



## Degree of Graph Theory as A Tool to Grow Creative Thinking Ability in Fluency Indicator

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### Abstrak

Pembelajaran matematika memerlukan kreativitas berpikir peserta didik. Kemampuan dasar yang harus dimiliki oleh peserta didik dalam belajar matematika yaitu salah satunya kemampuan berpikir kreatif. Kemampuan berpikir kreatif dapat diartikan sebagai kemampuan menyelesaikan masalah dengan lebih dari satu penyelesaian. Tujuan dari kajian ini adalah untuk menjelaskan bahwa sub derajat pada materi teori Graf dapat meningkatkan kemampuan berpikir kreatif matematika pada indikator fluency. Kajian ini menggunakan metode SLR (Systematic Literature Review). Metode yang digunakan merupakan metode untuk melakukan identifikasi, evaluasi serta interpretasi terhadap seluruh hasil penelitian yang didalamnya menganalisis berbagai macam jenis literatur yang diperoleh melalui pencarian berbagai sumber data. Hasil analisis dari berbagai sumber data menjelaskan bahwa derajat graf diklaim dapat meningkatkan kemampuan berpikir kreatif matematika. Hal itu terlihat dari penerapan derajat Graf pada soal latihan. Dari berbagai sumber data yang dianalisis, diperoleh hasil bahwa pertanyaan terbuka tentang sub derajat pada materi teori Graf dapat dijadikan indikasi untuk meningkatkan kemampuan berpikir kreatif matematika.

**Kata kunci:** Derajat, Teori Graf, Kemampuan Berpikir Kreatif, Indikator Fluency

### Abstract

*Learning mathematics requires creativity to think students. The basic ability that must be possessed by students in learning mathematics is one of them the ability to think creatively. Creative thinking ability can be interpreted as the ability to solve problems with more than one solution. The purpose of this study is to explain that sub-degrees in graph theory can improve mathematical creative thinking ability skills on fluency indicators. This study uses the SLR (Systematic Literature Review) method. The method used is a method for doing all things, evaluating and interpreting the results of the research which includes analyzing various kinds of literature obtained through searching various data sources. The results of the analysis from various data sources explain that the degree of the graph is claimed to be able to improve the ability to think creatively in mathematics. This can be seen from the application of Graf degrees to practice questions. From the various sources of data analyzed, the results obtained that open questions about graph theory material can be used as indications to improve creative thinking ability.*

**Keywords:** Degree, Graph Theory, Creative Thinking Ability, Fluency Indicator

## INTRODUCTION

Creativity plays a very important role in every line of the world, especially in terms of work or study. The ability of creativity needs to be applied, because creativity is one of the things recommended in the world of work (Career Center Maine, Department of Labor, 2004).

According to Harriman (2017: 120) Creative Thinking is a thought that tries to create new ideas. One branch of Mathematics is Graph Theory, while the Degree of Graph itself is a subsection of Graph Theory. We claim that graph degrees can improve students' creative thinking skills, especially on the fluency indicator.

Students' creative thinking skills also need to be improved by providing open-ended questions. Open-ended questions on graph degrees are used to improve students' creative thinking skills. In this article, the author will focus on open-ended questions on graph degrees on fluency indicators to improve students' creative thinking skills.

## METHOD

This study uses the SLR (Systematic Literature Review) method. SLR is considered the right method to obtain a very careful blend of academic literature (Chlakiadaki, 2018). Data is collected in the form of journal articles through Google Scholar. Then all the data obtained are then analyzed and presented globally and systematically in this article review.

## FINDINGS AND DISCUSSION

Some experts define ability from various perspectives, *Robert Kreitner (2005:185)* defines ability as a stable characteristic related to a person's maximum physical mental ability.

According to *Stephen P. Robins (2006,46)* the individual's capacity to carry out various tasks in a particular job is called ability. All individual abilities are divided into two namely intellectual abilities and physical abilities.

Meanwhile, according to *Mc Shane and Glinow in Buyung (2007:37)* abilities are natural intelligences and learned capabilities needed to complete a task. The natural talent that helps employees learn certain tasks faster and perform them better is called intelligence.

While the definition of creative thinking according to some experts, Creative thinking is a thinking process that produces various possible answers (*Siswono & Novitasari, 2015: 2*).

According to *McGregor (2007)* One type of thinking that leads to acquiring new insights, new perspectives, new approaches, or new ways of understanding something is called creative thinking. Students learn how to see a problem solving from various perspectives and learn how to find innovative answers and can solve problems in various ways through a creative thinking process. *Robinson (2011)* also suggests that creative thinking is important in the social field, so that with the ability to think creatively humans can improve their quality of life.

