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Exploratory of Set Induction Practices among Science Teachers

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Abstract

The purpose of this study is to explore science teachers' practices of set induction. Through the use of interview sessions and lesson plan analysis, the researchers identify teachers' notions and perceptions towards the use of set induction in Science teaching. It was found that all respondents have the same notion and perceptions about set induction in Science teaching. There are differences in practices used by in-service teachers and pre-service teachers in which in-service teachers preferred to use questioning for their set induction compared to pre-service teachers who preferred to use visual set induction. Teachers realize that set induction gives advantages and it is important to be implemented in the teaching and learning process which gives impact on students' engagement throughout the lesson. The researcher also found that pre-service teacher is lacking in generating an idea to be carried out during set induction in the classroom. Therefore, the researcher proposed that the current curriculum specification should be revised so that the column of "suggested set induction" can be added to it.

Keywords: Set Induction, Science Teachers Practices, Exploratory, Interview, Lesson Plan Analysis.

Introduction

Most teacher plays a big role in assure the teaching and learning process run smoothly for the students to learn effectively. The teaching and learning process mainly consists of three phases which are set induction, the teaching phase, and the closure phase. Normally, set induction is conducted by a teacher at the beginning of the lesson. This short phase usually did not take more than 5 minutes to be accomplished. It is about getting students ready and introducing them to the right mindset. Implementation of set induction is not limited to certain subjects only, it is crucial to all subjects been taught in school including Science subjects. A teacher can use any kind of set inductions to draw students' attention and further create students' interest to learn Science. This is because the implementation of set induction is believed to create motivation among students. Oman (2002) stated that research about set induction is usually included as a part of motivational research. The research is normally looking for the effectiveness of set induction for students' achievements and whether the effects of set induction can help a student to engage longer in the lesson. Since there was a

lack of interest in learning science and students can had a negative perception toward their Science teacher (Murat, 2009). Other than that set induction affects students' knowledge, attitude, and engagement levels. Therefore, this research uncovers the set induction practices among Science teachers. This study is focused on the following questions:

1. To find out teachers' notion of set induction in the teaching of Science.
2. To identify teachers' perception towards the use of set induction in the teaching of Science.

Literature Review

Perception is an important element in the cognitive process. Perception can be defined as a process by which an individual is faced with a situation or stimuli. It is based on the individual's prior experiences. He or she interprets the stimuli into something meaningful. However, the interpretation of the person might be different from the reality (Pickens, 2005). Usually, the process to interpret the stimulus is influenced by the experiences and the individual's learning process. Stimuli are the core of set induction. Set induction is the initial part of the teaching and learning process. It is the preparation for the formal lesson. According to Oman (2002), set induction is also known as anticipatory set or 'set'. It is a focusing event to grab or 'hook' the students' attention. It normally takes place at the beginning of a class period and can be performed when introducing a topic. Other than that, set induction also can be used to get the student ready to learn and induce them into the right mindset. Set induction is also one of the elements included in the lesson plan. A good lesson plan must have a set induction. The set induction part can be subdivided into three parts which are an introduction, implementation, and closure. In the introduction part, a teacher tries to make students pay attention to the lesson she/he wants to teach. This is the part where a teacher will bring any stimulus material such as pictures, showing videos, and models to attract students' attention. Then, in the implementation part, a teacher will give a set of questions that focus on the topic that will be learned and after that, a much deeper discussion about the contents is completed. The last part in the set induction steps is closure. This is where the teacher stated the topic she/he will teach and stated the learning objective as guidance for the lesson. Set induction is only given a short time to be conducted. Among the methods commonly practiced in the set, induction is by using teaching aids, questioning, revising a related topic, memorizing earlier lessons, warming up information, and so on. A teacher must have a set induction that is congruent with the lesson activities. This will enable the students to understand the lesson easily and focus on the lesson longer (Stephens, 2003). However, this set induction is used to induce students into the right mindset and not included as part of a lesson that wants to be delivered. So, the time allocated for this session is short and normally not more than 5 minutes.

