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Scientific Imagination of Lower Secondary School Students in Thailand




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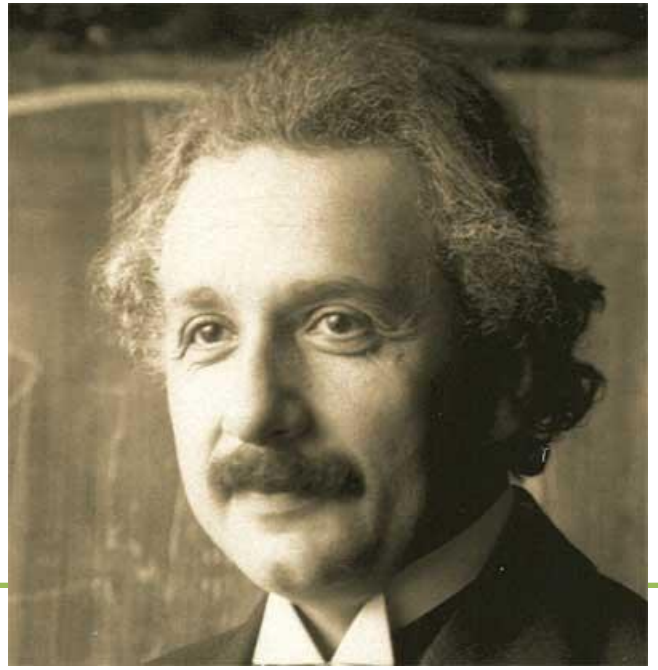
Introduction

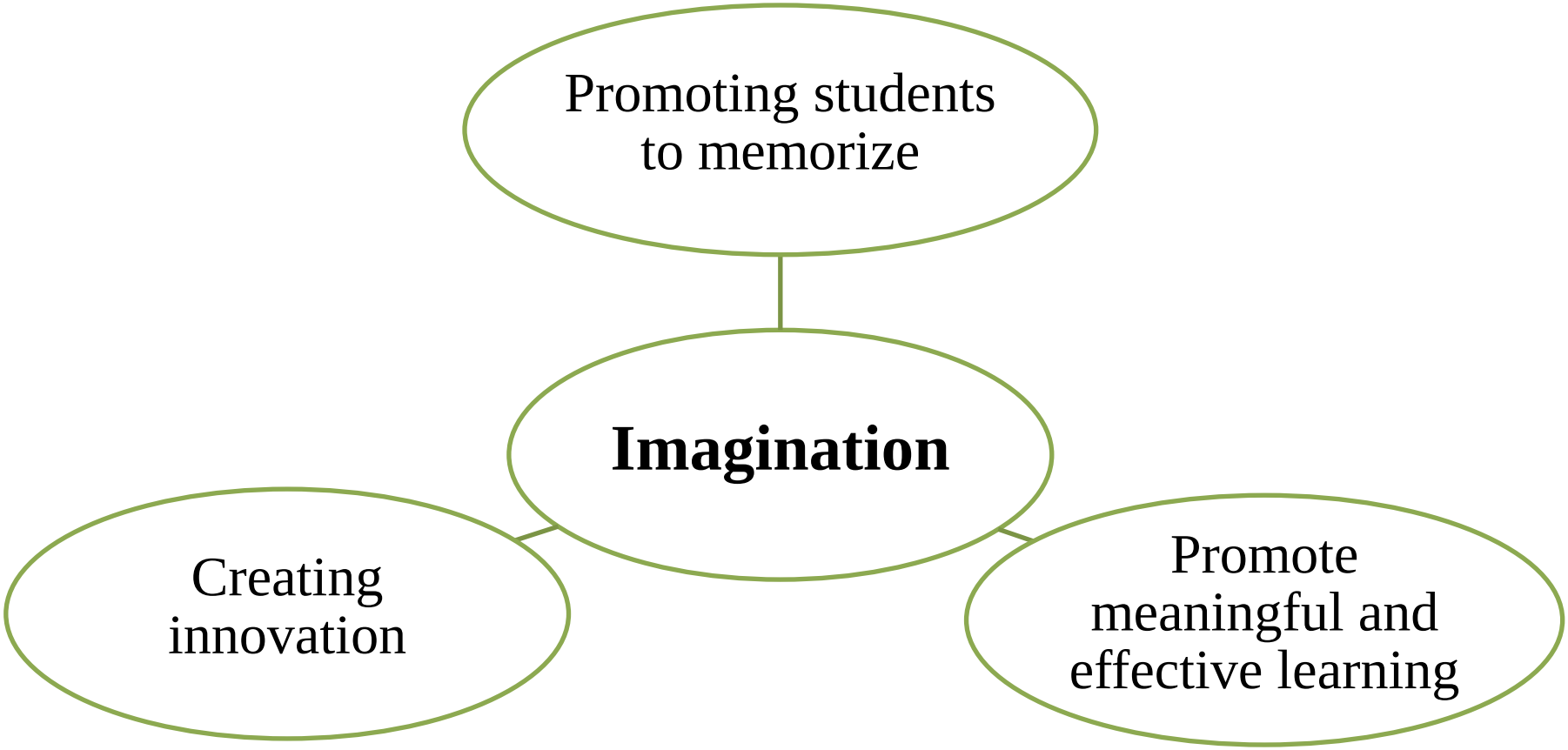
"Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution."

