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A psychological model explaining why we love or hate statistics

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ABSTRACT

Students of social sciences often hate statistics and therefore cannot utilize statistics optimally. As only a few studies are available on the antecedents of the attitude towards statistics, the authors investigated five possible antecedents in a hypothetical model. The sample for this study was 255 psychology students across Greater Jakarta, Indonesia (52 males, 203 females; M_{age} = 20.309 years old, SD_{age} = 1.182 years). Using path analysis, it was found that mathematics self-efficacy and appreciation towards history of mathematics can predict statistics appropriation, while ambiguity tolerance can predict previous bad mathematics experience. Finally, both statistics appropriation and previous bad mathematics experience can predict attitude towards statistics, thus confirming the hypothesized model. The overall psychological model had a good fit (χ^2 (7, N = 255) = 7.72, $p > 0.05$).

Introduction

Mathematics has long been considered as the language of any natural and social science (Choudhury & Das, 2012) as it provides a scientific basis that signifies empiricism (Al-Agili, Bin Mamat, Abdullah, & Maad, 2012). Studying statistics as "a branch of mathematics dealing with the collection, analysis, interpretation, and presentation of masses of numerical data" (Smith, 2011, p. E5) gives us the opportunity to make more logical and positive decisions in solving problems (Ulpah, 2009). Statistics helps us to: (1) describe phenomena in a simpler and more concrete manner, (2) identify the relationships between factors in dealing with problems and, (3) predict future outcomes (Huang, 2015). Due to these functions, statistics plays an important part in the study of psychology in determining the credibility of psychological research methods and results.

However, despite the importance of mastering statistical skills in psychology, there has been a tendency to dislike and even avoid number-associated statistics among college students (Slootmaeckers, Kerremans, & Adriaensen, 2014). The negative responses students have towards statistics (scary, confusing, and hard) eventually creates the tendency for students to avoid using quantitative methods in conducting research (Kurniati, 2012).

Attempts have been made through many studies to explain this phenomenon of disliking statistics, and a main focus deals with the attitude towards statistics, defined as an individual's tendency to respond to statistics based on their potential, evaluation, and act (Margono, 2013). The reason attitude is considered to be able to explain the phenomenon is because it reflects an individual's response to statistics based on their feelings, behavior, and beliefs (Schau & Emmioğlu, 2011). As Wirth and Perkins (2008) stated, learning is not just acquiring knowledge, rather it is an approach towards developing an attitude toward what

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is learned. Moreover, studying attitudes towards statistics could identify the potential risks and help students engage further in the learning process. The tendency to avoid or respond negatively towards statistics still prevails among students, yet there is only a small body of research on attitude towards statistics in Indonesia, making a deeper analysis of attitude even more necessary.

The objective of this study was to explain psychology students' attitude towards statistics through a theoretical model by outlining and examining some of the important factors that could potentially predict or influence the attitude, that is, mathematics self-efficacy, appreciation towards history of statistics, statistics appropriation, ambiguity tolerance, and previous bad mathematics experience (see Figure 1).

Literature Review

Attitude Towards Statistics

The attitude in this study is conceived by an interpretive approach to give meaning and interpret the interactions between components of attitude and to relate it better to real life examples (Di Martino & Zan, 2015). One of the most illustrious examples of this definition is contained in the model developed by Schau (2003), which described attitude as a construct comprised of six subjective component dimensions (Ramirez, Schau, & Emmioğlu, 2012)—affect, cognitive evaluation, value, difficulty, interest, and effort. The first component, *affect* indicates a student's subjective emotions and feeling towards statistics, that is reflected in their enthusiasm, comfort, and enjoyment in learning statistics. Having a positive affect means students are enjoying learning statistics, feel no threat and will focus on the lesson more, while having a negative affect means a student is more likely to get bored, be fearful, and to dislike statistics (Schau & Emmioğlu, 2011).

Cognitive evaluation is the subjective evaluation made by the students themselves regarding their cognitive competency in understanding statistics. *Value* shows how important and valuable statistics are toward the student. It reflects the subjective perception of whether they feel statistics are relevant and beneficial not only academically, but also personally. The fourth component, *difficulty* indicates the subjective perception of difficulty toward statistics-related lessons and activities (Schau & Emmioğlu, 2011). It does not reflect the true difficulty of the subject, as sometimes an easy lesson could be regarded as hard by some students, and vice versa. *Interest* is the subjective level of curiosity and willingness to engage in learning statistics. The final component, *effort*, is the subjective perception of how much effort students have to invest to learn statistics. It is not limited to understanding lessons; it could take the form of doing an assignment, taking a test and maybe collaborating with others.

In Indonesia, the main reasons students detest statistics are: they perceive the subject to be irrelevant and non-beneficial in studying psychology, a lot of calculation has to be done and formulas remembered, and lessons are not interesting, boring and hard (Kurniati, 2012); all of which align with the component dimensions of attitude towards statistics.

Statistics Appropriation

Appropriation is a term describing the adoption and use of an object to fit the user's need and intention (Gaskin & Lyytinen, 2011). Statistics appropriation involves not only the utilization of statistics for classroom practices and testing but also using statistics to deal with personal problems (Erfjord, Hundeland, & Carlsen, 2012). For example, psychology students may remember related statistical principles when deciding to avoid traffic in a rush hour.

In this study, statistics appropriation is not measured directly as concrete behavior, but rather as a tendency that will determine an individual's attitude. A higher tendency to appropriate predicts a positive effect in individuals, representing their interest and perceived value in statistics and considering the effort they have to invest in and the realization that they have the capacity of doing so. Therefore, the following hypothesis was proposed: *H1: "Statistics appropriation can predict an individual's attitude towards statistics positively."*

Appreciation Towards History of Mathematics

History of mathematics comprises previous events and problems in the field of mathematics that bring knowledge of procedures and practicality in dealing with problems

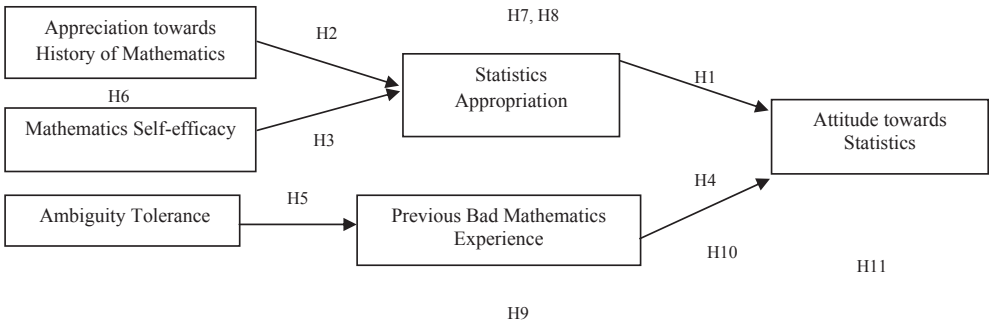

Figure 1. Theoretical model

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