

UNIVERSITI TEKNOLOGI MARA

**THE VARIATION OF CONCEPTIONS
ON THE NATURE OF SCIENCE:
A PHENOMENOGRAPHIC STUDY
ON SCIENCE LEARNERS FROM
MULTIPLE EDUCATIONAL TIERS**

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledge as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The study was grounded in the goal of science education to produce individuals who are scientifically literate. Understanding the Nature of Science (NOS) has been regarded as a crucial essence in producing Science literate individuals. Following this, there have been extensive researches worldwide to measure various groups' conceptions on NOS using instruments developed to cater this need. However, the previous studies in Malaysia only measured the same aspects of NOS while sidelining others, hence limiting the holistic understanding of NOS among Malaysians. Therefore, this study sought to investigate the understanding of other NOS aspects among Malaysians namely a) Tentativeness of scientific theories, b) The scientific theory-law relationship, c) The aim of scientific experimentation, and d) The structure of scientific experimentation. Participants of the study involved science learners with different science achievements from three different educational levels: Lower secondary level (aged 13), Upper secondary level (aged 16) and Post Matriculation level (aged 19-21). Using the phenomenographic approach which was guided by the structure of awareness, the participants were engaged through semi structured interview sessions, aided by instances and drawings to map out the way they conceptualize Nature of Science. Ten categories reflecting the various ways NOS aspects as conceptualized by respondents were found, with few categories unique to the local setting. The variation of conceptualizing NOS increased with the educational tiers, indicating more ways of understanding NOS at a higher level. Students from the higher educational tiers were also more confident articulating their notion of NOS although the notion was similar with what was inferred by their younger counterparts. No specific trend was found in conceptualizing NOS across different science achievers. Further analysis conducted across all the aspects at individual level indicated that all participants of this study perceive science as an objective knowledge. This study implied that there is a need for explicit NOS instructions in Malaysia in order to achieve the objectives as outlined in the curriculum. It is envisaged that an implementation of both contextualized and de-contextualized NOS instructions is prudent as it will promote continuous and sound understanding of NOS. Such endeavour is also able to leverage learners' scientific literacy in achieving nation's aspirations.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The understanding of science and the understanding about science are the pillars of science education. Understanding science refers to the understanding of contents in science, including but not limited to understanding of principles, theories and laws in science. Understanding about science, on the other hand, refers to the understanding of its components, i.e. its purpose, methodology, history, philosophy and sociology of science (Felske, 2000). The present study embarks on the understanding about science, or commonly referred to as the Nature of Science (henceforth NOS in this study).

In the global aim of science education, understanding NOS has been recognized as a key factor in producing scientific literate individuals. Science for All American (AAAS, 1990) as a blueprint for the reformation of science education, defines science literacy as

...understanding some of the key concepts and principles of science; having a capacity for scientific ways of thinking; knowing that science, mathematics, and technology are human enterprises, and knowing what that implies about their strengths and limitations; and being able to use scientific knowledge and ways of thinking for personal and social purposes (p.4).

Being literate in science entails the ability of an individual to be analytical and critical in evaluating daily life issues pertaining to science and making sound judgements that favour the betterment of self, nation and the world. Perceiving that science as a knowledge constructed by human provides individual a sense of belonging and control to encourage active involvements in scientific developments and inquiries. In another word, literacy in science prepares learners in pursuing their