

FACTORS OF STATISTICS ANXIETY AMONG SECONDARY STUDENTS
IN PASIR GUDANG, JOHOR VIA PHOTOVOICE APPROACH

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DEDICATION

This thesis is dedicated to the beloved people in my life.

Especially to my mother and father.

Thank you. I love you.

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Alhamdulillah thanks to Allah because due to His bounty, this study has been successfully completed.

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ABSTRACT

Statistics in secondary school education is very important before reaching to a tertiary level. Many studies emphasise on level, gender differences and factor of statistics anxiety on tertiary level, but no intention to discover among secondary level students. The purpose of this study is to determine the factors of statistics anxiety based on behaviour and speech of teachers and students through the perspective of students in helping educators who teach mathematics and statistics to improve their teaching quality. Learning statistics plays an important role in tertiary level. Studies found difficulty among students in learning statistics since secondary level. A study using Photovoice approach was conducted on 10 students in a secondary school in Pasir Gudang district, Johor. 10 out of 125 form four students were selected from questionnaire data who scored the most anxious in statistics. Validation by an expert from the university was obtained to determine the validity and reliability of the instrument used for the structured interview question. This study was conducted by using a qualitative method. Questionnaire data were analysed by using Statistical Package for the Social Sciences (SPSS) Version 24.0 software in order to select respondents with high levels of anxiety in statistics. Participants selected for the Photovoice were screened and required to take photographs during the teaching and learning sessions. The selected students were given a week training on the use of cameras in Photovoice. After the process of taking pictures, interviews are conducted using the pictures taken. Interview information was analysed using Nvivo 12 Plus. The findings of the study from the analysis of NVivo 12 Plus revealed that factors on statistical anxiety are influenced by teachers and peers through behaviour and speech. Overall, negative effects were shown in terms of cognitive, emotional and physical aspects after being exposed to Photovoice approach. Therefore, teachers need to surge efforts in strengthening teaching techniques in the classroom, especially statistical topics so that students' interests can be nurtured. Next, teachers' and peers' were able to help in reducing the level of anxiety in statistics at the school level and to the highest level.

ABSTRAK

Statistik dalam pendidikan sekolah menengah sangat penting sebelum mencapai tahap pengajian tinggi. Banyak kajian menekankan pada tahap, perbezaan jantina dan faktor kegelisahan statistik pada peringkat pengajian tinggi, tetapi tidak ada niat untuk ditemui di kalangan pelajar tahap menengah. Tujuan kajian ini adalah untuk mengetahui faktor-faktor kegelisahan statistik berdasarkan tingkah laku dan pertuturan guru dan pelajar melalui perspektif pelajar dalam membantu pendidik yang mengajar matematik dan statistik untuk meningkatkan kualiti pengajaran mereka. Statistik pembelajaran memainkan peranan penting di peringkat pengajian tinggi. Kajian mendapati kesukaran dalam kalangan pelajar dalam mempelajari statistik sejak peringkat sekolah menengah. Satu kajian menggunakan pendekatan Photovoice dilakukan terhadap 10 orang pelajar di sebuah sekolah menengah di daerah Pasir Gudang, Johor. 10 daripada 125 pelajar tingkatan empat dipilih dari data soal selidik yang mendapat markah paling cemas dalam statistik. Pengesahan oleh pakar dari universiti diperoleh untuk menentukan kesahan dan kebolehpercayaan instrumen yang digunakan untuk soalan temu bual berstruktur. Kajian ini dilakukan dengan menggunakan kaedah kualitatif. Data soal selidik dianalisis dengan menggunakan perisian Statistical Package for the Social Sciences (SPSS) Versi 24.0 untuk memilih responden dengan tahap kecemasan yang tinggi dalam statistik. Peserta yang dipilih untuk Photovoice disaring dan diminta untuk mengambil gambar semasa sesi pengajaran dan pembelajaran. Pelajar terpilih diberi latihan seminggu mengenai penggunaan kamera di Photovoice. Selepas proses mengambil gambar, temu bual dilakukan dengan menggunakan gambar yang diambil. Maklumat temu ramah dianalisis menggunakan Nvivo 12 Plus. Dapatan kajian dari analisis NVivo 12 Plus mendedahkan bahawa faktor kegelisahan statistik dipengaruhi oleh guru dan rakan sebaya melalui tingkah laku dan pertuturan. Secara keseluruhan, kesan negatif ditunjukkan dari aspek kognitif, emosi dan fizikal setelah didedahkan dengan pendekatan Photovoice. Oleh itu, guru perlu melonjakkan usaha memperkukuhkan teknik pengajaran di bilik darjah, terutamanya topik statistik agar minat pelajar dapat dipupuk sekaligus dapat membantu mengurangkan tahap kegelisahan dalam statistik di peringkat sekolah dan ke tahap tertinggi.

TABLE OF CONTENTS

	TITLE	PAGE
	DECLARATION	iii
	DEDICATION	iv
	ACKNOWLEDGEMENT	v
	ABSTRACT	vi
	ABSTRAK	vii
	TABLE OF CONTENTS	viii
	LIST OF TABLES	xii
	LIST OF FIGURES	xiv
	LIST OF ABBREVIATIONS	xv
	LIST OF APPENDICES	xvi
CHAPTER 1	INTRODUCTION	1
1.1	Introduction	1
1.2	Problem Background	6
1.2.1	Lack of emphasis on statistical anxiety among students	6
1.2.2	Lack of emphasis towards factors of statistics anxiety	10
1.2.3	Lack of emphasis on statistic anxiety on secondary level	11
1.2.4	Lack of emphasis on qualitative approach compared to quantitative	12
1.3	Photovoice Approach	13
1.4	Problem Statement	15
1.5	Objectives of the Study	16
1.6	Research Questions	17
1.7	Theoretical framework	17
1.8	Conceptual Framework	21
1.9	The Rationale of the Study	24

1.10	Importance of the Study	24
1.10.1	Importance to the teacher	25
1.10.2	Importance to the secondary students	25
1.11	Limitations	25
1.12	Operational Definition	26
1.12.1	Behaviour	26
1.12.2	Statistics anxiety	26
1.12.3	Photovoice	27
1.12.4	Peer	27
1.12.5	Communication	27
1.12.6	Teacher	28
1.13	Summary of the chapter	28
CHAPTER 2	LITERATURE REVIEW	29
2.1	Introduction	29
2.2	Anxiety	29
2.3	Statistics Anxiety	30
2.3.1	Previous Research on Statistics Anxiety	30
2.3.2	Students and statistics anxiety	37
2.3.2.1	Students and cognitive symptoms of statistics anxiety	38
2.3.2.2	Students and emotional symptoms of statistics anxiety	39
2.3.2.3	Student and physical symptom of statistics anxiety	39
2.3.2.4	Dispositional antecedents of statistics anxiety	40
2.3.2.5	Environmental antecedents of statistics anxiety	41
2.3.3	Statistics teacher and statistics anxiety	42
2.3.3.1	Statistics anxiety and teacher speech	43
2.3.3.2	Statistics anxiety and teacher behaviour	43
2.3.4	Peer and statistics anxiety	44

	2.3.4.1	Statistics anxiety and peer behaviour	44
	2.3.4.2	Statistics anxiety and peers' speech	45
2.4		Review on Photovoice	45
	2.4.1	Strengths of Photovoice	47
	2.4.2	Weakness of Photovoice	48
	2.4.3	Comparison between Photovoice approach and other approaches	49
2.5		Summary of the chapter	50
CHAPTER 3		RESEARCH METHODOLOGY	53
3.1		Introduction	53
3.2		Research design	53
3.3		Participants sampling	55
3.4		Instrumentations	56
	3.4.1	Statistics anxiety rating scale	56
	3.4.2	Structured interview questions	59
	3.4.3	Validity and reliability of the instrument	60
3.5		Data collections	61
	3.5.1	Dealing with shortcomings of Photovoice in this research	63
	3.5.2	Photovoice Method of Data collections	63
	3.5.3	Connection and consultation with the school authority	64
	3.5.4	Appropriate planning of the Photovoice project.	64
	3.5.5	Training and recruiting Photovoice participants.	65
	3.5.6	Launching the Photovoice research	66
	3.5.7	Interview sessions	66
	3.5.8	Report on the Pilot Test	66
	3.5.9	Method of data analysis	69
3.6		Summary of the chapter	70
CHAPTER 4		DATA ANALYSIS	71
4.1		Introduction	71

