved parents, Hj. Suhaili and Hajah Ara also my brothers and sisters, for giving me their constant support, undivided love, endless patience, encouragement and financially. Without them I would not have the strength and motivation to complete this study.

In addition, I would like to convey my heartiest appreciation to my beloved husband and daughter, Saifulbahri bt Hj. Abdul Rahman, Ayunni Fathiah and Aisyah Zakiah who have giving me a support and understanding. Thank you for the love and support.

Last but not least, I wish to express my gratitude SMK Siburan, Senior Assistant of Administrative and science teachers that had given the time and cooperation in this study also to all who participated in this research. Not to forget to thank to all the lecturers of Faculty Cognitive Science and Human Development in UNIMAS for giving me the support to conduct this study. Once again, thank you all very much.
TABLE OF CONTENTS

| Statement of Originality                       | i                  |
| Acknowledgement                                | ii                 |
| Table of Contents                              | iii                |
| List of Tables                                 | vii                |
| List of Figures                                | viii               |
| List of appendices                             | x                  |
| Abstract                                       | xi                 |
| Abstrak                                        | xii                |

CHAPTER ONE - INTRODUCTION

1.0 Introduction 1
1.1 Background of the study 4
1.2 Problem statement 8
1.3 Objectives of the study 10
1.4 Research questions 10
1.5 Significance of the study 11
1.6 Limitations of the study 12
1.7 Definition of terms 13
1.8 Summary 16

CHAPTER TWO - LITERATURE REVIEW

2.0 Introduction 17
2.1 Teachers’ perceptions and past studies related to teachers’ perceptions 18
2.2 Definition of higher order thinking skills (HOTS) 21
  2.2.1 Component of Higher Order Thinking Skills (HOTs) and the roles of HOTs 23
    2.2.1.1 “Top end” of Bloom’s Taxonomy 24
    2.2.1.2 Critical thinking skill 24
    2.2.1.3 Creative thinking skill 28
    2.2.1.4 Metacognition 30
    2.2.1.5 Problem solving skill 31
    2.2.1.6 Deep learning 32
  2.2.2 Thinking skills in national science curriculum 33
2.3 Past studies related to the used of higher order thinking skills (HOTs) for learning 37
  2.3.1 Past studies related to higher order thinking skill in teaching of science 41
2.4 The problems of teaching and learning science related with integration of higher order thinking skills (HOTs) and recommendation solutions 46
2.4.1 The problems of teaching and learning science related with integration of HOTs
  2.4.1.1 Adaptability
  2.4.1.2 Complex communication skills
  2.4.1.3 Non-routine problem solving skills
  2.4.1.4 Self-management/Self-development
  2.4.1.5 System thinking
  2.4.1.6 Time constraint
  2.4.1.7 Science curriculum syllabus

2.4.2 Recommendation solutions for science educator
  2.4.2.1 Creating adaptive motivational context in science classroom
  2.4.2.2 Develop requisite knowledge, skills and dispositions
  2.4.2.3 Classroom social environment
  2.4.2.4 Use assessment that focused on higher order learning
  2.4.2.5 Professional development for science teachers

2.5 Potential factors that needs for developing higher order thinking skills (HOTs)
  2.5.1 Teaching strategies
  2.5.2 Student-centred environment
    2.5.2.1 Learners’ engagement
    2.5.2.2 Learners’ empowerment
    2.5.2.3 Collaborative
    2.5.2.4 Teachers’ role
    2.5.2.5 Higher order thinking skills (HOTs)
    2.5.2.6 Approaches/Methodology/Strategy
    2.5.2.7 Assessment
  2.5.3 Instructional communication
  2.5.4 Scaffolding
  2.5.5 Learning and thinking strategies
  2.5.6 Questioning strategies
  2.5.7 Feedback
  2.5.8 Team activities
  2.5.9 Computer mediation