Based on some of the opinions above, it can be concluded that the ability to think creatively is the ability to analyze something based on available data or information but also gives birth to new concepts that are much more perfect and determine alternatives with various ideas that can be used to solve the problem.

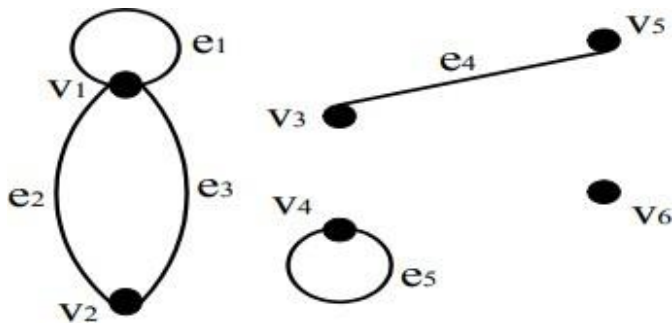
Fluency is an indicator or component that describes a solution procedure in a discussion that has several solutions. Fluency can be applied to graph theory and is known when students do exercises about graph degrees or degrees.

A graph is a set of vertices ( $V$ ) which is not empty and a set of edges ( $E$ ) which may be empty (Chartrand & Lesniak, 1986). The relationship of the points on the graph forms the edges and can be represented on the image so as to form a certain graph pattern. The patterns formed are defined and also grouped into graph classes. One of the interesting topics in graph theory is the degree of graph.

Definition of graph degrees, Let  $v$  be a vertex in a graph  $G$ . The degree of vertex  $v$  (symbol  $d(v)$ ) is the number of lines corresponding to the vertex  $v$  and the line of a loop is counted twice. The total degree  $G$  is the sum of the degrees of all points in  $G$ .

Example:

Determine the degree of each vertex in the graph in the figure below. How many degrees in total?



### Image Degree (Degree)

#### Solution:

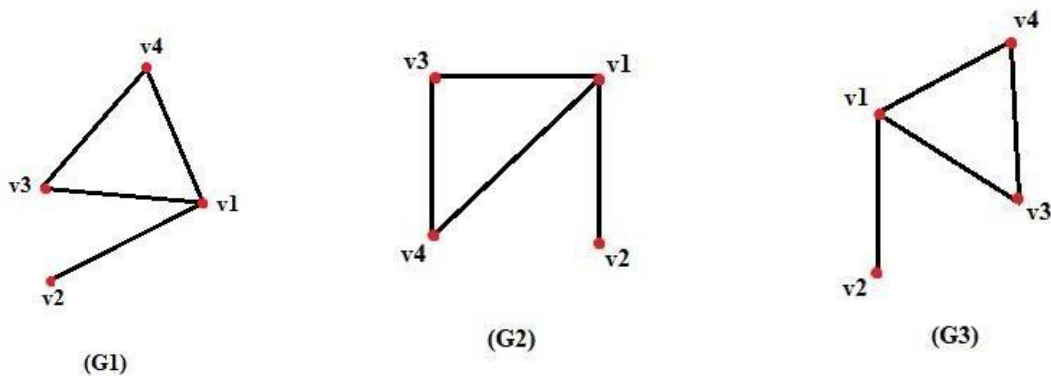
$d(vv1) = 4$  lines corresponding to 1 are 2, 3 and the loop 1 which is counted twice.  $d(vv2) = 2$  lines related to 2 are 2 and 3.

$d(vv3)$  and  $d(vv5) = 1$  because the line corresponding to 3 and 5 is 4.  
 $d(vv4) = 2$  lines corresponding to 4 are loops of 5 which are counted twice.  $d(vv6) = 0$  because there is no line corresponding to 6.

Degrees total = 6 ( $vvii$ ) =  $4 + 2 + 1 + 2 + 1 + 0 = 10$ .

#### Application of Fluency pad Degree Graph

Draw a graph with degrees  $v1(3), v2(1), v3(2), v4(2)$



### CONCLUSION

The results of the analysis from various data sources explain that the degree of the graph is claimed to be able to improve the ability to think creatively in mathematics. This can be seen from the application of Graf degrees to practice questions. From the various sources of data analyzed, the results obtained that open questions about sub-degrees in graph theory material can be used as indications to improve mathematical creative thinking skills. Fluency in graph theory can be seen when students do exercises on the sub-material of graph degrees

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