4.2	Data analysis of the participant	71
4.2.1	Gender distribution of the participants	71
4.2.2	Race analysis of the participants	72
4.3	Level of statistics anxiety analysis	73
4.3.1	Categorisations of statistics anxiety analysis	73
4.4	Photovoice structured interview responses analysis	74
4.4.1	Teachers' influence statistics anxiety structured interview analysis	74
4.4.2	Peers' influence statistics anxiety structured interview analysis	90
4.5	Summary of the findings	100
4.6	Summary of the chapter	101
CHAPTER 5 DISCUSSIONS, IMPLICATIONS AND RECOMMENDATIONS		103
5.1	Introduction	103
5.2	Discussion	105
5.2.1	Level of statistics anxiety	105
5.2.2	Factors of statistics anxiety	105
5.2.2.1	Teachers' influence statistics anxiety	106
5.2.2.2	Peers' influence statistics anxiety	108
5.3	Implications	109
5.4	Recommendations	110
5.5	Suggestions for further study	112
5.6	Conclusions	112
REFERENCES		115

LIST OF TABLES

TABLE NO.	TITLE	PAGE
Table 2.1	Previous study on statistics anxiety	34
Table 2.2	Summary of the strength of Photovoice	47
Table 2.3	Summary of the weaknesses of Photovoice	49
Table 3.1	Godbey mathematics anxiety rating scale (MAR) version	57
Table 3.2	Researcher adapted version from Godbey mathematics anxiety rating scale (MAR) to cognitive, emotional and physical statistic anxiety rating scale (CEP_STA)	57
Table 3.3	Teacher phase – Statistics anxiety structured interview questions	59
Table 3.4	Peers’ phase – Statistics anxiety structured interview questions	59
Table 3.5	Validity comments for CEP_STA	60
Table 3.6	Reliability Items	61
Table 3.7	Reliability Statistics	61
Table 3.8	Reliability Items Nine steps of implementing Photovoice approach by (Palibroda et. al., 2009)	62
Table 3.9	Six steps of conducting Photovoice in statistics education developed by researcher	62
Table 3.10	Shortcoming or challenges	63
Table 3.11	The summary of the Photovoice plan of this study	64
Table 3.12	Pilot study theme and sub-themes of the findings in Nvivo 12 Plus	67
Table 3.13	Summary of Photovoice findings in pilot study	67
Table 3.14	Identified symptoms in pilot study	68
Table 3.15	Means-score range of mathematics anxiety	69
Table 3.16	Themes and sub-themes to be used for the findings of this study	70
Table 4.1	Gender analysis of the participants	72
Table 4.2	Race analysis of the participants	72

Table 4.3	Race analysis of the participants	74
Table 4.4	Number and percentage of students with low, medium and high anxiety	74
Table 4.5	Teachers' influence statistics anxiety in terms of behaviour interview findings	77
Table 4.6	Teachers' influence statistics anxiety in term of speech interview findings	82
Table 4.7	Identified symptoms in term of teachers' influence statistics anxiety interview findings.	86
Table 4.8	Summary of the analysis of subsections arising on teachers' influence statistics anxiety	88
Table 4.9	Peers' influence statistics anxiety in term of behaviour interview findings	92
Table 4.10	Peers' influence statistics anxiety in term of speech interview findings	95
Table 4.11	Identified symptoms in term of peers' influence statistics anxiety interview findings	98
Table 4.12	Summary of the analysis of subsections arising on peers' influence statistics anxiety	100

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
Figure 1.1	A pictorial representation of theoretical framework of this research illustrate in Venn diagram	20
Figure 1.2	A pictorial representation of conceptual framework of this research	23
Figure 3.1	A pictorial representation of theoretical framework of this research illustrate in Venn diagram	54
Figure 4.1	Example of transcript on teacher's speech	75
Figure 4.2	Example of transcript on teacher's behaviour	75
Figure 4.3	Example of full transcript on teacher's behaviour and speech	76
Figure 4.4	Example of transcript on peer's speech	90
Figure 4.5	Example of transcript on peer's behaviour	90
Figure 4.6	Example of transcript on peer's behaviour and speech	91
Figure 5.1	Summary of findings on factors of statistics anxiety among secondary students	104

LIST OF ABBREVIATIONS

Covid-19	-	Coronavirus Novel 2019
CEP_STA	-	Cognitive, Emotional, Physical symptoms statistics anxiety rating scale
SPSS	-	Statistical package for social sciences
Nvivo	-	Qualitative data analysis software package
UTM	-	<i>Universiti Teknologi Malaysia</i>
Moe	-	Ministry of Education
PPPM	-	<i>Pelan Pembangunan Pendidikan Malaysia</i> Malaysian Education Development Plan
KBSM	-	<i>Kurikulum Bersepadu Sekolah Menengah</i> Integrated Secondary School Curriculum
KSSM	-	<i>Kurikulum Standard Sekolah Menengah</i> Secondary School Standard Curriculum
SPM	-	<i>Sijil Pelajaran Malaysia</i>
DSKP	-	<i>Dokumen Standard Kurikulum Penilaian</i> Curriculum and Assessment Standard Document
BPK	-	Curriculum Development Division
STARS	-	Statistical Anxiety Rating Scale

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Letter of Data Collection	127
Appendix B	CEP_STA Validation Form	128
Appendix C	CEP_STA Questionnaire	141
Appendix D	Structured Interview Question Validation	145
Appendix E	Pilot Test Report	150
Appendix F	Quantitative data from CEP_STA	155
Appendix G	Level of statistics anxiety	161
Appendix H	Structured Interview Transcript	164

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter tells about the background of the study on the factors of statistical anxiety among secondary school students. The purpose of this study is to examine the factors of statistical anxiety and to identify factors of statistics anxiety based on behaviour and speech of teachers and students influence in statistical learning in the classroom through the perspective of students. Thus, could help educators who teach mathematics and statistics to improve their teaching quality especially for statistical topics. Besides that, this chapter explains about the problem background, problem statement, objectives of the study, research questions, conceptual framework of the study, importance of the study, operational definition and the conclusion.

Secondary school education is very important before reaching to tertiary level. The secondary school Mathematics curriculum aims to form mathematically minded and skilled individuals who apply mathematical knowledge effectively and responsibly in problem solving and decision making, so as to be able to deal with challenges in daily life in line with scientific and technological developments. Students must follow three division of subjects at the secondary school level, namely core, compulsory and elective. One of the core subjects is Mathematics with a minimum time allocation of 112 hours per year (Surat Pekeliling Ikhtisas, 2019). The old curriculum (KBSM) is replaced by the new curriculum known as Secondary School Standard Curriculum (KSSM) started on 2017. Through the Curriculum and Assessment Standard Document (DSKP) at the Secondary School Standard Curriculum (KSSM) level, among the areas of learning in upper secondary mathematics in Form 4 and Form 5 are Relation, Algebra, Statistics and Probability (Curriculum Development Division, 2018). Curriculum Development Division (BPK), Ministry of Education Malaysia stated in Mathematics Syllabus where Mathematic is

important in providing workforce capable of meeting the needs of a progressive nation. Thus, in line with the national objective to create a knowledge-based economy, Research and Development skills in mathematics are nurtured and developed at the school level.

Learning statistics plays an important role in tertiary level. It is a compulsory for the students to take statistics courses (Reeinna, 2014). But, studies found difficulty among students in learning statistics since secondary level. Learning statistics is compulsory subject for students in pursuing secondary studies. The importance of studying statistics in secondary level as early preparation before entering tertiary level. Students who do not fully expert in statistics topic will need extra effort later. In studying statistics at secondary school, students are exposed by analysing data from grouped and ungrouped data. One of the important topics in mathematics education in secondary school is statistics because it is used in almost all fields such as university studies, computer science, engineering and physics where students will use statistics to solve problems such as mean, median, mode, variance, graph and so on. In statistics secondary, students are targeted to learn on data collection, frequency, frequency timetable and class interval, pictographs, bar charts, pie charts and line graphs, histograms and frequency polygons, frequency of pile and ogive, measurements of central tendency: mode, mean and median, scatter measurement: range and range between quartiles. Master the basic skills of mathematics using algorithms and relation. Among the examples that are often seen today is the use of graphs to display positive patient data of 2019 Novel Coronavirus (2019-nCoV or Covid-19) on television screens. Furthermore, individuals who study statistics are not only able to draw graphs but can analyse data from those graphs well. Each individual is able to read the data with the statistical skills learned even by using basic concept of statistics.