Albert Einstein (1929)



Introduction

- Imagination is a unique system of human thinking. It is related to the process of finding and improving ideas.



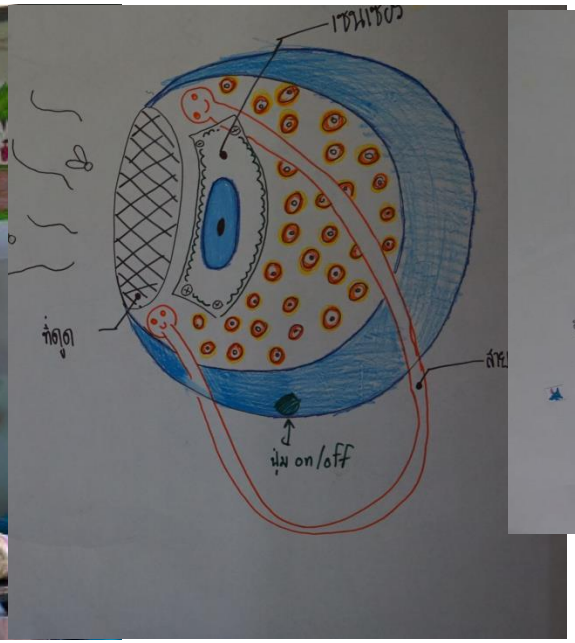
Introduction

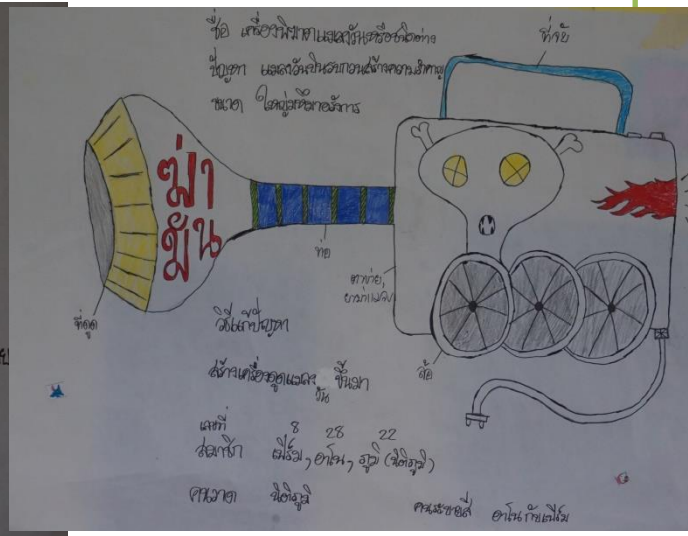
Thai students have low abilities in learning science.To achieve a deeper understanding of nature, scientific imagination has taken an important role in science teaching and learning.

Introduction

Scientific imagination

was defined as an ability to construct the pictures, models and stories in an individual's brain in order to understand the problems or situations based on the accurate scientific knowledge that leads to the development of creativity.





Introduction

- The results from the study of 270 Thai in-service science teachers' opinions toward scientific imagination revealed that scientific imagination is important for both students and teachers. It is the main key to success in the goal of learning science.

Introduction

Scientific imagination is the foundation of creativity which is one of the necessary skills for the 21st century skills.

Creativity

Scientific imagination

However, thinking ability is quite difficult to measure.

The research instrument needs to be a well-designed tool with appropriate criteria.

Using familiar situations related to students' lives will help students to further their thinking ability.

Research objectives

This research aimed

1) to develop scientific imagination test for lower secondary school students and

2) to study and compare scientific imagination of lower secondary school students among grade 7-9 students.

Research methodology

The samples used in this study were 213 lower secondary school students from 6 schools in Bangkok, Loei, Kanchanaburi, Rayong and Nonthaburi provinces. The samples voluntarily applied to join this research by themselves and using purposive sampling.

Levels of study	n
Grade 7	85
Grade 8	64
Grade 9	64
Total	213

Research instrument

The scientific imagination test was composed of four situations;

1. The planet
2. Teka country
3. Electronic waste
4. Songkran festival (water festival in Thailand).

The questions were in the form of open-ended questions related to students 'lives and the context of Thailand.

Research instrument

The test was verified by five experts.

Tried out with 45 lower secondary school students, 15 students in each grade level.

Appropriateness mean scores were in the range between 4.20 – 4.80

The congruence scores were equalled 1.00 in all situations.

The congruence mean score between questions and criteria was equalled 1.00.