2.6 Barriers to critical thinking
2.7 Conclusion

CHAPTER 3 - RESEARCH METHODOLOGY

3.0 Introduction
3.1 Research design
3.2 Location, population, sample and sampling procedure of the study
  3.2.1 Location
  3.2.2 Population
3.2.3 Sample
3.2.4 Sampling procedure
3.3 Research instruments
3.3.1 Open-ended survey questionnaires
3.3.1.1 Section 1 of open-ended survey questionnaires
3.3.1.2 Section 2 of open-ended survey questionnaires
3.3.1.3 Section 3 of open-ended survey questionnaires
3.3.1.4 Section 4 of open-ended survey questionnaires
3.3.1.5 Section 5 of open-ended survey questionnaires
3.3.1.6 Relationship between questions in each section with research questions (RQ)
3.3.2 Semi-structured interview
3.4 Pilot study
3.5 Data collection procedures
3.6 Data analysis procedures
3.7 Summary

CHAPTER 4 - RESEARCH FINDINGS

4.0 Introduction
4.1 Content Analysis of Open-Ended Questionnaires and Semi-structured Interview
4.1.1 Description of the sample of open-ended questionnaires
4.1.1.1 Gender
4.1.1.2 Age
4.1.1.3 Marital status
4.1.1.4 Ethnicity
4.1.1.5 Education level
4.1.1.6 Years of teaching experience
4.1.1.7 Teaching level
4.1.1.8 Periods of teaching
4.1.2 Description of the sample of semi-structured interviews
4.2 Thematic analysis
4.2.1 Results of RQ 1. What are teachers’ perception of higher order thinking skills?
4.2.2 Results of RQ 2. What are teachers’ perceptions of the role they have to play when implementing higher order thinking skills (HOTs) in their lessons?
4.2.3 Results of RQ 3. What are teachers’ experience(s) of students’ ability to think on higher level in teaching of science?
4.2.4 RQ 4. What are problems on integrating of higher order thinking skills (HOTs) in teaching of science?
4.2.5 Result of RQ 5. What are teachers’ solutions on integrating of higher order thinking skills (HOTs) in teaching of science?
4.2.6 Results of Teachers’ willingness to implement higher order
thinking skills (HOTs) in teaching of science (TW)

4.3 Relational analysis

4.3.1 The relationship between teachers years of teaching experiences with teachers’ perceptions of higher order thinking skills (HOTs)

4.3.2 Relationship between teachers’ perception of the role they have to play when implementing higher order thinking skills in their lesson with years of teaching experiences

4.3.3 Relationship between teachers’ experiences of students’ ability to think on higher level in teaching of science with years of teaching experiences

4.3.4 Relationship between teachers’ perception of the role they have to play when implementing higher order thinking skills (HOTs) in their lesson with teaching level

4.3.5 Relationship between teachers’ experiences of students’ ability to think on higher level in teaching of science with students academic achievement

4.3.6 Relationship between time constraint with science curriculum syllabus

CHAPTER 5 - DISCUSSIONS AND CONCLUSIONS

5.0 Introduction

5.1 Summary of the finding and discussion

5.2 Conclusion

5.3 Limitation of the result

5.4 Suggestion for the future research

5.5 Closure

REFERENCES

APPENDICES
### LIST OF TABLE

Table 2.1  Development of Higher Order Thinking Skill (HOTS)

Table 2.2  Cognitive Process Dimension

Table 2.3  The summary of the past studies related to teachers’ experiences on integration of higher order thinking skill in teaching of science at school level in Malaysian context

Table 2.4  The instrument for collecting data

Table 2.5  Summary of contents in open-ended questionnaires

Table 3.1  The instruments for collecting data

Table 3.2  Summary of the alteration of the questions in the questionnaires survey to suite the need of present study

Table 4.1  Gender of the informants

Table 4.2  Age of the informants

Table 4.3  Marital status of the informants

Table 4.4  Ethnicity of the informants

Table 4.5  Education level of the informants

Table 4.6  Years of teaching experience of the informants

Table 4.7  Teaching level

Table 4.8  Periods of teaching in a week

Table 4.9  Summary of demographic data of the semi-structured interviews sample
LIST OF FIGURE