Recently, various initiatives have been commenced in the world of education to ensure that students get an interesting learning experience and can be applied in their daily lives, especially in statistical learning among high school students. In addition, the initiative also helps students in their preparation to enter higher education and the world of work. Unfortunately, the level of statistical anxiety is very bothersome for every educator. The importance of statistics in the Sijil Pelajaran

Malaysia (SPM) for mathematics examination contributes to the large percentage of marks. With the new syllabus of KSSM Form 4, statistics are known as the dispersion measures for ungrouped data. The content is slightly differ from the previous statistics learnt in KBSM. As well known, statistics is a rather challenging topic for some students because there are formulas such as variance and graph concepts that need to be understood such as reading and analysing information from the graphs. The statistical calculation involves many data analysis questions drawn by using formulas. It aims to educate and train students to better understand the use of the measures of dispersion in statistics rather than just memorizing for the exam. In SPM level, every Form 5 student who sits for Mathematics examination will focus to score at least 11% percentage marks which help students a lot in order to pass. The percentages of the marks are consist of 3 marks from Paper 1 and 12 marks in Paper 2. If it is a failure to do so, students are thought to have difficulties in doing the other part of the paper. The percentage of 11% marks is a huge amount to bear because the other percentage of 89% consists with algebra and other difficult topics. The adventure in facing the crisis is the statistics anxiety. Thus, the pressure to score the statistics part give effects on anxiety level among students towards statistical papers.

Challenges in learning statistics in the classroom are included by certain factor such as anxiety. According to Williams (2010), an individual with anxiety has trouble identifying a legitimate source of threat, yet they expect something destructive or other painful to happen with a certain stimulus. Every human being has a variety of interpretations of anxiety. Some are caused by own-self, friends, teachers or the environment. According to (Williams, 2010; Barlow, 1988), anxiety involves the perception of lack of control over future events and that it may be related to a number of different situations. There are various symptoms that a person experience if they are worried about something, this involved symptoms in terms of cognitive which explains about the way of thinking of an individual, emotional which include the emotion of an individual and physical which include the appearance seen such as sweat and shivering. In term of statistical learning, according to Jacofsky et al. (2019), cognitive symptoms is thoughts that come to mind when we feel anxious about a situation such as “I won’t be able to solve statistics problem”, “People will laugh at me if I can’t simply answer the statistics question given” or “What if something happen if I try to answer and failed?”. This is supported by Bourne (2000) that the thoughts people

experience when anxiety is usually referred to as anxiety. Another symptoms related to the physical anxiety refers to how we experience anxiety in our body such as sweating, heart palpitations, chest pain or uneasiness, muscle pressure, feeling shaky, nausea and / or diarrhoea, "butterflies" in the stomach, dizziness, or feeling faint, numbness, or tingling sensations, obsessive response is shocking, having sleep disorders or easily feel tired. Furthermore, Jacofskyl et al. (2019) stated that emotional symptoms is an emotion that produces a set of feelings such as hesitation, misery, fear, nervousness, feeling speechless, panic, awkwardness, worry, fear or terror, restlessness or tenseness.

Statistics anxiety is often associated with students' mathematical anxiety. Some researchers attributed the statistic anxiety is influenced by mathematics anxiety. According to Baloglu (2004), statistical anxiety is a moderately new construct and is related to but unlike from mathematical anxiety. According to Bui & Alfaro (2011), although both types of anxiety are related to the stress felt by students when faced with mathematical reasoning, Baloglu (2004) states that statistical anxiety is different because students also have worries involving verbal reasoning manipulation of mathematical symbols needed in understanding statistics. Statistical anxiety can affect students' interest in learning in the classroom. Mental and emotional bother of students could affects the psychology of learning, thus affecting the achievement when performing statistics exercises and in examinations. This is supported by Wilson (1996) where statistical anxiety can result in poor performance, mental illness and denial of interest in statistical courses. Statistical anxiety is the stress faced by individuals that has a negative impact on statistical learning. Statistical anxiety is influenced by the symptoms that act as the catalyst for its existence. According to Perepiczka et al. (2011), three categories of variable were identified where situational, dispositional, and environmental are related to statistics anxiety (Onwuegbuzie & Wilson, 2003). Situational experiences are factors that surround the student, including previous statistics experiences (Sutarso, 1992). The researchers found a negative connection between the number of completed mathematics courses and statistics anxiety (Auzmendi, 1991; Robert & Saxe, 1982; Zeidner, 1991). According to Forte (1995), the researcher found little previous mathematic experience, late introduction to quantitative analysis, and lack of mental imagery as factors contributing to statistics anxiety among community work students.

Factors that might contribute to the statistics anxiety are dispositional and environmental antecedents where dispositional antecedents is referring to the intrapersonal factors and environmental antecedents is referring to the interpersonal factors that affect students in or outside the classroom. The prefix "inter" means "between" and the prefix "intra" means "within." Students that have interpersonal skills are great at communicating to others while students who has great intrapersonal awareness has a very solid sense of their own identity and personality, so does if the students have low interpersonal and intrapersonal skills. Students may be exposed to low dispositional antecedents such as extreme fear that learning is impaired due to unpredictable, as well as interpersonal factors, environmental antecedents such as influencing behaviour when learning and dealing with people such as teachers and peers.

In relation with study, Onwuegbuzie & Daly (1999) stated that, dispositional antecedents are intrapersonal factors students bring to the classroom, which includes concerns such as perfectionism besides perception of abilities at developmental stages in life (Pan & Tang, 2004). Walsh and Ugumba-Agwunobi (2002) found evaluation concern, fear of failure, and perfectionism provoked statistics anxiety among students. Liu et.al (2007) stated that dispositional theme is concerned with the extent to which individuals perceive control over themselves and/or their environments, and it is best operationalized through the locus of control and self-efficacy constructs. Thus, dispositional antecedents play an important role in order to examine the level of anxiety among secondary students in learning statistics.

Unlike dispositional antecedents, environmental antecedents are interpersonal factors related to the classroom experience (Onwuegbuzie et al, 1999), which can include the student's experiences with the teacher. A strong instructor-student relationship is a key factor in academic achievement in statistics courses (Waples, 2016). Stipek (2006) notes that secure relationships not only support persistence when students face difficult course material but also enhance communication, thus encouraging students to ask for help when they need it. Tomazie and Katz (1988) reported previous experiences in statistics courses have influenced learning in a current course.

Students with the lowest stages of perceived capability had the highest levels of statistics anxiety (Onwuegbuzie (2000). Being more frequently and persistently involved with learning statistics might increase the students' confidence with typical requirements and methods (Waples, 2016). Researchers have suggested that self-efficacy, broadly defined as the level of confidence a person has in their ability to obtain a particular goal (Bandura, 1977), may be one of the key factors in determining the outcome of statistics anxiety on learning and performance. Students who score higher on these statistical measures tend to perform better on statistical tasks or in statistics courses, and also tend to report having lower levels of anxiety (Finney & Schraw, 2003). This study will be able to investigate deeper into students' anxiety about learning statistic in terms of behaviour and speech of peer and teacher.

1.2 Problem Background

This subtopic explains about the background of the study that lack of emphasis on statistical anxiety compared to mathematical anxiety. Furthermore, this subtopic also explain the factors that cause statistical anxiety compared to the exploration of statistics anxiety. Also, most of the studies of statistics anxiety are related with graduate students compared to secondary school students. Moreover, the research gap are looking for the lack of qualitative statistical anxiety studies compared to quantitative studies.

