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THE IMPLEMENTATION OF 'DECARUSE' TO ENHANCE STUDENTS' VISUAL IMAGERY IN MATHEMATICS

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Abstract: *Visual imagery is the sense of having "pictures" in mind. Visual imagery is a particularly important element in studying mathematics. It involves several cognitive activities like spatial reasoning, the acquisition of skills, memory, and the comprehension of non-routine problems in mathematics. Weak learners have a weak concept imagery that makes them unable to perceive and create gestalt image. Fifty students of Programme Pra Pengajian Tinggi Semester March-July 2024 at Mara University of Technology Kelantan were involved. The vividness of visual imagery that consists of questions on characteristics of people, scenery and objects developed by David Marks (1973) was applied in this study. From the result, it showed that 60 % of the students are weak in visual imagery. Therefore, 'DECARUSE,' that stands for 'define characters,' 'category,' 'representational' and 'use 'were designed. The triangulation method of observation, interview and questionnaires showed that there is an improvement in students' visual imagery towards mathematics, thus, helping them to score in their examination.*

Keywords: *Visual Imagery, Mathematics*

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Introduction

Program Pra Pendidikan Tinggi that used to be known as Program Mengubah Destini Anak Bangsa has been initiated by the Vice Chancellor Of UiTM launched by the Prime Minister Of Malaysia on 15th February 2010.This program is based on the philosophy of the university which believes that an individual is capable to achieve excellence through the transfer of knowledge and the application of pure values. There are two main programs of Pra Pendidikan Tinggi, one is called Pra Perdagangan, and another one is Pra Sains. The main purpose of program Pra Pendidikan Tinggi is to take SPM graduates who have obtained SPM results that do not meet the requirements of Unit Pusat University. (Wan Bakar, W.N.2013)

As mentioned before there are a few reasons why the students do not meet the requirements of Unit Pusat University. This is because of the weakness in mathematics subject. The students' understanding of mathematics appears to be limited to the surface level instead of depth comprehension of the subject. A primary cause of mathematics difficulty faced by the students in Pra Pendidikan Tinggi is an inability to create a gestalt image or the structured whole image of the concepts underlying the mathematics processes. Individuals often attempt to memorize facts instead of being able to think, reason and problem solve with numbers. or symbols. (Lindamoodbelle, 2022), A study conducted by Nazhatul Sahima et al. (2012) on the subtopic of algebra among Pra Pendidikan Tinggi UiTM Kelantan found that the level of mastery on the topic of algebra was weak because the students had not mastered the algebra concepts since the secondary school.

Neuroscientists have found that imagery and perception share the same areas of the brain function similarly during both imagery and perception such as visual cortex and higher visual areas. Kosslyn and colleagues (1999) showed that early visual cortex is activated during visual imagery. They found that inhibition of these areas through repetitive transcranial magnetic stimulation resulted in impaired visual perception and imagery. This can be concluded that patients with impaired perception also experienced visual imagery deficits at the same level of mental representation.

Due to these overmentioned problems there is a dire need to find a new innovation to help the students in need. This will automatically reduce the number of weak learners and increase the number of good students, hence will help the countries to increase the number of highly educated students in the country. The approach which is called 'DECARUSE' that stands for (DEFINE-CATEGORY-REPRESENTATION-USE) is implemented.

