

**NEEDS ANALYSIS OF
ELEMENTARY PUPILS AND
TEACHERS IN SCIENCE
TEACHING AND LEARNING:
AN ESSENTIAL STEP TOWARDS
INTEGRATIVE STEM EDUCATION**

NURAZIDAWATI MOHAMAD ARSAD
PROF. DR. KAMISAH OSMAN
PROF. DATO' MOHAMED AMIN EMBI

THE NATIONAL UNIVERSITY OF MALAYSIA

PRESENTATION OUTLINE

- ▶ Introduction
- ▶ Context of problems
- ▶ Type of Needs
- ▶ Research questions
- ▶ Methodology
- ▶ Research Findings & Discussion
- ▶ Conclusion



INTRODUCTION

- ▶ Knowledge based economy or k-economy.
 - ▶ Workforce demand to develop economy is controlled by four main areas which are science, technology, engineering and mathematics (STEM).
 - ▶ Thus, a country with a society that dominated by these four central areas will be able to develop their own economy and compete with other developed countries (MPEN, 2010).
 - ▶ By the year 2020 with global economic challenges in the years to come, Malaysia is dedicated to become a developed and high income nation. In order to achieve the main goal, human capital with a high literacy in various disciplines especially in STEM fields is needed.
-



CONTEXT OF PROBLEMS

- ▶ New generation become less interested in STEM.
- ▶ In Malaysia, pupils enrollment in science stream and STEM-related fields continue to show a decline trend for years since 2010 (MOE, 2016).
- ▶ Pupil's achievement in science in the National Primary School Achievement Test (UPSR) exams 2010-2013 respectively indicate a decrease (Malaysian Examination Board, 2011).
- ▶ Existing intervention at a primary school education level in Malaysia did not clearly mention about the integrative STEM education.



CONTEXT OF PROBLEMS

▶ How to overcome?

- ▶ Effective teaching and learning in science.
- ▶ Introduce learning by integrative teaching.
- ▶ STEM education is approached to integrate teaching and learning between contents and skills with two or more disciplines of Science, Technology, Engineering and Mathematics (STEM) (Becker & Park, 2011a).
- ▶ Intervention of integrative STEM education show that:
 - ▶ Learning by integrative teaching in the STEM fields resulted positively and increase their interest and learning (Becker & Park, 2011b).
 - ▶ Improve the performance, skills and promote learning even it can close the gap between different ability levels of pupils (Han, Capraro & Capraro 2014).
 - ▶ Improve their knowledge, attitudes, beliefs and efficacy in teaching (Shahali et al., 2015).



NEED ANALYSIS

- ▶ Need analysis must be implemented before the development of STEM education intervention.
- ▶ To identify the problems or gaps in the teaching and learning in science at primary school by teacher and pupils.
- ▶ Types of needs:
 - ▶ Needs of lack - Deficiencies in what the learners knows.
 - ▶ Needs of felt - Desire to improve their self-performance
 - ▶ Needs of want - Wish the effective teaching and learning science.



RESEARCH QUESTION

- ▶ Identify the pupils' and teachers' needs in term of:
 - ▶ Needs of lack
 - ▶ Which science topics are difficult to learn and teach?
 - ▶ What are the pupils learning experienced and teaching practices implemented by teachers?
 - ▶ Needs of felt
 - ▶ What is the level of pupils' attitudes towards science and constraints of the teachers in teaching?
 - ▶ Needs of want
 - ▶ What are the teachers and pupils wanting in their teaching and learning?



METHODOLOGY

QUANTITATIVE DESIGN



SURVEY RESEARCH



QUESTIONNAIRE INSTRUMENT

(five-point agreement of Likert-type responses & frequency scale)

Lack	<ul style="list-style-type: none">• Level of difficulties of science topics (Ministry of Education Malaysia, 2014)• Learning and teaching experience by pupils and science teachers (Aldridge et al., 2011; Dorman, 2003; Khine, 2001).
Felt	<ul style="list-style-type: none">• Pupils' attitude towards science (Murphy and Beggs (2003) and Iksan et al. (2006))• Teaching constraints (Al-Jarrah and Khasawneh (2013), Laidlaw et al. (2009) and Tenaw (2014))
Want	<ul style="list-style-type: none">• Necessity in learning by pupils• Necessity in teaching by science teachers



PARTICIPANTS & LOCATION



SCIENCE TEACHERS (N=50)



PUPILS YEAR 6 (N=160)



NEED OF LACK



Difficult science topics

Science topics	Pupils	Teachers
	Mean	Mean
Survival of animals	1.69	1.51
Survival of plants	2.02	1.55
Food chains	2.27	1.86
Energy	2.26	2.96
Light	2.06	2.69
Electricity	2.40	2.98
Heat	2.21	3.02
The properties of the substances	2.64	3.30
Acid and alkaline	2.15	3.04
Earth, moon and sun	1.93	2.59
Strength and stability	1.85	2.88