1.2.1 Lack of emphasis on statistical anxiety among students

Statistics is one of the important areas in mathematics learning in schools. The relationship between statistics and mathematics at the school level needs serious attention. Weaknesses in statistical topics give rise to skill continuity at the next level. Thus, researchers assessing mathematical anxiety at the school level has a major impact on statistical anxiety as well. It is well known that statistics are an important topic in Mathematics in secondary school. This is due to the use of statistics in the field of technology and science that are valuable today. Malaysia needs experts in the field

of technology and innovation in the face of the rapid development of the education ecosystem which caused the Malaysian Education Development Plan (PPPM) for the framework of 2013-2025 that began to take place in the world of education as a manifestation of government in helping to improve the quality of education. Education that starts in school needs to be emphasized to produce a generation that thinks far ahead. Thus, KSSM was first introduced to replace the Integrated Secondary School Curriculum (KBSM) in 2017 with the aim of making the national curriculum more holistic and relevant. Under KSSM, Mathematics is one of the core subjects. The attention in scoring higher percentage in statistics topic increase the anxiety towards the expectance. The study's focus on diminished mathematical anxiety on statistical topics requires serious consideration. According to Onwuegbuzie et al. (1997), statistics anxiety has been found to be related to mathematics anxiety. This is due to a study that found that the level of anxiety of school children towards mathematics should not be taken lightly. According to (Arem, 2003; Marzita, 2002), extreme mathematical anxiety and indifference will leave a negative impact on students. According to Valero & Skovsmose (2012), this is a worrying vicious cycle that require to be talked seriously. Thus, determination of exploring the factors should be put into trying to introduce any intervention to break it.

Learning statistics is a fundamental in school as Rosli, Maat and Rosli (2017) stated that students must equip themselves with statistical knowledge in order to prepare themselves on how importance statistical learning. Learning statistics topic in mathematics subjects is essential in secondary level as it acts as an introduction to tertiary level statistics. Statistics topic carries twelve marks in the Malaysia Education Certificate (SPM) paper which carries higher percentage in passing the paper. Unfortunately, feelings of anxiety affects the way of learning statistics among students as the expectation increases. Students' curiosity about the application of statistics in real life effect the learning process in the classroom. According to Schau (2003), the real objective of the statistics education is to make sure the students can think statistically in the real life. The way of thinking among the students are different.

According to Koh & Mohd Zawi (2014), students come from a variety of backgrounds such as different social status and may not have much experience with

numbers. Some of the students have limited access to good education due to socioeconomic background. This will influence the learning style towards the statistics topic in mathematics classroom among the students. They felt that they are not good with numbers, graphs, formulas, especially when most of the secondary school students learned various subjects in school. This is supported by Lai, Tanner & Stevens (2011) that the student's attitude and anxiety toward statistics may be influenced by their mathematics competence. The level of statistics anxiety are related with the level of understanding in learning mathematics in secondary school.

Faizal (2012) stated that the fundamentals of mathematics need to be put together as one in formal education to all students from elementary school to university and everyday life. However, most students today are not interested in mathematics because for them it is very difficult to understand and practice (Shahidah, 2015). The previous researcher also stated that, the level of mathematics mastery among students in Malaysia is still less impressive because students consider this subject to be boring and not important to be emphasized. The lack of awareness towards the importance in learning mathematics influence the level of statistics anxiety among secondary students. Based on the previous studies, the researcher found that students' acceptance towards mathematics subjects greatly affected student's interest and skills in statistics.

From the previous studies, the researcher found that students tend to get bored of subjects that require them to think critically and then to despair from showing seriousness in learning. Any type of calculations. Worryingly, boredom in statistics lesson makes learning less fun. Learning statistics is actually fun by guessing which formula to use, drawing the graphs by using pencil and analyse the data. But, according to (Garba, 2020; Mutodi & Ngirande, 2014), many students perform less well and have difficulty learning in mathematics. As the statistics lesson were in Mathematics syllable, the fact of low achievement in statistics should be taken in measure. Thus, the contributing factors to mathematics achievement in Malaysia are the influence of attitudes, interests, peers and teachers (Shahidah, 2015) should be looking forward into the deeper observation.

According to the study of students' anxiety towards statistics, Rosli et al (2017) found that the level of statistical anxiety among students are moderate and the findings of this study showed a lot of concern about class and test, consistently as Koh and Mohd Khairi (2014) stated that in their findings that students did not show their anxiety as a whole, however, a high degree of anxiety was noted in mathematics classes. Students are exposed with negative perceptions from their friend either from the senior or from the different classes. Rosli et al (2017) stated that anxiety have a relationship where negative attitudes will increase student anxieties over statistics as students' novice the knowledge and statistical content. This is supported by Chiesi and Primi (2010) that statistical anxiety can influence the student's beliefs' towards the course.

The researcher found that the statistical anxiety has been widely but limited in the context of Malaysian education mostly to the secondary students regarding the statistics anxiety in university. Some studies usually focused on mathematics in elementary and secondary school. Koh & Zawi (2014) stated that previous studies have shown that students reported high level of statistics anxiety during a statistics lesson, unfortunately, there are limited studies on statistics anxiety.

Most of the previous studies were focused on mathematics anxiety as per following: Mazalan (2012) studied the factor on achievement in learning mathematics anxiety in secondary school in Pontian which aims at identifying the leading factor to the achievement among Malay students. Mutodi & Ngirande (2014) did an exploration towards mathematics anxiety with objective to explore the level of students' mathematics anxiety at a chosen tertiary organisation in South Africa. Mutawah (2015) focused on the influence of mathematics anxiety in middle and high school students Mathematics' achievement in Bahrain. Ng (2012) mathematics anxiety in secondary school students in Singapore. More studies on mathematics anxiety were found as becoming the worldwide issues. As mathematics are probably the most important subject for every students, the lack of statistics anxiety information among secondary students are to be profound. The less information gained from secondary school students' might affect the statistics anxiety in future.

1.2.2 Lack of emphasis towards factors of statistics anxiety

Learning statistics as one of mathematics syllable in secondary school is fascinating. The fun of learning on how to draw the graphs, use the formulas and analyse the data are quite intriguing. The importance of learning statistics are well-known for the top classes but not acceptable for some low-achievable students from bottom classes. The expectation to score in statistics places students into a high level of statistics anxiety. Not all students who were good in mathematics, are also good in statistics. Some of the students are having difficulties to draw the graphs well because of the motor skill, to understand the concept of analysing the data or even worse, to insert the correct value in the formula of statistics even though it is given at the front page of exam paper. Students learn mathematics since primary school. Hadfield and McNeil (1999) stated that most of the students facing mathematics anxiety since primary school. Not all students are exposed to calculations at an early education at home. The factors influencing the level of statistics are somehow related to mathematics as a core subject.

Most of the studies are not focusing on factors which cause the anxiety but more towards exploration of the anxiety. According to Arsaythamby (2006), the affective abilities in learning mathematics are attitudes, fears and habits. Students who acted to not like statistics love questioning on the importance of learning it in everyday life. Puteh (2014); Arem (1993) & Marzita (2002), have found that there are many aspects that brought to the mathematics anxiety such as curriculum weakness, negative experiences in learning mathematics, stress, teacher's behaviour and teaching style, thoughts and expectations of family and peer influences. According to Cemen (1987), anxiety in mathematics is defined as a discomfort state created when students are required to perform mathematical tasks. These discomfort states including the symptoms such as hatred, worrisome, and terror, with specific behavioural manifestations such as tension, frustration, distress, helplessness and mental disorganization when handling mathematical tasks (Richardson & Suinn, 1972). While, Baloğlu & Paul (2015) explained that statistics anxiety is proposed to be a multidimensional construct that embraces factors such as statistics test and class anxiety, interpretation anxiety, anxiety related to asking for help, computational

anxiety and anxiety related to statistics instructors such as teacher. Some factors have been found to affect statistics anxiety such as statistics-course or instructor related features, personality-related elements, and factors related to students' gender, age, study major, ethnicity, and college status. Most of the difficulties with statistics are due to non-intellectual factors such as misconceptions, perceptions, and anxiety (Baloğlu & Paul, 2015).

1.2.3 Lack of emphasis on statistic anxiety on secondary level

The researcher found that the statistical anxiety has been widely but limited in the context of Malaysian education mostly to the secondary students compared to the statistics anxiety in university level. Statistics in secondary school is placed under mathematics subject. Most of the studies focused on mathematics compared to statistics because statistics lesson is not too challenging compared to university life. The important of learning statistics in university such as research purposes are definitely challenging. And, the researcher found the importance of study towards statistics anxiety at secondary level, since most of the studies are focusing on statistics anxiety on graduate level.

Malik (2015) did a phenomenological study towards undergraduates' statistics anxiety which involved mathematics anxiety scale that is revised to measure students' statistics anxiety scores. In the study, Malik revealed that undergraduates from a non-mathematics background, having high statistics anxiety, feel challenged while in statistics class, solving statistical problem, taking tests, or speaking in front of their peers, whereas Koh & Zawi (2014) did a study on postgraduate students in UKM, Malaysia to explore the level and factor of statistics anxiety by using quantitative approach. Williams (2010) also in the study, focused on the relationship between instructor immediacy and graduate students statistics anxiety. The limitation on statistics anxiety in secondary school trigger the researcher on digging the situations from secondary school point of view.