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Literature Review

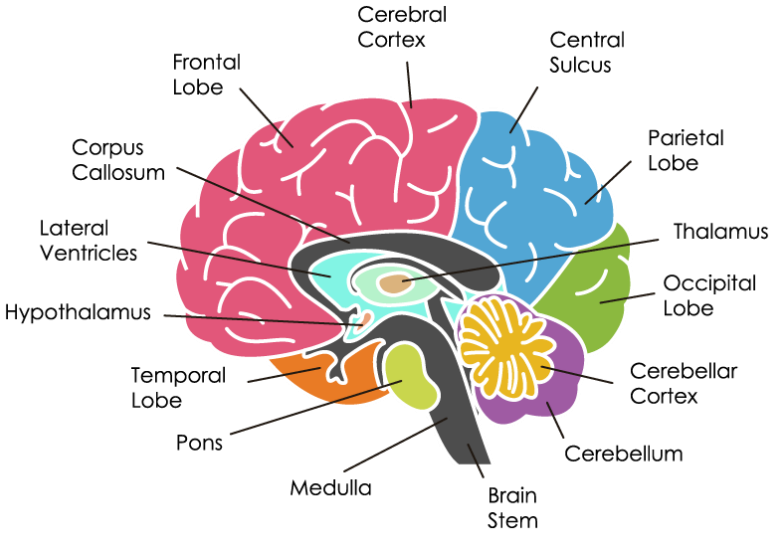

Figure 1: Human Brain

Visual imagery, also known as mental imagery, refers to the ability to form a complete picture in the mind and is processed in the visual cortex located in the occipital lobe of the cerebrum. When visual information enters through the eyes, it is transmitted to the occipital lobe, where it is interpreted by area V1 of the visual cortex, often called the "sorting area." This area identifies two essential aspects of vision: "what" (object identity) and "where" (object location). The right side of the visual cortex processes input from the left visual field, while the left side processes input from the right visual field. A critical pathway for recognizing objects is the occipitotemporal (ventral) stream, which primarily receives input from parvocellular cells in the lateral geniculate nucleus of the thalamus—cells specialized in processing fine spatial details, color, and clarity. Inhibition of the occipitotemporal region results in impaired perception and difficulty with visual imagery (Kosslyn, S.M., 2003).

Figure 2: Occipital Lobe

Visual imagery involves several cognitive activities like spatial reasoning, acquisition of skills, memory and the comprehension of non-routine problems in mathematics. In spatial reasoning, the ability to visualize is very important in tasks of transformational geometry, where students perform operations like translations, rotations, reflections and dilations (Kirby, Boulter

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1999).In the acquisition of skills, individual with strong mental image formation abilities show enhanced skills in visualizing, remembering and rendering scenes imaging capacity too is foundational to various artistic competencies (Perez-Fabello And Campos,2007).In non-routine problems of mathematics, it is very important to use visual imagery techniques.(Mustafa Ulu, Conneyt Akar 2016).

Few efforts have been initiated by researchers to identify the truth that lies beyond the problem and the solution to it. Lindamood Belle (2022) explained a primary cause of math difficulties is inability to create a gestalt image for the concepts underlying the math processes. Individuals often attempt to memorize facts instead of being able to think, reason and solve the problem itself.

Researchers have been venturing into new innovations to solve the problems of visual imagery. The Cloud Nine Math's program stimulates the ability to image and verbalize the concepts underlying math processes. Concept and numerical images are integrated with language and applied to math computation and math problem solving. There is emphasis on mathematical reasoning and mathematical computation.

Clark et al. (1984) has developed the explicit instruction of visual imagery training strategy known as RIDER, an acronym for Read, Image, Describe, Evaluate and Repeat. Rider requires students to image parts of written language recall and relate these images, then reorganize and verbalize the concepts imaged.

Morris's center has developed now, a mental imagery for language comprehension, memory and reasoning that successfully stimulates concept imagery. Patients become able to create images of words, sentences, and paragraphs. These images are extremely specific and contain details addressing color, shapes, sizes, numbers, and movement. As a result, their memory for critical thinking and ability to express themselves in oral and written language. The visual imagery begins at basic, single image level before moving into single sentences, then concepts, then combine ideas into the whole concept (gestalt).

Methodology

As the objective of this paper is the implementation of DECARUSE to enhance students' visual imagery in mathematics, a qualitative study method is used. Fifty students of Programme Pra Pengajian Tinggi Semester March-July 2024 at Mara University of Technology Kelantan by random sampling were involved. The strategies were arranged in few phases. Firstly, the Vividness of Visual Imagery consists of questions on characteristics of people, scenery and objects developed by David Marks (1973) which was applied in this study. From the results it showed that 60% of the students are weak in visual imagery. Secondly, the students were taught the topic of algebra by using direct teaching. Then a set of tests were given.