Figure 2.1 Thinking Skills and Thinking Strategies Model in Science

Figure 2.2 Old version and New Version of Bloom’s Taxonomy

Figure 2.3 Student-centred Learning (SCL) framework

Figure 3.1 Research Design Framework

Figure 3.3 Summary of Location, Population, Sample and Sampling Procedure

Figure 3.4 Summary of The Sample

Figure 3.5 Summary of relationship between research questions (RQ) with the questionnaires in each section

Figure 3.6 Summary of data analysis procedure

Figure 3.7 Coding categories

Figure 4.1 Framework of nine categories were used to explore teachers experiences on integration of higher order thinking skills (HOTs) in teaching of science

Figure 4.2 Summary of thematic analysis for RQ 1. What are teachers’ perception of higher order thinking skills?

Figure 4.3 Summary of the thematic analysis of RQ 2. What are teachers’ perceptions of the role they have to play when implementing higher order thinking skills (HOTs) in their lessons?

Figure 4.4 Summary of the results of RQ 3. What are teachers’ experience(s) of students’ ability to think on higher level in teaching of science?

Figure 4.5 Summary of results for RQ 4. What are teachers’ problems on integrating of higher order thinking skills (HOTs) in teaching of science?

Figure 4.6 Summary of results of RQ 5. What are teachers’ solutions on integrating of higher order thinking skills (HOTs) in teaching of science?
Figure 4.7  Summary of teachers’ willingness to implement higher order thinking skills in teaching science (TW)

Figure 4.8  Summary of the finding
# LIST OF APPENDICES

<table>
<thead>
<tr>
<th>Appendix 1</th>
<th>Approval letter from Ministry of Education (EPRD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix 2</td>
<td>Approval letter from State Education Department of Sarawak (JPN)</td>
</tr>
<tr>
<td>Appendix 3</td>
<td>Audio-tape release form</td>
</tr>
<tr>
<td>Appendix 4</td>
<td>Coding and content analysis</td>
</tr>
<tr>
<td>Appendix 5</td>
<td>Data analysis procedure</td>
</tr>
<tr>
<td>Appendix 6</td>
<td>Data collection procedure</td>
</tr>
<tr>
<td>Appendix 7</td>
<td>Field note</td>
</tr>
<tr>
<td>Appendix 8</td>
<td>Figure 4.8: Summary of the results</td>
</tr>
<tr>
<td>Appendix 9</td>
<td>Interview transcripts</td>
</tr>
<tr>
<td>Appendix 10</td>
<td>Open-ended survey questionnaires</td>
</tr>
</tbody>
</table>
ABSTRACT

Exploring teachers’ experiences on integration of higher order thinking skills (HOTs) in teaching of science

Adawati binti Hj Suhaili

In today's era of rapid information, thinking skills is seen as a very important component skills to face global competition in the world. In recent years, the application and construction of higher order thinking skills are very highly valued in teaching and learning. To develop higher order thinking skills, the Malaysian Ministry of Education has put in a lot of effort to help schools impart thinking skills to students, and to enable them to be lifelong learners. The purpose of this study is to explore teachers’ experiences on integration of higher order thinking skills (HOTs) in teaching of science. In addition, this study also aims to investigate the problems and solution on integration of higher order thinking skills in teaching of science in school classroom. The open-ended survey questionnaires and semi-structured interview was conducted to obtain the data from the science teachers that teaching science subject for primary and secondary school level via online medium by means facebook, email and educational portal in Malaysia and face to face meeting with science teachers for the selected school in Padawan Division, Sarawak. In order to explore teachers experiences on integration of HOTs this study will investigate teachers’ perception of HOTs, teachers’ perception of the role they have to play when implementing HOTs in their lesson, teachers’ experience of students’ ability to think on higher level in learning of science, problems and solutions on integration of HOTs in teaching of science. The result of the study, found that teachers perceive they are teaching HOTs to their students but the instructional strategies in teaching have to be improve to make sure the integration is effectively delivered. The findings suggest that science teachers need professional development purposely teaches for promoting HOTs, the profesional development process should changing teachers’ belief and practices in this field. The programs must structured in such a way that teachers will have better understanding of what HOTs is and would able to conceptualize HOTs in a more coherent way.
ABSTRAK