1.2.4 Lack of emphasis on qualitative approach compared to quantitative

According to Malik (2015), there were many quantitative studies provide insight into the negative experiences of students with statistics anxiety, as well as the factors that reduce anxiety levels, unfortunately a little studies used qualitative research exists on this subject. Some of the studies used a quantitative approach instead of qualitative approach where the ability to reach for a conclusion have a limitation. Most of the researcher in their previous studies practised quantitative to analyse the data by using SPSS and explain with numbers to support the findings while in looking forward to qualitative study of statistics anxiety, the use of qualitative in research is to get clearer data from respondents' view, the honesty in giving opinion and to gather detailed information from participants. In addition, to use quantitative is easier to gather the data collection compared to qualitative.

Chew & Dillon (2013) used quantitative approach to investigate the relationship between statistics anxiety and the Big Five personality factors using a multivariate approach by using Statistical Anxiety Rating Scale (STARS) (Cruise et al., 1985). Wilson (1997) used quantitative method to examine the relationship of the anxiety felt by students in statistics lessons to their characteristics and to the teaching strategies used by their instructors to decrease anxiety in the statistics classroom and also to measure the extent to which statistics instructors use those teaching strategies purported in the literature to reduce anxiety in the statistics class. Hamid & Sulaiman (2014) used quantitative approach to discover the pattern of the connection between performance in a statistics course and the six subscales of STAR. The use of quantitative approach are expected to help the trainers of statistics to comprehend the students' characteristics that effect their capability to accomplish in a statistics course. Koh & Zawi (2014) also used quantitative method to explore factors that are associated with statistics anxiety.

Meanwhile Onwuegbuzie et al. (1997) explored students' attitudes and perceived experiences in a middle statistics class in a department of education engaged the study in interviews, focus groups, and journal writing as a method. Limited qualitative research is available on factors and specific situations that lead to negative

feelings and experiences of students in statistics classes or on how teachers and educators can address these factors. Malik (2015) used qualitative as an attempt to discover students' learning with anxiety issues in the broader context of statistics education by focusing on factor contribute to their heightened and reduced levels of statistics anxiety among students in undergraduate university. Thus, due to limited access of using the qualitative toward determining the factor of statistics anxiety among secondary school students, the researcher aim to use qualitative approach to determine the factor of statistics anxiety from students' perspective.

Other than that, studies also found that the study on secondary students have a limitation on the approach used such as interview the individual respondent or study on photographs taken by the selected respondents. Thus, this has been the reason why studies on statistics anxiety among students need to be conducted by using Photovoice approach. The previous study found to be using Photovoice approach were (Garba, 2020) where the researcher explore the factors of mathematics anxiety. Thus, the researcher grab the opportunity to explore factors towards statistics anxiety by doing revised version of mathematics rating scale towards statistics rating scale.

Therefore, this study was conducted to obtain more information on statistical anxiety factors among secondary school students. The results of this study are expected to identify statistical anxiety factors and help educators to improve the quality of teaching and learning statistics in the classroom.

1.3 Photovoice Approach

According to Abma & Schrijver (2019), Photovoice is a child-friendly method used to place children in topic areas to inspire study and social change. Photovoice is a technique of academic study involving persons who generate and discuss pictures as a means of encouraging community and self-change (Caroline, Wu, Zhan & Kathryn, 1998). This method is a qualitative method because the detailed data computation is not involved and this could lead to get clearer image of the situation.

Photovoice is the only method that uses photography as a research strategy (Heidi, Lisa & Anna, 2013). Photovoice, as a community-based participatory action research, known as (PAR) approach or method (Liebenberg, 2018). Photovoice approach is the process by which people can identify, represent, and improve their communities through a specific photographic technique based on three aims; (1) to enable the public to record, register and provide reflection on the strengths and concerns of their community (2) to promote critical dialogue and knowledge on important issues through discussion of large and small group pictures, and (3) to achieve greater awareness of policymakers. In this research, the study will focus pay attention towards promoting serious discussion and information on important issues through dialogue of large and small group pictures.

Photovoice places the viewpoints of participants at the center of the work. Amanda, 2017 in “Photovoice Research in Education and beyond” stated that photovoice is a form of participatory action research, participants typically have high levels of input throughout all aspects of the project.

The photovoice method is described in detail to provide comprehensive information as a guide for future research. The Photovoice method aims to expose respondents' viewpoints of their world and the different challenges that individuals face on certain factors, thus becoming a method of extensive data collection. In using the photovoice method, participants were asked to photograph what was important in their everyday world, paying particular attention to the phenomenon they were interested in (Heidi, Lisa & Anna, 2013). The resulting images will be used as excerpts for discussion of the meaning attached by the participant to the documented activity or object. The image generated by the respondents will be used as the topic for discussion.

The strength such as where and when to apply, a weakness, which includes the restraint, ethics and the review of past research on Photovoice, were also highlighted in Chapter 2.

1.4 Problem Statement

Statistics are considered as complex field. Statistics is related to mathematic, probability, calculator, and computer. The relation between the importance of mathematics, learning statistics in university influenced by the mathematics' achievement in secondary levels. Most of the studies focused on mathematics compared to statistics because statistics lesson is not too challenging compared to university life. The important of learning statistics in university such as research purposes are definitely challenging. But, the researcher found the importance of study towards statistics at secondary level in order to explore if there is any influence towards statistics anxiety in the next level? By exploring the situation of mathematics anxiety in secondary school, the researcher will be able to finding the influence in statistics anxiety too.

Feeling of having anxiety towards learning statistics need to be taken seriously. As it is known, some students delaying taking statistics course in tertiary level due to negative behaviour they have from previous experience. The consequences of multiple influences may be contribute to the problem. Attitude might be one of the factor causing to student's anxiety as stated to Rosli et al (2017) where attitude and anxiety have a relationship with each other where negative attitudes will increase student anxieties over statistics as students' novice the knowledge and statistical content.

Besides that, different students have different level of statistics anxiety. The influence of mastery in mathematics might be one of the factor of students to have different level of statistics anxiety as supported to Lai et al (2011), the student's behaviour and anxiety toward statistics may be influenced by their mathematics competence. Moreover, level of anxiety of students are difference as students may see

statistics as difficult and unpleasant. The ability to handle the dilemma is difference depending on acceptance of individual.

Furthermore, teacher and peer also contribute toward the influence of statistics anxiety among students. There are many studies conducted in Malaysia regarding on mathematics anxiety, thus could help to represent and understand the issue related on statistics anxiety in secondary level. Thus, this study aims to examine the factors of statistics anxiety among secondary students from the students' perspectives in Pasir Gudang, Johor. Thus, the researcher finds it is necessary to explore and examine the teachers and peers factors to the statistical anxiety by using Photovoice approach. Photovoice as stated earlier, is a qualitative research approach of collecting data that uses photography as a research strategy and to collect respondents' viewpoints of their world and the different challenges that individuals face on certain factors, thus becoming a method of extensive data collection.

1.5 Objectives of the Study

The purpose of this research is to examine the factors of statistics anxiety among secondary school students in Johor Bahru. Hence, the Photovoice approach is conducted in this research to:

- (a) To examine level of statistics anxiety among secondary students.
- (b) To examine teachers' influence on statistics anxiety among secondary students using the Photovoice approach.
- (c) To examine peers' influence on statistics anxiety among secondary students using the Photovoice approach.

1.6 Research Questions

Based on background of the problem, the research questions are as the following to be explored:

- i. What are the levels of statistics anxiety among secondary students?
- ii. How do teachers' behaviour influence the statistics anxiety among secondary school students?
- iii. How do teachers' speech influence the statistics anxiety among secondary school students?
- iv. How do peers' behaviour influence the statistics anxiety among secondary school students?
- v. How do peers' speech influence the statistics anxiety among secondary school students?

1.7 Theoretical framework

In order to study the factors of statistics anxiety, this study is linked to the theoretical framework through social cognitive theory which is the basis for identifying both teachers' and peers' influence in term of statistics anxiety among secondary students. The theoretical framework used by Bandura (1986) were suggested by Garba (2020) in the study of determining the factors in mathematics anxiety among secondary school students in Nigeria.