The reliability of the test using Cronbach's alpha coefficient was equalled 0.888

Research instrument

Example of the TEST

ข้อที่ 2 สงกรานต์

ภารกิจที่ 1 หนึ่งในประเพณีสำคัญของประเทศไทยที่เป็นที่นิยมเป็นอย่างมาก ได้แก่ ประเพณีสงกรานต์ ในแต่ละปี แต่ละพื้นที่ของประเทศได้กำหนดจุดเล่นน้ำสงกรานต์ไว้เพื่อสะดวกต่อการดูแลด้านความปลอดภัยแก่นักท่องเที่ยว โดยในทุกปีครอบครัวของนักเรียนต้องนำของขวัญไปมอบกับญาติ ๆ ในละแวกบ้านเดียวกัน

สถานการณ์: ในวันสงกรานต์แม่ของนักเรียนได้ให้นักเรียนเดินทางไปส่งของให้กับญาติ ๆ ที่บ้านอยู่ไม่ไกลจากกัน นักเรียนต้องเดินผ่านจุดเล่นน้ำสงกรานต์หลายจุดด้วยกัน โดยของที่นักเรียนต้องนำติดตัวไปด้วย ได้แก่ โทรศัพท์มือถือ กล้องถ่ายรูป กระเป๋าเงิน กุญแจบ้าน และกล่องของขวัญสำหรับญาติจำนวน 5 กล่อง ให้นักเรียนตอบคำถามต่อไปนี้

1. นักเรียนคิดว่า ปัญหาอะไรบ้างที่สถานการณ์ได้กล่าวถึง (คิดถึงปัญหาจากสถานการณ์ให้ได้มากที่สุด)

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2. นักเรียนมีวิธีแก้ไขปัญหาหรือเสนอแนวทางการสร้างสรรค์ผลงานเพื่อแก้ไขปัญหานั้นอย่างไร (คิดวิธีการแก้ปัญหาให้ได้มากที่สุด)

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ภารกิจที่ 2 จากสถานการณ์เดียวกันให้นักเรียนวาดภาพสิ่งประดิษฐ์ที่นักเรียนคิดว่าสามารถแก้ปัญหาได้อย่างมีประสิทธิภาพที่สุด อธิบายวัสดุที่นำมาใช้ในการสร้างสิ่งประดิษฐ์นั้น พร้อมทั้งระบุหน้าที่หรือการทำงานและตั้งชื่อให้กับสิ่งประดิษฐ์นั้น

Mission 1

Present the situation and ask 2 questions

- Identify the problems from the situation
- Think about the ideas to solves those problem

(as many as possible)

Mission 2

- Draw the picture of the invention to solve the problems and relate to scientific knowledge.

Results

- **Descriptive statistics**

Levels of study	n	Mean	SD
Grade 7	85	30.76	9.242
Grade 8	64	35.69	10.655
Grade 9	64	31.67	8.621
Total	213	32.52	9.703

Results

- There was a statistically significant difference at .05 level between groups of students as analysed by one-way ANOVA (F =5.248, p = .006).

	df	SS	MS	F	p-value
Between Groups	2	950.039	475.019	5.248	.006
Within Groups	210	19009.153	90.520		
Total	212	19959.192			

Results

There were no statistically significant differences between scientific imagination scores of students in grade 7 and 9 (p = .847), as well as, students in grade 8 and 9 (p= .060).

Comparisons	MD	Std. Error	p-value
Grade 7 and 8	- 4.923*	1.575	.008
Grade 7 and 9	- .907	1.575	.847
Grade 8 and 9	4.016	1.682	.060

Conclusion and discussion

- The quality of the scientific imagination test was in a high level.
- One of the experts suggested that researcher should conduct in-person interviews with some students in order to receive in-depth data.
- Some students did not answer the questions. Moreover, most of students' answers did reflect their imagination but not scientific imagination.

Acknowledgement

This paper is part of the project "*The Development of Science Learning Activities Package to Promote Scientific Imagination in the Classroom for Lower Secondary School Students*", financed by Srinakharinwirot University, Contract No. 164/2558.

I offer my regards to the Strategic Wisdom and Research Institute and Science Education Center of Srinakharinwirot University (SWU), Thailand, for financially supporting me in all respects during the time at the conference.

Thank you

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ISET 2017 provides the ideal opportunity to present your research and experience. This conference purpose is to be perfect platform to discuss the latest development in the field of teaching and learning science; to better understand the challenge and to identify obstacles and ways to overcome them. We will explore new pathways toward making research more immediately applicable in the classroom, and to make the classroom more responsive to new ideas and approaches emerging from research.

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Phuket: is one of the southern provinces (changwat) of Thailand. It consists of the island of Phuket, the country's largest island, and another 32 smaller islands off its coast. It lies off the west coast of Thailand in the Andaman Sea. Phuket Island is connected by the Sarasin Bridge to Phang Nga Province to the north. The next nearest province is Krabi, to the east across Phang Nga Bay. Phuket formerly derived its wealth from tin and rubber, and enjoys a rich and colorful history. The island was on one of the major trading routes between India and China, and was frequently mentioned in foreign ship logs of Portuguese, French, Dutch, and English traders. The region now derives much of its income from tourism. Phuket has a fantastic array of attractions. From natural to man-made, from land-based to water activities; there's always something to see and do on Phuket Island.

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Q & A