Meninjau pengalaman guru terhadap pengintegrasian kemahiran berfikir aras tinggi (KBAT) di dalam pengajaran sains

Adawati binti Hj Suhaili

Dalam era yang pesat dengan maklumat pada masa ini, kemahiran berfikir dilihat sebagai komponen kemahiran yang sangat penting untuk menghadapi persaingan di dalam dunia globalisasi. Dalam tahun-tahun kebelakangan ini, aplikasi dan pembinaan kemahiran berfikir aras tinggi adalah sangat sangat bernilai dalam pengajaran dan pembelajaran. Untuk membina kemahiran berfikir aras tinggi, Kementerian Pelajaran Malaysia telah menjalankan banyak usaha untuk membantu sekolah membangunkan kemahiran berfikir kepada para pelajar bagi membolehkan mereka mengamalkan pembelajaran sepanjang hayat. Tujuan kajian ini adalah untuk meninjau pengalaman guru terhadap pengintegrasian kemahiran berfikir aras tinggi (KBAT) di dalam pengajaran sains. Di samping itu, kajian ini juga bertujuan untuk mengenalpasti beberapa masalah dan penyelesaian terhadap pengintegrasian kemahiran berfikir aras tinggi di dalam pengajaran sains di sekolah. Kajian soal selidik terbuka dan temubual separa berstruktur telah dijalankan untuk mendapatkan maklumat daripada para guru sains yang mengajar mata pelajaran sains bagi peringkat sekolah rendah dan menengah menggunakan medium di dalam talian melalui facebook, e-mail dan portal pendidikan di Malaysia dan juga secara bersemuka dengan para guru sains untuk sekolah yang dipilih di Bahagian Padawan, Sarawak. Untuk meninjau pengalaman para guru terhadap pengintegrasian KBAT, kajian ini akan mengenalpasti persepsi guru terhadap KBAT, persepsi guru terhadap peranan yang mereka perlu mainkan apabila melaksanakan KBAT di dalam pengajaran mereka, pengalaman guru terhadap keupayaan pelajar untuk berfikir pada aras tinggi dalam pembelajaran sains, masalah dan penyelesaian kepada pengintegrasian KBAT di dalam pengajaran sains. Hasil kajian, mendapati bahawa guru menganggap mereka mengajar KBAT kepada para pelajar mereka tetapi strategi pengajaran yang digunakan perlu ditingkatkan bagi memastikan pengintegrasian dapat dilaksanakan dengan lebih berkesan. Hasil kajian menunjukkan bahawa para guru sains memerlukan pembangunan profesional yang bertujuan untuk mempromosi KBAT, proses pembangunan profesional perlu merubah kepercayaan dan amalan guru di dalam bidang ini. Bentuk program yang dilaksanakan mestilah dalam cara yang sebenarnya guru akan memahami KBAT dan mereka dapat melaksanakan konsep KBAT dengan lebih baik.
CHAPTER 1

INTRODUCTION

1.0 Introduction

In today's era of rapid information, thinking skills is seen as a very important component skills to face global competition in the world. In recent years, the application and construction of high-order thinking skills are very highly valued in teaching and learning. A number of influential psychologists and educationists supported the importance of developing thinking skill in learning (Jarvis, 2005, p. 96). For example,

“The advent of Information Age has made the development of problem solving, critical thinking and higher order thinking skills crucial to future success.”

In addition, Gaugh (1991) state that:

“Perhaps most importantly in today’s information age, thinking skills are viewed as crucial for educated persons to cope with a rapidly changing world. Many educators believe that specific knowledge will not be as important to tomorrow’s workers and citizens as the ability to learn and make sense of new information” (Gaugh, 1991 cited in Fischer, Bol, Pribesh, 2011, p. 5).

Other psychologist such as Piaget (1970) and Vygotsky stated that children are active agent of learning as they construct their own understanding of the world (cited in Jarvis, 2005, p. 96). According to Jarvis (2005) the role of teacher is to facilitate learning situations so the children can find things out for themselves. Through this active process, children can construct their understanding and consequently develop higher order thinking skills.