No human is born into the world haunted by statistical worries. It requires history, experience and influence from the environment. Bandura (1977) believes that humans are active information processors and think about the relationship between their behaviour and its consequences. This may be related to factors that may be involved in causing anxiety among students, including themselves. Self-reported anxiety is influenced by intrapersonal factors. As a result, it will affect learning and

life. Obviously at an early stage of child development, the child is statistics anxious free, but through interaction with the environment such as school and classroom, teacher and peer, students eventually start to develop statistical anxiety. This could interact with three types of modelling namely direct modelling, symbolized modelling and synthesized modelling as found by Bandura (1986) in behaviour theory. This is accordance with perception of Pan & Tang (2004), concerns such as perfectionism besides perception of abilities at developmental stages in life. The importance of handling anxiety need to be taken seriously.

Social cognitive theory is part of behaviourism (Bandura, 1986). Bandura's social learning theory highlights the importance of observing and modelling people's behaviour, attitudes, and emotional responses. Furthermore, Bandura developed social cognitive theory from a complete view of human cognition in relation to social awareness and influence. He emphasized that behaviour is directed by a combination of drivers, signals, answers, and rewards. Modeling is the tendency of individuals to copy behaviours they observe in others. According to Bandura (1986), there are three types of model behaviours; direct modeling, symbolic modeling and synthesised modeling.

Direct modeling occurs when students imitate the behaviour of models such as teachers or peers. For example, a teacher can show how to compute statistics questions or how to analyse data on a computer. Students will then do calculations and work by imitating teacher behaviour. Thus, imitation can occur either positively or negatively to the learning of statistics in the classroom. In a class of students who are not interested in statistics for their own reasons, these students are likely to mimic these behaviours directly and hence, will hate statistics. This will lead to high level of statistics anxiety.

Symbolic modeling takes place over an imitation of the behaviours displayed by characters in situation in statistics classroom, teacher or peers. When thinking about imitating characters, usually students will think about how they dress and how they act. However, symbolic modeling has been used to teach students various subjects in education. For example, using female's pictures in demonstrating statistics

phenomenon in classroom throughout the photovoice interview may lead to the male students to learn or perceived statistics as difficult and only meant for female, not for male students. In other example, students will observe their surrounding and take an example of a person such as peer as a role model or symbol and if that person gives positive influence, student will show less anxious towards statistics, so does vice versa.

Synthesized modeling is the development of behaviour by combining portions of the observed acts. For instance, the student may completely hate statistics by observing teacher's or peers' negative behaviour. However, peers' and teacher's positive attitude, behaviour and speech may yield or influence students' interest in mathematics (Garba, 2020).

Human behaviour is depended and shaped automatically and mechanically by surrounding factors (Bandura, 2001). Thus, positive learning experience of the environment will lead to better academic performance of the students and vice versa. Stajkovic (2014) stated that in social learning theory, learning regarded as knowledge through cognitive processes of information. According to Bandura (1999), individual were attributed to self-system that makes them come out with a measure control over their belief, feeling, and action. Students generally believe that peers are the ones who spend most of their time as potential assistants in an academic setting (Newman & Schwager, 2017). Thus, these perceptions can affect students' positive and negative learning. It can be if peers voicing negative experience gained from the social context as possible from home or their parents, although this narrative students tend to hate statistics and positively as possible otherwise. According to Marzita (2002), student's anxiety can affect their attitude towards certain subjects. The student's attitude and anxiety toward statistics may be influenced by their mathematics competence (Lai et al, 2011). In order to overcome the anxiety, study need to be taken to find out the factors contribute to the student's anxiety in learning statistic.

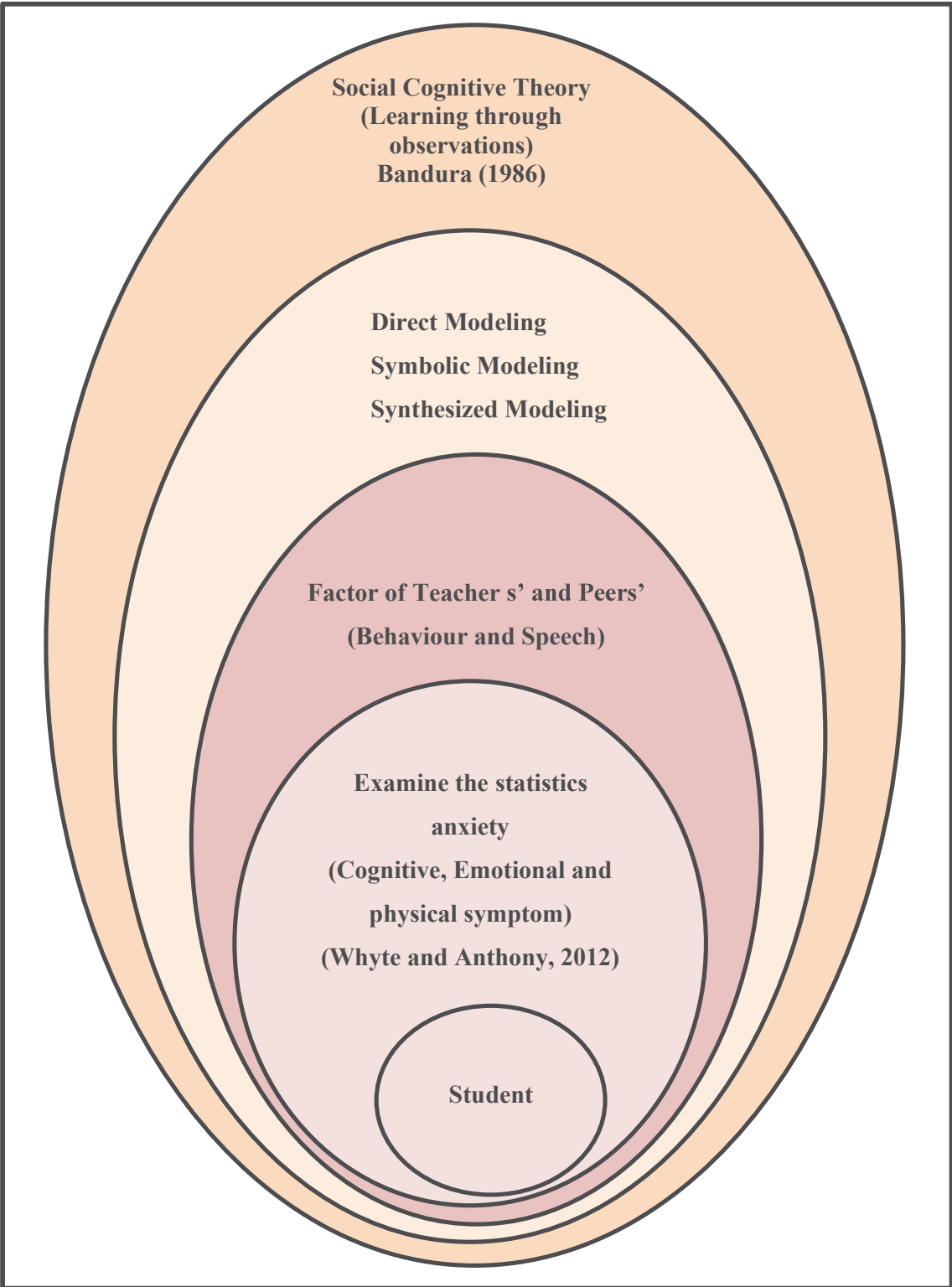


Figure 1.1 A pictorial representation of theoretical framework of this research illustrate in Venn diagram

Figure 1.1 illustrates on how students develop statistics anxiety through the interaction with the social situation. The social cognitive theory explains how individuals study new behaviour through observational learning. According to Stajkovic (2014), learning occurs as a result of observing the behaviour of others and expected consequences of that behaviour. Therefore, teachers' and peers' negative behaviour and speech with regard to statistics can easily lead to the anxiety students developed in the area and vice versa. The diagram describes how social environment can influence students' statistics anxiety. This can be from direct contact with peer or teacher, symbolic through pictures, television and textbook or through synthesized modeling where mixing some portion of behaviour or speech of either teacher or peer and complete hate or love of statistics.