Methodology

This study used the qualitative approach specifically exploratory research design. Exploratory research is often referred to as qualitative research because both can provide the researcher with some insight and ideas into the topic selected. One of the reasons to conduct exploratory research is it can provide a better understanding of a situation particularly the set induction practices among Science teachers. Despite the richness and meaningful information gained through exploratory research, it is not designed to provide final decisions or answers to solve a problem for the overall population. This is because exploratory research usually involves only a small group of people. The methods usually used for exploratory research include

literature searches, depth interviews, focus groups, and case analyses. The required sample for this research was four Science teachers. These four Science teachers were from three different schools. The respondent mostly from school located in in Shah Alam. All of the teachers have more than 3 years of teaching experience in the Science field. Therefore, various information can be gathered from the interview session. The interview method used in this research was a semi-structured interview. A semi-structured interview is conducted in a semi-formal manner and the interviewer is allowed to be more flexible. Moreover, the questions can also be altered and arranged in an orderly so that the respondents can understand them (Chua, 2012). To avoid bias, the researcher practice “disciplined subjectivity” when making decisions so that the researcher will not easily be carried by emotions that might emerge during the study (Erickson, 1984). Thus, the researcher in this study will ignore cultural influences or others factors that might cause respondents to make an option regarding set induction practices matter. The researcher also made an effort to develop familiarity with respondents so that the respondents become comfortable to make a conversation. Thus, the interview session run smoothly and the researcher was able to collect data needed for this study. The instrument of this research consisted of 10 questions. So, there were 10 questions were asked to the respondents. Table 3 shows the ten questions used and the research questions involved. Table 1 shows the ten questions used and the research questions involved.

Table 1

Shows the 10 questions use and the research question.

Item	Interview questions	Research questions
1.	What do you understand about set induction?	What are teachers' notions of set induction in the teaching of Science?
2.	What kind of set induction that you usually use in your class?	
3.	What kind of activity can be categorized as set induction?	
4.	Why do you think it can be categorized as set induction?	
5.	How do you carry out the set induction in class?	
6.	When do you use the set induction? (In every class or every transition of a new chapter?)	
7.	How do you know if your set induction is successful?	What are teachers' perceptions towards the use of set induction in the teaching of Science?
8.	What are the advantages when you use set induction in class?	
9.	Do you think set induction is important?	
10.	Why do you think set induction is important?	

Generally, these questions are formulated based on previous studies regarding set induction. Through this interview, the researcher also probed the topic more deeply to uncover all the research objectives so that the research objectives can be achieved. In addition to interviews, the second instrument used in this study was the pre-service teachers' lesson plan book. Only two lesson plan books were reviewed. The lesson plan books comprise lesson plan books for Form 1 and Form 2. Basically, in a lesson plan, there are three important stages highlighted which are the set induction part, development part, and closure part. For this research, the

researcher is focusing more on the set induction part to obtain the desired data. Therefore, through interview and lesson plan book analysis, the desired data can be obtained.

Findings and Discussion

A teacher may have a different notion or idea about what is set induction even though they had already been introduced and applied the set induction in their class. To know Science teachers' notion about set induction, six questions (question 1 – question 6) were asked by the researcher during the interview. After analysing the responses from the interview sessions, it was found that all respondents do understand what is set induction is all about. All of them agreed that set induction works as an introduction part before going deep into the main lesson which will attract students' interest towards the lesson and it is the beginning part that helps to stimulate students' minds so that they are interested to learn. As stated by Oman (2002), set induction also known as anticipatory set or 'set' which is a focusing event to grab or 'hook' the students' attention. Johnston (2010) also agreed that the purpose of set induction is to attain engagement and meet the desired learning objective of a particular lesson. Besides, the respondents stated several types of activities that can be considered as set induction which are storytelling, showing pictures, acting, making a simple experiment, showing videos, playing simple games, simple quiz and giving questions to students. There are varieties of techniques used at the beginning of a lesson to switch the learner's mind to a different thought process (Oman, 2002).