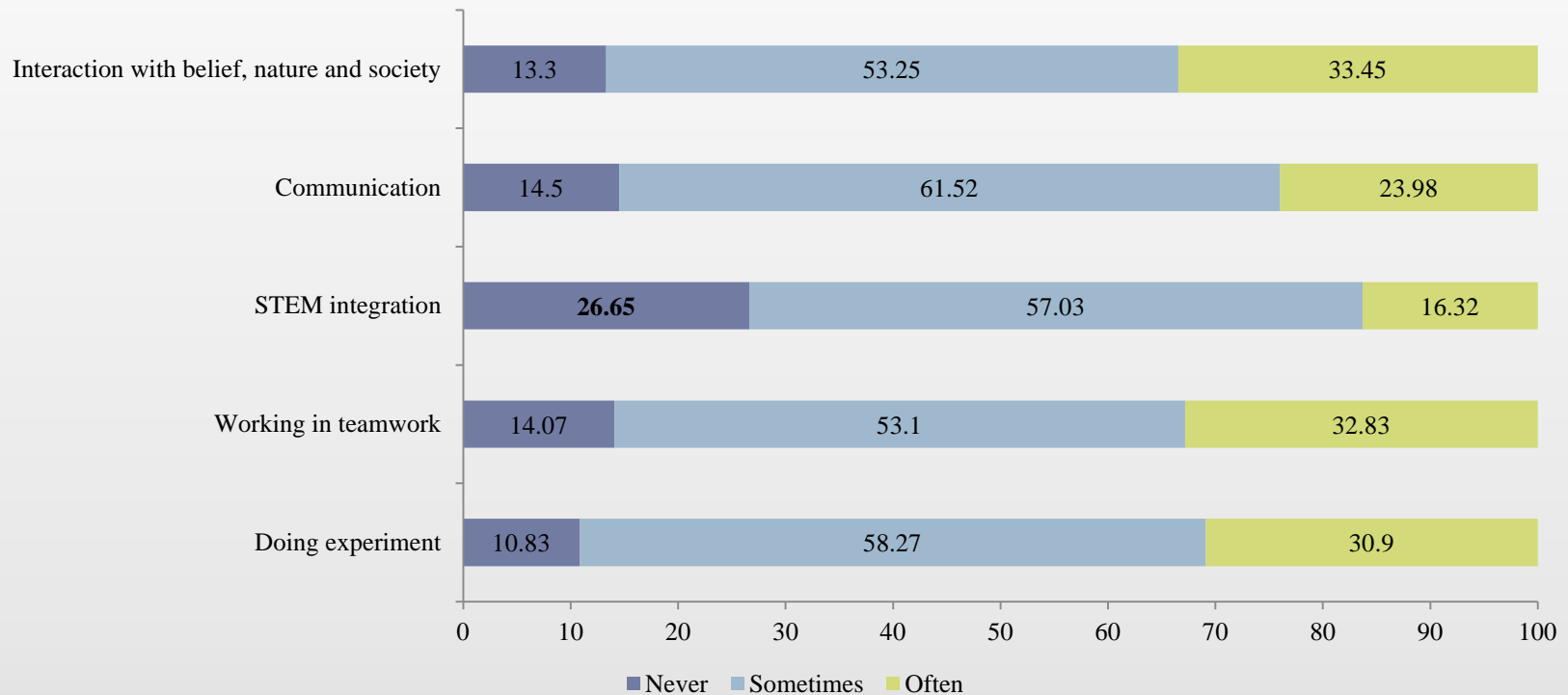
Four topics should be focused in STEM education and to develop the integrative STEM intervention for science fifth grade:

1. The properties of the substances
2. Electricity
3. Energy
4. Heat.

Physics' theme often seen as abstract and difficult topics (Duit 1984, Tsagliotis 2005, Yuenyong & Yuenyong 2007)