The statistics' teacher sometimes contribute to the fear student developed in statistics education. Some of them use harsh statements, poor teaching style and excessive anger among others. However, teacher's positive behaviour and speech can easily sustain interest and reduce the level of anxiety for the subject. On the other hand, the diagram illustrates that peers as an immediate individual to the students also contribute to the students' anxiety in the subject. Peers' negative behaviour and speech such as, unhappy, less seriousness and narrating negatives talks in the area contribute a lot toward statistics anxiety same goes if peers' positive behaviour and speech such as, inspirational, serious towards lessons, happy go lucky and speak positively will led to lower statistics anxiety.

1.8 Conceptual Framework

This research intends to study the factors that cause statistics anxiety in Pasir Gudang, Johor from students' perceptive. The conceptual framework of this research is based on the suggestion by (Garba, 2020) which proposed Bandura to be applied. Garba in his studied, determining the factors of mathematics anxiety by using

Photovoice Approach. As a qualitative study, Photovoice approach will be used in order to identify the factors of statistics anxiety among secondary students.

The factors of statistics anxiety can be traced back to the work of Finney et al (2003), that the struggle students experience with statistics is not necessarily due to lack of intelligence or poor skill, but may be a result of motivation for further learning (Gal et al, 1994). As discussed earlier, there are three variables which relate to statistics anxiety as stated by Perepiczka et al (2011), the researchers identified three categories of variable where situational, dispositional, and environmental are related to statistics anxiety (Onwuegbuzie et al, 2003). Throughout this research, the researcher will focus more on dispositional and environmental antecedents. As dispositional antecedent is related with intrapersonal factors and environmental antecedent is related with interpersonal factors, the researcher will be able to determine factors that might effects statistics anxiety among secondary students.

Showing students less concern can easily lead to the statistics anxiety and some teachers may contribute to poor communication to their students. Social interactions with immediate surroundings such as social media, peers, friends and senior who have taken statistics classes also have their own percentage of contributions to the statistics anxiety. These factors are example of factors that led to environmental antecedents. Dispositional antecedents can be related as sources such as attitude, self-efficacy, examination, teachers, and peers have impact on the student's achievement and failure, as students are interacting to the factors throughout the semester. Intrapersonal factors might impact on student's behaviour personally.

The concept of Photovoice approach is depending on images or pictures given from the respondents chosen, and from the pictures, the researcher will study and discuss with participants about the idea of their concern and difficulties. The power of photographs cannot be underestimated, pictures can describe detailed information and influences the target audience or society and will lead to viral.

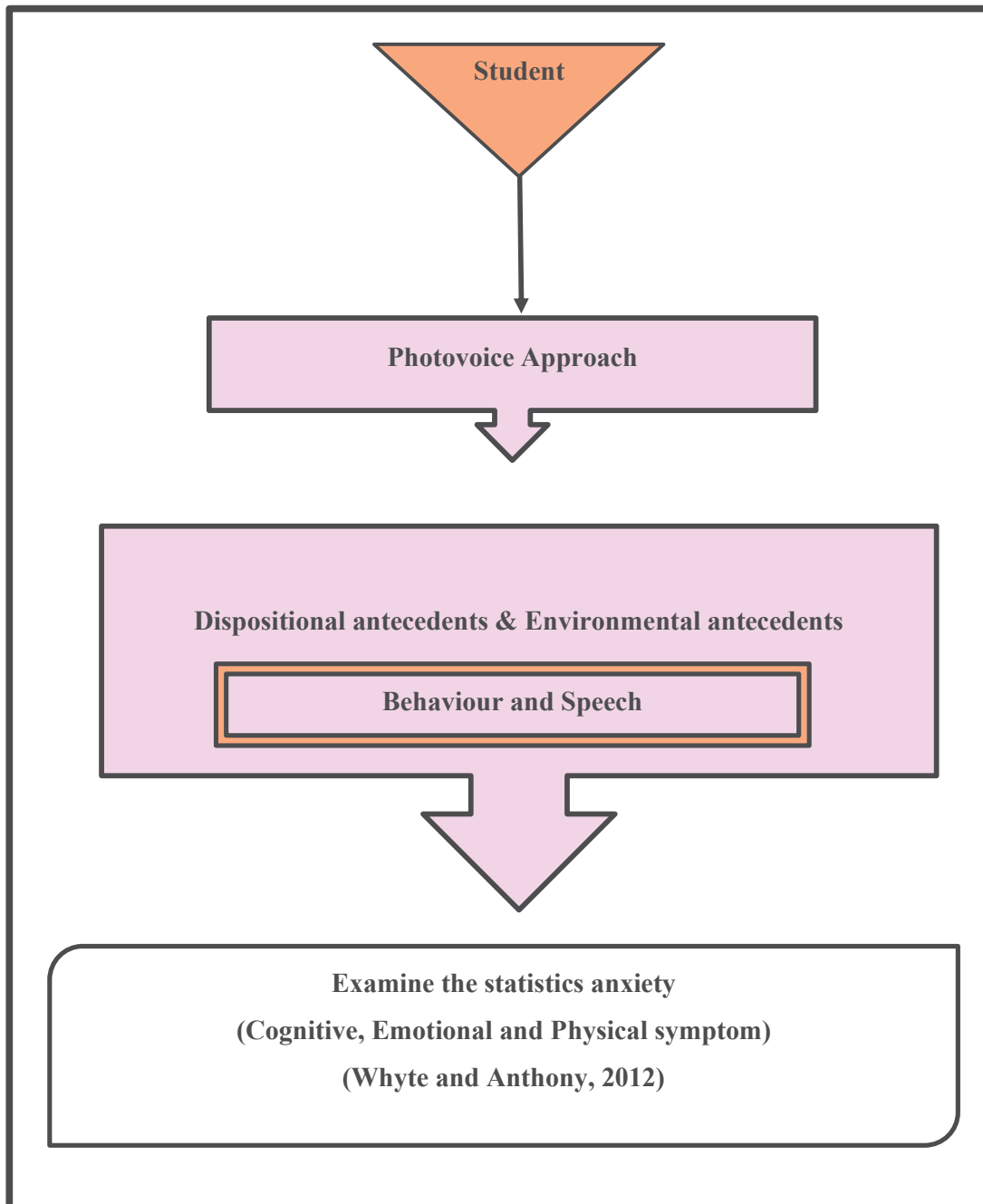


Figure 1.2 A pictorial representation of conceptual framework of this research

Figure 1.2 shows the consequences flow of the study as stated in objectives. The students as they key respondents for the study and is guided to identify and examine the factors of statistics anxiety. While Photovoice approach is used in collecting and analysing the data where students will take photographs which trigger

their concern and tensions in a statistic class. The researcher will interview the respondents in order to explore the behaviour and speeches and to take note of the factors information that could led to the factors of anxiety by focusing on dispositional and environmental antecedents. After the data is being analysed, the researcher could examine the factors of statistics anxiety among secondary students.

1.9 The Rationale of the Study

Learning statistics and knowing its importance in everyday life is undeniable important mostly to students. Many field in learning and data analysis involved of using statistics. Thus, this research is conducted to study the level of anxiety among students towards statistical learning. Besides that, this study is to determine the factors of teachers and peers influence on statistics anxiety among secondary students using Photovoice approach from students' perspective.

1.10 Importance of the Study

Learning statistics in secondary school is important as students need to get better understanding in order to help them in tertiary level through their research. Statistics teach students to be able to analyse the data from the formula and graph given and interpret correctly from basic to the steps taken in the calculation. Many researchers have carried out the study, but some areas cannot be fully explored due to specific constraints. Therefore, this study focused on factors of statistics anxiety for teachers and peers. There is very limited research on statistical anxiety in the secondary level in Malaysia.

1.10.1 Importance to the teacher

The main driver in the classroom is the teacher. Teacher as facilitator to facilitate students in learning and teaching that appeal to lure the attention and interest of students. Quality teachers will provide advantages in teaching and learning in the classroom as well as to improve student's achievement. This study will highlight teachers and peers in influencing the percentage of the student statistics anxiety. This can be helpful in controlling behaviour of students to be better, and can inject success in learning statistics.

1.10.2 Importance to the secondary students

Besides the teachers as a pillar in the classroom, students and peers also play a very important role. Teachers as educators and students as the learners. Both are interdependent and interrelated. Students and peers should be aware that they play a very important role in determining the contribution to the notion that statistical concerns that exist. Moreover, some students are unable to realise the weaknesses. Thus, this study actually helps students to identify and determine the factor of statistics anxiety in order to improve the quality of learning process.