Teachers' Notions of Set Induction in the Teaching of SCIENCE

Varies of techniques are used to enable the student to understand the lesson easily and focus on the lesson longer (Stephens, 2003) as long as the set induction conducted is at par with the lesson objective which would guide a student into the right mindset. The respondents also respond that they consider the activity as set induction because the activity was able to attract students' interest and attention as well as build a sense of curiosity among students. The respondents also stated that the activity can motivate students and create an effective classroom environment. As Schuck (1971) explains that set induction can encourage students' involvement throughout the lesson. Apart from that, the findings obtained also showed the pattern of set induction being carried in the teaching class. Teaching process begin with set induction where the teacher carries out an activity by asking questions with produces and also using stimulus materials. Asking questions to students is important where it produce transferrable among students and creates motivation within students by giving praise when students are able to get the answer correctly. By praising the students, they will know that they are doing better in their learning. Eliciting using the questions technique during set induction will induce students thinking skill by elicited students' prior knowledge and the teacher asks questions show students' understanding of the material used in the set induction. The pattern shown by a teacher while conducting the set induction is parallel with the proper steps of set induction at the beginning of the class. To know Science teachers' notion about set induction, six questions (question 1 – question 6) were asked by the researcher during the interview. After analysing the responses from the interview sessions, it was found that all respondents do understand what is set induction is all about. All of them agreed that set induction works as an introduction part before going deep into the main lesson which will attract students' interest towards the lesson and it is the beginning part that helps to stimulate students' minds so that they are interested to learn. Table 2 shows teachers' notions of set induction in the teaching of science.

Table 2

Teachers' notions of set induction in the teaching of Science

Findings from interviews	Discussion
<ul style="list-style-type: none"> Set induction is an introduction part before going deep into the main lesson which will attract students' interest towards the lesson and it is the beginning part where helps to stimulate students' minds so that they are interested to learn. 	<ul style="list-style-type: none"> Set induction also known as anticipatory set or 'set' which is a focusing event to grab or 'hook' the students' attention (Oman, 2002) Set induction is to attain engagement and meet the desired learning objective of a particular lesson (Johnston, 2010)
<ul style="list-style-type: none"> Type of set induction that can be considered as set induction which is storytelling, showing pictures, acting, making a simple experiment, showing videos, conducting simple games, simple quiz and giving questions to students 	<ul style="list-style-type: none"> There are varieties of techniques used at the beginning of a lesson to switch the learner's mind to a different thought process (Oman, 2002)
<ul style="list-style-type: none"> Consider the activity as set induction is because the can attract students' interest and attention as well as build a sense of curiosity among students. 	<ul style="list-style-type: none"> Explains that set induction can encourage students' involvement throughout the lesson (Schuck (1971)
<ul style="list-style-type: none"> The pattern of set induction has been carried out in the class teachers begin with showing objects then ask questions to students. They use questions and use an object to stimulate students' minds. 	<ul style="list-style-type: none"> The teaching process begins with set induction where the teacher carries out an activity by asking questions. Set induction can be subdivided into three stages which are an introduction, implementation, and closure. For Medical student normally there are three types of set induction namely narratives, food-based analogies and humor-based images or activities at the beginning of anatomy lecture and their response to it is collected and analyzed (Narayanan et al., 2019).
<ul style="list-style-type: none"> An appropriate occasion to implement set induction is on every transition of chapter or subtopic 	<ul style="list-style-type: none"> Set induction is used to make "passage from the known to new material (transition) and builds continuity from lesson to lesson" Schuck (1971)

Teachers' Perceptions towards the Use of Set Induction in the Teaching of Science

Every individual might be experiencing the same situation but interprets or perceived the circumstances differently and as a result, every individual came out with a different perspective on their own. It is the same as a teacher, teachers knew what is set induction and they used it at the beginning of their lesson but the way they perceive set induction may be different to another teacher. Therefore, to identify teachers' perception towards the use of set induction in the teaching of Science, there were 4 questions directed to these teachers