Thirdly, the students were taught the topic algebra by using DECARUSE, which is shown as an animation which was developed by using the computer software called Adobe Illustrator. The 'DECARUSE 'had been pilot tested to three students before Therefore, 'DECARUSE,' that stands for 'define characters,' 'category,' 'representational' and 'use 'were used. The implementation of DECARUSE was as follows.

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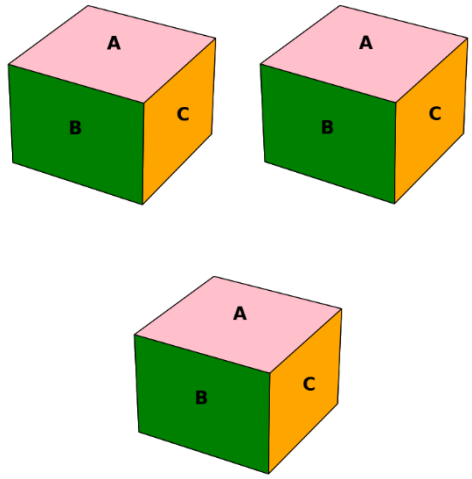
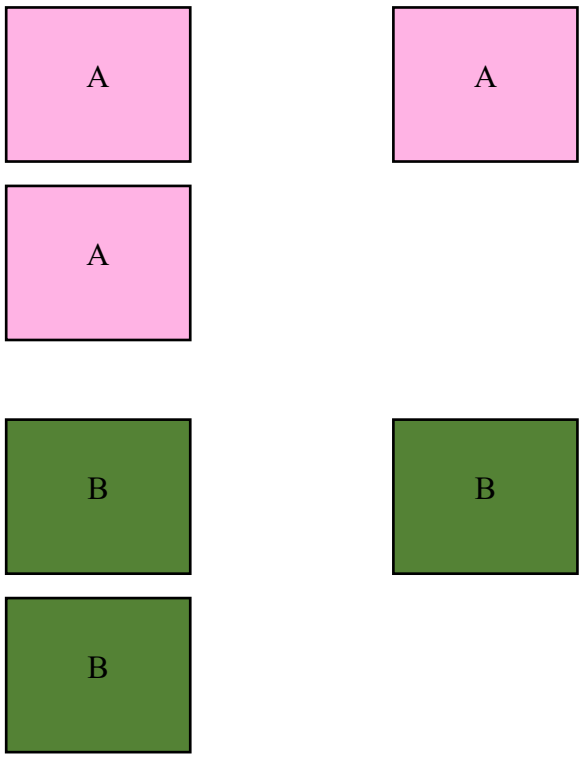
The Implementation of DECARUSE

DE – Define characters (color)
CA – Category
R – Represent on drawings
USE – use only symbol to solve problems.

	DECA-DEFINE CHARACTERS AND,CATEGORY Define character in color Category it as A,B,C
	R-REPRESENT Represent it on drawings..put similar color together.

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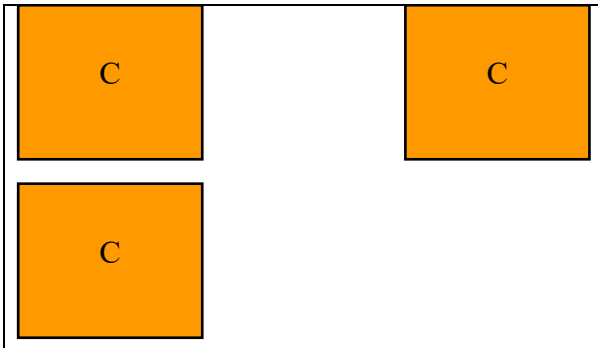	
$A + A + A = 3A$ $B + B + B = 3B$ $C + C + C = 3C$	USE - use symbol to solve maths problem