Benjamin Bloom first highlighted critical thinking through his taxonomy a few decades ago (Duron, Limbach, & Waugh, 2006; Lauer, 2005) critical thinking is perceived as a higher level of cognitive ability. According to Sternberg and Williams (2002), critical thinking need not be taught to students because critical thinking is a natural process which is carried by everyone. However, Duron, Limbach and Waugh (2006) argued that thinking is a natural process, on its own it can often be biased, distorted, partial, uninformed and potentially prejudiced. Therefore, excellence in thought must be cultivated. A study by Black (2005) also found that if students were thought how to think, they might be able to improve their thinking. Moreover, Nickerson (1994) stated that it is essential for student to be taught on how to think more effectively, which is more critically, coherently, and creatively. Teachers could teach the terms and strategies used in critical thinking and provide students with the criteria for judging information (Black, 2005).
Here, it can be concluded that although critical thinking is a natural ability, it is imperative that teachers guide them in order to refine their skills.

The Ministry of Education has put in a lot of effort to develop higher order thinking skills. For example, the joint venture between the Ministry and the Agensi Inovasi Malaysia (AIM) in developing the i-THINK programme to help schools impart thinking skills to students, and to enable them to be lifelong learners. This project aims to produce workers who would be able to solve complex problems and be innovative and creative. In this project, teachers and students will use the eight thinking tools - in implementing higher-order thinking skills in teaching and learning. Friday July 13, 2012, The Star Online reported, Malaysian Prime Minister Datuk Seri Najib Abdul Razak at the launching of the Premier Rally Excellent Teachers 2012 in Putrajaya, stressed the importance of higher-order thinking skills among students. Quoting his words that:

“Rapid progress in technology has created jobs that did not even exist 20 years before. This trend will become more prevalent in years to come. The question is, how do we prepare them to take on jobs that don't exist yet? The answer is, we can't because we don't know what will come in the future. What we can do is prepare them with higher order skills, with the ability to not only think at a deeper level but also creatively” (The Star Online, 2012).

On this occasion, instructors especially teachers, are urged to educate students to be competent in thinking at a higher level to meet the human capital needs in the future. Teachers should also take up the challenge to equip students with the knowledge to meet the career or
human capital demand will exist in 10 or 15 years later. Hence, this studied aims to explore teachers experiences on integration of higher order thinking skills in teaching of science. It aims to investigate the potential factors that needs for developing higher order thinking skills for better learning in school. In order to explore about the experiences of the teachers, this studied also aims to investigate the problems and solution on integration of higher order thinking skills in teaching of science in school classroom.

1.1 Background of the study

A fundamental objective of any education system is to ensure that its students are being equipped with the knowledge and skills required for success in life. Historically, the Malaysian education system, like others around the world, has emphasis the development of strong content knowledge in subjects such as science, mathematics, and language. There is, however, increasing global recognition that it is no longer enough for a student to leave school with the 3 Rs (Reading, Writing & Arithmetic). The emphasis is no longer just on the importance of knowledge, but also on developing higher-order thinking skills.

Even since independence, Malaysia has been using exam oriented system. Therefore, in order to analyze students normatively and formatively based on their attitudes and ability to understand the topic and also hand on activity, the Minister of Education, Tan Sri Muhyiddin Yassin said that it was important to change the curriculum from being exam oriented. Under the National Key Area Result (NKRA) for education, the new curriculum was launched in 2010 after the announcement and introduction of this new curriculum in 2009 by the sixth Prime
Minister of Malaysia, Dato’ Seri Najib Bin Tun Abdul Razak. The aims of the new curriculum are to close the gap between students in the city and the students in the village. This new curriculum was introduced to reduce the focus on exams in school and encourage students to think, know, understand and act like what they have learn from the new curriculum’s modules. It is also to let students to think critically (Amalina & Nik, 2012).