(question 7- question 10) during the interview. Based on the interview there is four importance of set induction. First is it able to attract students’ attention and interest by using an interesting and creative set of induction tools or techniques? It is essential to have an interesting set induction so that the attractive stimuli will be selected and delivered to the brain to be interpreted. Through the process of perception, individuals will give meaning to the set induction that they see or hear and further influence behaviour. So, the individual action or behaviour that responds to the stimuli is paying attention. Second, it helps students to prepare themselves for the next activity. This is because set inductions are capable to create students’ curiosity towards the lesson taught by the teacher. Next, students become alert with what they had learned. Students can recall back all previous lessons and through the set induction, it can stimulate students' minds to the right mindset. This happens when the stimulus which is set induction triggers the sensory component to analyse the information from set induction before transferring it to the cognitive system. Therefore, set induction is important in the teaching process to stimulate students thinking skills and make the lesson more interesting. So, all respondents realize that set induction does give advantage and importance in the teaching and learning process which gives impact on students’ engagement throughout the lesson. Table 2 shows teachers’ perceptions towards the use of set induction in the teaching of science.

Table 2

Teachers’ perceptions towards the use of set induction in the teaching of Science

Findings from interview	Supported by
<ul style="list-style-type: none"> • A successful set induction can be observed by looking at students respond. Can be detected them by looking at students’ facial expression, body language, answer given by students, students giving attention during set induction sessions, and students giving cooperation for the next activity 	<ul style="list-style-type: none"> • Looking at students’ reactions and responses such as responding to the questions and paying attention indicated that students are engaged to the lesson.
<ul style="list-style-type: none"> • Advantages of set induction: <ol style="list-style-type: none"> i. Create motivation among them ii. Attract students’ attention • Advantages of set induction: <ol style="list-style-type: none"> iii. Make the learning more meaningful. Set induction can make 	<ul style="list-style-type: none"> • Students become more motivated to learn more about the subject by looking at the set induction of a particular topic (Oman, 2002) • When the set induction is managed to attract student’s attention and it makes positive connections within their schema, then it becomes meaningful to them, and as a result of that is students can maintain better engagement levels throughout the lesson (Johnston, 2010) • “If the learner begins with the right “set”, then material is potentially

<p>continuity from lesson to lesson and relate the new lesson to students' prior knowledge.</p> <p>iv. Create effective communication between teacher and students.</p>	<p>understandable, afterward meaningful learning can occur".</p> <ul style="list-style-type: none"> • A poor communication between teachers and students will cause the teaching and learning process bored (Coombs, 1995)
<ul style="list-style-type: none"> • Importance of set induction - attract students' attention and interest, increase students' readiness for the next activity, stimulate students' minds, trigger students' curiosity, and smoothen the teaching. 	<ul style="list-style-type: none"> • Set induction enables students to prepare themselves for the next activities. Set induction was capable to trigger students' curiosity towards what will be taught by the teacher. • Set induction refers to the process of using a thought-provoking statement, interesting fact, or an audio-visual stimulus at the beginning of lecture to gain student's attention and give an overview about the lecture topic (Narayanan et al., 2019)

Teacher Set Induction Practices

After comparing the practices held by in-service teachers and pre-service teachers, it was found that there are differences in practices used by in-service teachers and pre-service teachers. In-service teachers do prefer to use questioning as their set induction compare to a pre-service teacher where they favour using visual set induction mainly used real objects for their set induction. In-service teachers have preferred questioning skills as their set induction because it is the easy set induction they can do which did not consume time to prepare. Other than that, it also found that in-service teachers did not have a variety of set induction compared to a pre-service teacher even though both in-service teacher and pre-service teacher applied the three categories of set induction in their class; visual set induction, set induction using questioning skill and set induction that conducted verbally. This showed that in-service teachers did not eager to use a variety of techniques of set induction compared to a pre-service teacher. The researcher also found that in-service teachers encounter problems generating an idea to carry out set induction in the classroom compared to pre-service teachers. Activities that are commonly practiced in the set induction are the use of teaching aids, situation, motivation, questioning, revising a related topic, recapping the previous lesson, and so on. So, teachers have so vast choices of set induction to be used in teaching as long as it is related to the topic and the set induction can open the mind and move the student's cognition so that they can follow the lesson easily. The findings however are limited to four in-service teachers and two pre-service teachers, thus it cannot be generalized into a bigger population.