Few dice were used. The dices were colored with different colors. The students were asked to use colored dice to represent algebraic symbols, which then were transformed into drawings. Afterward, they were instructed to solve mathematical problems using only algebraic symbols. Once the session on DECARUSE was completed, the students were evaluated on specific topics. The data from both the diagnostic test and the evaluated test were gathered and tabulated for comparison. The evaluation of the diagnostic test and the evaluated test followed the same marking scheme that was based on the ability of the students to answer it successfully by applying the formula of the workings and the answer. The students were then interviewed to see whether it fulfills the objectives on how the DECARUSE can promote the understanding of the concept of algebra and the responses were analyzed by using the thematic analysis.

Result and Discussion

As the topic is the implementation of DECARUSE on students' visual imagery, a qualitative study method was used. Students were seated for diagnostic test on the topic of algebra.10 questions on the topic of algebra were answered. The students were then taught by using computer animation on the topic of algebra.the concept of addition, subtraction and multiplication were taught by the computer system. The students were then asked to answer the same question again and the diagnostic result and the evaluated result were then tabulated.the diagnostic test scored is between the range of zero until two. It is evaluated based on the ability of the students to answer it successfully by applying the formula, the workings and the answer. The evaluated result too has the same format of answering scheme.

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	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25
D1C1	02	02	02	02	02	02	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
D2C2	02	02	02	02	02	02	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
D5C5	02	02	02	02	02	02	00	02	02	00	12	22	00	22	22	22	00	22	02	22	00	00	00	00	00
D6C6	02	02	02	02	02	02	00	22	00	11	22	00	11	22	00	20	20	00	00	00	22	22	00	00	00
D7C7	02	01	20	02	02	02	22	22	01	01	12	02	02	02	00	02	02	00	02	02	00	00	00	00	00
D8C8	02	01	02	02	02	00	22	22	01	01	12	22	22	02	00	02	02	02	02	02	02	02	02	02	02

The students were then interviewed to see on how they understand the vivid concept while answering the questions.

Due to the answers that have been answered by 50 students it has been clearly observed that the students have a slightly different ways in answering the questions.21 students answered in a usual way when answering the questions while after seeing the animations on the computer they started to group the answers into like terms following the one that have been shown in the animation which are group into different group of dices. These students do understand the concept of like terms. The students were interviewed based on what they have experienced while studying the concept using animation. The first question that was being asked was what he or she saw in the picture. The answer was answered differently.

The visual student said that he has seen the whole picture and was able to imagine the answer. The auditory student said that he can see box,circle and triangles. The kinesthetics student, further explained that he can see the combination of few items. The same goes to visual,auditory and kinesthetics students.where they can only get half of the image, such as the combination of three symbols but still get the wrong answers on it.based on the interview it can be concluded that the animation is shifting the students mind from blur to schematic thinking on the concept of categorization of algebra.

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When the students were asked what concept of algebra was depicted the kinesthetics students answered the concept was plus and minus. The visual,auditory and kinesthetics students too, answered the same answer.this indicated that the animation has helped them to understand the processs of algebra implemented that is plus and minus.

The last question wants to know the students prefer direct teaching or animation..Only the auditory student prefer animation to have a clear and full picture on the whole structured concept discussed. Others prefer direct teaching because they can clearly understand the explanation by the mentor.

As the topic is the implementation of DECARUSE on students' visual imagery, a qualitative study method was used. Students were seated for diagnostic test on the topic of algebra.10 questions on the topic of algebra were answered. The students were then taught by using computer animation on the topic of algebra.the concept of addition, subtraction and multiplication were taught by the computer system.

Conclusion

Weak learners have a weak concept imagery that makes them unable to perceive and create gestalt image. 'decaruse' that stands for 'define characters','category' and 'use' was implemented to solve this problem.It was significantly proved that this situation was solved by comparing diagnostic test and current test. Future research on factorizing and expansion of algebra can be further continue in order to develop more skilful problem solvers in algebra .

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