While Malaysian student performance has improved over several decades, those remarkable gains may be at risk in both relative and absolute terms. Firstly, other systems are improving student performance more rapidly, and have found ways to sustain that momentum. The gap between Malaysia’s system and these others is therefore growing. Secondly, international assessments suggest that Malaysian student performance is declining in absolute terms.

Over the past two decades, international student assessments, such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS), have emerged as means of directly comparing the quality of educational outcomes across different systems. These assess a variety of cognitive skills such as application and reasoning.

When Malaysia first participated in TIMSS in 1999, its average student score was higher than the international average in both Mathematics and Science. By 2007, the last published cycle of results, the system’s performance had slipped to below the international average in both Mathematics and Science with a commensurate drop in ranking. Critically, 18% and 20% of
Malaysia’s students failed to meet the minimum proficiency levels in Mathematics and Science in 2007, a two to fourfold increase from 7% and 5% respectively in 2003. These students were identified as possessing only limited mastery of basic mathematical and scientific concepts.

The results from PISA 2009 (the first time Malaysia participated in this assessment) were also discouraging, with Malaysia ranking in the bottom third of 74 participating countries, below the international and OECD average (Exhibit 3). Almost 60% of the 15-year-old Malaysian students who participated in PISA failed to meet the minimum proficiency level in Mathematics, while 44% and 43% did not meet the minimum proficiency levels in Reading and Science respectively. A difference of 38 points on the PISA scale is equivalent to one year of schooling. A comparison of scores shows that 15-year-olds in Singapore, South Korea, Hong Kong, and Shanghai are performing as though they have had 3 or more years of schooling than 15-year-olds in Malaysia (as cited from Malaysia Ministry of Education. (2012), Malaysia Education Blueprint 2013-2025).

When Malaysia seems to be stuck in the bottom third of the countries surveyed in international assessments, and not making any upward move towards the upper tier of the top third of the countries (Look at Malaysian ranking in PISA Programme for the International students assessment 2011, 2012 ranked 52 and 53 out of the 65 countries for Mathematics and Science respectively). Hence, more research needs to be done to find out the best method to improve the student performance.
Among the efforts taken by the Ministry of Education is to identify factors that contribute to the achievement of Malaysia. There are three main factors which contributed to Malaysia's performance in TIMSS and PISA. There are the attitude of the students, the format of questions and teacher preference.

The first factor is the students' attitude. Many of the students answered this PISA test are not seriously because they assume this is just a normal study and not important to them. There are many questions left unanswered by the students. A second factor that contributed to Malaysia’s achievement is the format of the question. The format of the questions are different from the common questions that asked to the students in the schools examination and the public exam that conducted by the Ministry of Education in Malaysia. The format for the PISA questions are in the form of long text and require the students to make an interpretation, reflection and evaluation based on real life. Instead, format for the Malaysian public examination questions are in brief and more focused on figures and tables.

The final factor that contributing to the achievement of Malaysia at the international level is the priorities of teachers in teaching and learning in schools. Teachers were asked to prioritize on finishing the syllabus in order to prepare their students for public examinations. This situation has caused the learning process in the classroom to be ignored as the teachers have to finish the syllabus quickly neglect the learning objective. Teachers are more focused on examination without building the strong foundation of understanding to the concept of learning among students. Drills used to train students to answer exam questions and these factors have contributed to the low performance of Malaysia in TIMSS and PISA.
1.2 Problem statement

Generally, teaching practices in Malaysian secondary schools are still using conventional teacher-centred approaches that focus on information purveying, algorithms, as well as drill and practice (Lim, Fatimah, & Tan, 2002; Maimunah, 2000; Tan & Arshad, 2011). Teachers perceive their main role as the purveyor of information and instruction, and thus possess high intention to implement teacher-centred learning in their classrooms (Abu Hassan, 2003; Lim, 2007). During lessons, students listen passively to the teacher and questioning only happens occasionally. Students are used to relying on their teachers for all information, explanation, and instructions. As a result, low participation rates, rote learning, and lack of higher-order thinking among the students occur in Malaysian secondary science classrooms. So, that way study must be conducted to find out why this phenomenon occurred in school.