Table 3

The Category of Set Induction Based on Form 1 Topics

Topics	Learning Activities	Category of set induction
Introduction to Science - Knowing physical quantities and their units.	<ul style="list-style-type: none"> • Identify physical quantities (length, mass, time, temperature and electric current), their values and units found on product descriptions. • Find words with the prefixes used in measurements such as kilo-, centi-, and milli- . • Find the symbols used for these units of measurement. • Find the values of these prefixes 	Visual set induction (non-screen visual set induction). Questioning skill
Cell as a Unit of Life - Understanding cells.	<ul style="list-style-type: none"> • Gather information on living organisms and identify the smallest living unit that makes up the organism. • Prepare slides of cheek cells and onion cells. • Study the general structure of cheek cells and onion cells under a microscope using the correct procedure. • Draw and label the different structures of an animal cell and a plant cell. • Compare an animal cell to a plant cell. • Gather information on cell structures and discuss their functions. 	Visual set induction (non-screen visual set induction) Questioning skill
Matter - Understanding the three states of matter.	<ul style="list-style-type: none"> • Gather information and discuss <ol style="list-style-type: none"> a) what matter is made up of, b) What the three states of matter are. • Compare the three states of matter in terms of: <ol style="list-style-type: none"> a) the arrangement of particles, b) The movement of particles. • Simulate the arrangement and movement of particles in the three states of matter. 	Visual set induction (non-screen visual set induction) Questioning skill
The Variety of Resources on Earth	<ul style="list-style-type: none"> • Discuss the importance of the earth's resources (water, air, soil, minerals, fossil fuels, and living things) to man. 	Visual set induction (Screen visual set induction and non-screen set induction)

<p>- Appreciating the importance of the variety of earth's resources to man.</p>	<ul style="list-style-type: none"> • Draw a concept map to show the relationship between these resources to the basic needs of life. • Gather information on the preservation and conservation of resources on earth. • Discuss the importance of the preservation and conservation of resources on earth (e.g. recycling of paper reduces the cutting down of trees; conserving clean water prevents water shortage). 	<p>Questioning skill</p>
<p>The Air Around Us - Understanding that oxygen is needed in respiration</p>	<ul style="list-style-type: none"> • Gather information and discuss respiration. • Carry out an experiment to show that during respiration, living things <ul style="list-style-type: none"> (a) use oxygen, (b) Give out carbon dioxide. 	<p>Visual set induction (non-screen visual set induction) Questioning Skill</p>
<p>Heat - Analyzing the effect of heat on matter.</p>	<ul style="list-style-type: none"> • Carry out activities to show the change in the state of matter in physical processes. • Discuss: <ul style="list-style-type: none"> (i) the effects of heat on the state of matter, (ii) examples of daily observations which show a change in state of matter 	<p>Visual set induction (screen visual set induction) Questioning skill</p>

Conclusions

The purpose of this study is to study the exploratory of set induction practices by Science teachers in teaching Science. Generally, the teaching and learning process involved three key phases, namely the set induction phase, the teaching phase, and the closing phase. The fact that the set induction phase only required three to five minutes for early exposure is used by a teacher to attract students' interest towards the learning process to be carried out and it also becomes a significant introductory part in teaching. Through the use of interview and lesson plan analysis specifically the set induction part, the researcher identifies teachers' notions and perception towards the use of set induction in the teaching of Science as well as identifies the differences of practices used by in-service Science teachers and pre-service Science teachers in conducting set induction. It was found that all respondents have the same level of the notion of set induction in the teaching of Science. Other than that, all of the teachers have the same perceptions towards the use of set induction in the teaching of science. Teachers realize that set induction gives advantages and it is important to be

implemented in the teaching and learning process which gives impact on students' engagement throughout the lesson. Lastly, the findings showed that there are differences in practices used by in-service teachers and pre-service teachers which in-service teachers is preferred to use questioning as their set induction compare to a pre-service teachers where they prefer to use visual set induction as their set induction. The researcher also found that teacher is lacking in generating an idea to be carried out during set induction in the classroom. Therefore, the researcher proposed that the current curriculum specification should be revised so that the column of "suggested set induction" can be added to it. Nonetheless, the findings of this study can provide useful data and help with future research in the same area of concern.

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