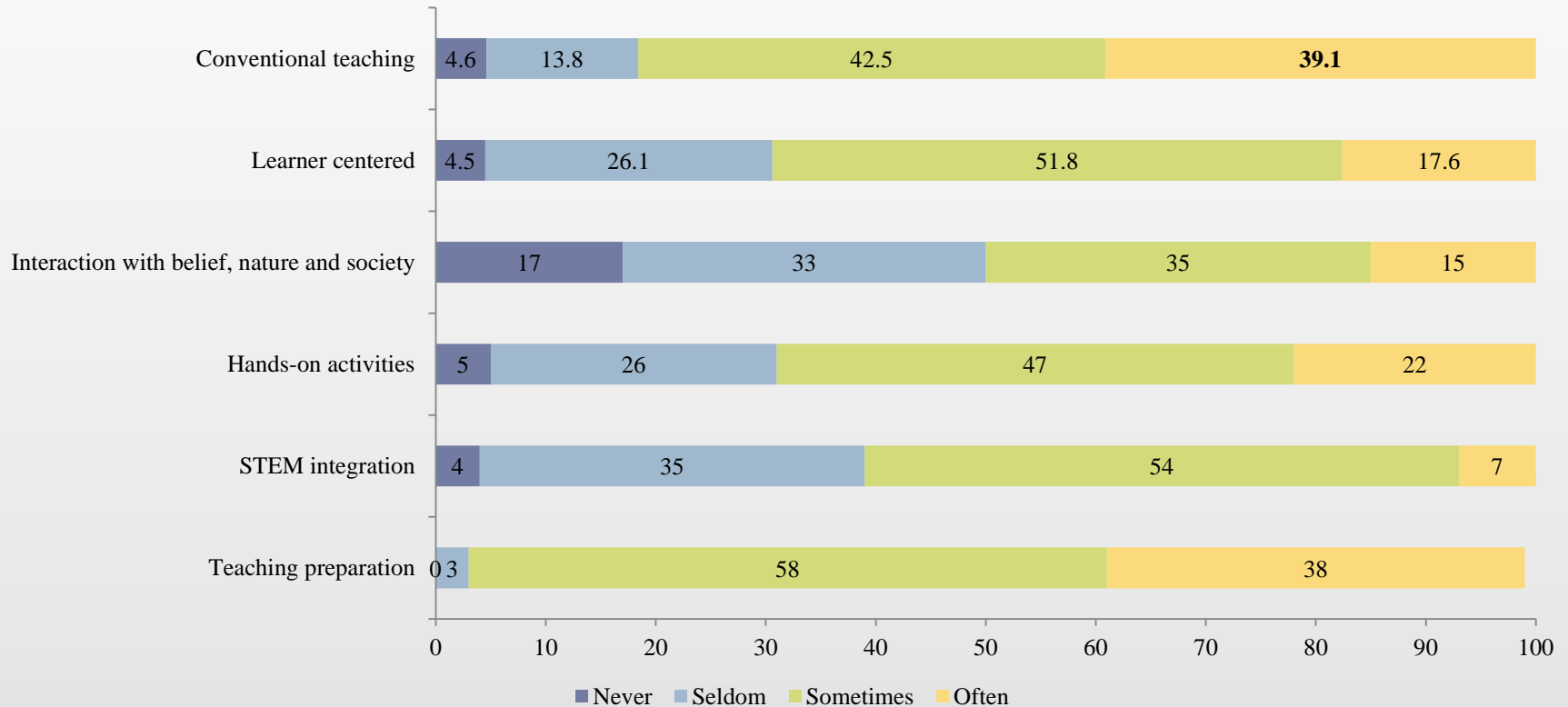


PUPILS LEARNING EXPERIENCED



Integration of STEM in learning science is the most activities that are not implemented in class with the percentage frequency 'never' was 26.65%.

TEACHING PRACTICES



Teacher often use conventional teaching in their science teaching practices.

NEED OF FELT



PUPILS ATTITUDE TOWARDS SCIENE


Constructs	Mean	S.D	Interpretation
Enjoyment of learning science	4.45	0.68	High
Importance of science	4.19	0.58	High
Perception towards science teacher	4.25	0.67	High
Perception towards STEM	3.58	0.67	Moderately high
Motivation in science	3.83	0.79	Moderately high
Interaction of belief, nature and society	3.79	0.77	Moderately high

- Positive attitude will encourage pupils to demonstrate positive behaviors, and the impact of positive attitude will increase pupils achievements (Osman et al 2007).
-



TEACHERS CONSTRAINTS

Constructs	Mean	S.D	Interpretation
Perception towards pupils' interest	2.37	0.51	Moderately low
Profesional skills	2.43	0.51	Moderately low
Facilities	2.74	0.52	Moderately low
Time	3.87	0.93	Moderately high

- Time constraint ($\mu = 3.87$) considered to be a major problem for science teachers.
 - Current science period 3 periods/week.
-
- 

NEED OF WANT



NECESSITY IN LEARNING

Constructs	Mean	S.D	Interpretation
Hands-on activities	4.34	0.58	High
Teamwork	4.50	0.73	High
ICT	3.76	1.06	Moderately high
Important of science	4.16	0.71	High
STEM integration	4.24	0.66	High
Interaction of belief, nature and society	4.34	0.68	High


The necessity in learning using ICT is the lowest necessity in learning.



NECESSITY IN LEARNING

Constructs	Mean	S.D	Interpretation
STEM integration	4.33	0.63	High
Teaching materials and infrastructure management	4.29	0.55	High
Teaching skills	4.40	0.59	High
Classroom management skills	4.49	0.51	High
Interaction of belief, nature and society	4.50	0.52	High

Majority of science teachers had a high desire in all aspects of needs for teaching science.



CONCLUSION

- ▶ Consider to do need analysis before developing an intervention.
- ▶ Science topics under physic theme is difficult to teach and learn.
- ▶ Less of integrative STEM education in learning and conventional teaching practice give clear picture why the subjects is difficult.
- ▶ Students perception towards STEM will probably impact the achievement towards STEM subject.
- ▶ More time periods needs to deliver an innovative teaching.
- ▶ Science teaching and learning that integrating four central area should be implemented in elementary schools.



THANK YOU