Teacher questioning is an important and prominent aspect in any classroom. Questioning does not only function to evaluate student understanding, reinforce factual knowledge, and elicit prior knowledge, but also to stimulate student thinking and promote classroom interaction as well as student participation. However, in conventional Malaysian classrooms, the usage of questioning is low and the majority of teacher questions are low order, which do not involve the application of thinking skills (cited in Tan & Arshad, 2014, p. 174). In the studied conducted by Zamri and Lim (2011), on average only 24 questions are asked by the teacher per hour, which is significantly lower compared to 69 questions asked by their Western counterparts (Graesser & Person, 1994). Furthermore, Malaysian teachers are still behind in techniques and skills of asking questions that could promote higher order thinking skills.
Previous researches (Supramani, 2006; Tay & Arshad, 2008; Zamri & Lim, 2011) reported that the percentage of low order questioning ranges from 72.2% to 82.4%, which is not a good sign for science classrooms. In the study that have been conducted by Tan and Arshad, 2014 showed that even though high order questions are still low in frequency, the teacher and students did show a practice of asking high order questions. In the long run, with more problem based learning lessons, teachers and students will show progress in their questioning technique and higher order thinking. This study was conducted only for chemistry lesson and not for other science subject. This study found out the effectiveness of problem based learning approach to promote teacher and student questioning in Malaysia classroom that will promoting higher order thinking skills. Therefore, to fulfil the gap, the study must be conducted to explore other Science subject and teachers’ experiences on integration of higher order thinking skills and find out other problems that have been faced by the teachers and find out other solutions to solve the problems.

The goal of this study is to explore teachers experiences on integration of higher order thinking skills in teaching of Science. Therefore, this research hopes to determine teacher experiences and what their perceptions of higher order thinking skills are. On the other hand, this research also hopes can investigate the problems and the solution on integration of higher order thinking skills especially in teaching of Science that can improve the implementation of higher order thinking skills in teaching and learning that can help improve the ranking of Malaysia in TIMSS and PISA assessment.

Moreover, this study is also important to fill in the gap in the literature because here in Sarawak, the are different cultures and different learning environments.
1.3 Objectives of the study

Based on statement of the problem, specifically the purpose of this study is:

1.3.1 To find out the teachers’ perceptions of higher order thinking skills (HOTs).

1.3.2 To find out teachers’ perceptions of the role they have to play when implementing higher order thinking skills in their lessons.

1.3.3 To find out the teachers’ experience(s) of students’ ability to think on higher level in teaching of science.

1.3.4 To investigate teachers’ problems on integrating of higher order thinking skills (HOTs) in teaching of science.

1.3.5 To investigate teachers’ solution on integrating of higher order thinking skills (HOTs) in teaching of science.

1.4 Research questions

The five research questions that guide this study were as follows:

1.4.1 What are teachers’ perceptions of higher order thinking skills (HOTs)?

1.4.2 What are teachers’ perceptions of the role they have to play when implementing higher order thinking skills in their lessons?
1.4.3 What are teachers’ experience(s) of students’ ability to think on higher level in teaching of science?

1.4.4 What are teachers’ problems on integrating of higher order thinking skills (HOTs) in teaching of science?

1.4.5 What are teachers’ solutions on integrating of higher order thinking skills (HOTs) in teaching of science?

1.6 Significance of the study

This study is a research to explore the teachers’ experiences on integration of higher order thinking skills (HOTs) in teaching of science among Sarawakian teachers in SMK Siburan, Sarawak and volunteered teachers who want to take part in the study via Facebook, electronic mail (e-mail), blogs, and educational portal in Malaysia. The result from this study provides practical implication for teachers and also for the students. The teachers could used the result of this finding to re-examine and redesign their instructional models to allow students to employ multiple thinking. The findings from this study will give broad implication for teaching and learning in Malaysia especially in implementation of higher order thinking skills in teaching of Science and other subjects to promote better learning.

Both teachers and students will benefit from this study because this study also provides the investigation of the problems that students faced when their teachers are trying to teach them