1.11 Limitations

In order to focus on the objectives of the study, the researcher limited this study to teachers' and peers' behaviour and speech from students' views and opinions. This sample is limited to secondary school students in Pasir Gudang, Johor. Due to Movement Control Order (MCO) since March 2020, the collection data is influenced by the new norm.

1.12 Operational Definition

Below are some operational definitions used in this research.

1.12.1 Behaviour

According to Raidah and Fauzi (2017), behavioural refers to negative and positive behaviours including concentration, determination, persistence, which give impact to homework completion and classroom discussion during the Learning Statistics process. Attitudes toward statistical significance in education statistics because they are considered as factors that will affect the achievement of arithmetical literacy, or thinking (Watson, 2006). Behaviour to factors involved in the study will have an impact on students in determining the level of mathematics anxiety in statistics class. Rosli et al (2017) stated that anxiety and attitude have a connection with each other where positive attitudes will lower student anxieties over statistics as students' novice statistical content and the knowledge.

1.12.2 Statistics anxiety

According to Marzita (2002), anxiety is a feeling of anxious and depressed when faced with numbers and solving mathematic problems while learning mathematic or in everyday life. Statistical anxiety is the anxiety that students encounter while studying statistics or performing statistical analysis involving the operations of collecting, processing and interpreting (Mustafa, 2004). In this study, statistical anxiety data will be obtained from specific factors such as teachers, secondary students and peers.

1.12.3 Photovoice

According to Abma & Schrijver (2019), Photovoice is a student-friendly technique used to place students in topic of areas to encourage research and social change. Photovoice is a way of academic study involving people who generate and discuss pictures as a means of encouraging community and self-change (Caroline, Wu, Zhan & Kathryn, 1998). In this study, the Photovoice method allowed respondents to tell stories and use photography to refer to and describe situations during statistical learning. This method is a qualitative method because it does not involve detailed data computation and in order to get clearer image of the situation.

1.12.4 Peer

Peer are individuals of the same age and social status (Nurul, 2015). In the study of Maizatul (2007), independent variables namely family relationships, peer influence and emotional intelligence were used to assess their effect on students' delinquent behaviour. Mansur Abdullah et al (1988) states by emulating peers, our youth will be able to learn a new behaviour and is trying to absorb and adapted into the inner personality. In this research, peer will be one of the important factors to statistics anxiety because peer plays an important role as their associate.

1.12.5 Communication

The process of information transfer requires more than one party. Arfizawati (2017), Verdeber K. & Verdeber R. (2004) & Hybels and Weaver (2001), defines communication as a process of shaping and sharing of meanings, feelings and ideas in speech, writing or speech group interaction areas. In this research, verbal communication is used in order to receive and interpret the information received. Verbal messages convey meanings uttered by the speaker's words into speech, but the

listener who understands what it has exceeded the literal meaning of the words (Robert, 2002).

1.12.6 Teacher

Teacher is an instructor. Teachers can be regarded as travel guides, based on the knowledge and experience, responsible for the charming journeys of the participants study in the learning process (Siti, 2015). In this research, teacher refers to the persons that teach inside the statistic classroom for secondary students in Pasir Gudang, Johor.

1.13 Summary of the chapter

This chapter describes the researcher's view of statistics anxiety drawn from various factors. Various negative opinions about statistical anxiety to students. Among them, the influence of statistical weaknesses was one of the factors in the statistical anxiety. Statistical anxiety exists when students are overly worried with the concept of statistics. This study will identify the factors, the level of anxiety and teachers that influence the secondary students in learning statistics at Pasir Gudang, Johor.

REFERENCES

- Abd Hamid, Harris & Sulaiman, Muhamad Karimi. (2015). Statistics Anxiety and Achievement in a Statistics Course among Psychology Students. *International Journal of Behavioral Science*. 9. 55-66. *Library and Information Science Research*, 19, 5-33.
- Akande, J. A., Olowonirejuaro, A. O., Okwara-Kalu, C. E. (2014). Electron spectroscopy . A Study of Level and Sources of Stress among Secondary School Students. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, Volume 4, Issue 5 Ver. I (Sep- Oct. 2014), PP 32-36.
- Akande, J.A., Olowonirejuaro, A.O., Okwara-Kalu, C.E. (2014). Electron spectroscopy. A Study of Level and Sources of Stress among Secondary School Students. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, Volume 4, Issue 5 Ver. I (Sep- Oct. 2014), PP 32-36. anxiety, and composition anxiety. *Library and Information Science Research*, 19, 5-33.
- Arem, C. (1993). *Conquering Math Anxiety: a Self-Help Workbook*, California: Brooks/Col Thomasan Learning.
- Baloğlu, M. & Zelhart, P. (2003). Statistical Anxiety: A Detailed Review of the Literature. *Psychology and Education*. 40. 27-37.
- Baloğlu, M. (2003). Individual differences in statistics anxiety among college students. *Personality and Individual Differences*. 34. 855-865. 10.1016/S0191-8869(02)00076-4
- Baloğlu, M. (2004). Statistics Anxiety and Mathematics Anxiety: Some Interesting Differences I. *Educational Research Quarterly*, 27, 38-48.
- Baloglu, M., & Zelhart, P. (2003). Statistical Anxiety: A Detailed Review of the Literature. *Psychology And Education*, 40, 1-15.
- Baloğlu, M., & Zelhart, P. (2003). Statistical Anxiety: A Detailed Review of the Literature. *Psychology and Education*. 40. 27-37
- Baloğlu, Mustafa & Zelhart, Paul. (2003). Statistical Anxiety: A Detailed Review of the Literature. *Psychology and Education*. 40. 27-37.

- Barkley, C. A. (1995). A study of misconceptions in statistics and statistics anxiety: Affect and performance in an undergraduate math course. Unpublished doctoral dissertation, the University of Denver.
- Barlow, D.H. (1988). Anxiety and its disorders: the nature and treatment of anxiety and panic. New York City: Guilford Press: 66–69, 235-236.
- Benson, J. (1989). Structural components of statistical test anxiety in adults: An exploratory model. *Journal of Experimental Education*, 57, 247-261.
- Benson, J., & Banda los, D. (1989). Structural model of statistical test anxiety. In R. Schwarzer, H.M. van der Ploeg, & C.D. Spielberger (Eds.), *Advances in test anxiety research* (vol. 5) (pp. 207-211). Lisse: Swets and Zeitlinger: Hillsdale, N.J. Erlbaum.
- Betz, N. E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. *Journal of Consulting Psychology*, 25, 151-157.
- Bill, J. A. (2003). Statistics anxiety: The nontraditional student. *Education*, 124(1), 157-163.
- Birenbaum, M., & Eylath, S. (1994). Who is afraid of statistics? Correlates of statistics anxiety among students of educational sciences. *Educational Research*, 36, 93-98.
- Blalock, H.M. (1987). Some general goals in teaching statistics. *Teaching Sociology*, 15, 164
- Buckley, S. (2008). Peer Relationships in The Mathematics Classroom: A Social Network Approach To Understanding Anxiety And Motivation (Buc08987). Australian Association for Research in Education's (AARE) Annual Conference, 30th November – 4th December, 2008.
- Buckley, S. (2008). Peer Relationships In The Mathematics Classroom: A Social Network Approach To Understanding Anxiety and Motivation (Buc08987).
- Bui, N. H., & Alfaro, M. A. (2011). Statistics anxiety and science attitudes: age, gender, and ethnicity factors. *College Student Journal*, 45(3), 573+.
- Buljubašić-Kuzmanović, V. (2012). Škola kao zajednica odrastanja. *Pedagoški istraživanja*, 9(1-2), 43–57.
- Byrd, P. (1982). A descriptive study of mathematics anxiety: Its nature and antecedents. Doctoral Dissertation, Indiana University.

- Cemen, P. B. (1987). *The Nature of Mathematics Anxiety* (Report No. SE 048 689). Stillwater, OK: Oklahoma State University (ERIC Document Reproduction Service No. ED287729.)
- Chiesi, F., & Primi, C. (2010). Cognitive and non-cognitive factors related to students' statistics achievement. *Statistics Education Research Journal*, 9(1), 6-26.
- Cox, A. & Benson, M. (2017). Visual methods and quality in information behaviour research: the cases of photovoice and mental mapping. *Information Research*, 22(2), paper 749. Retrieved from <http://InformationR.net/ir/22-2/paper749.html> (Archived by WebCite® at <http://www.webcitation.org/6r2Qhd97m>.)
- Cruise, R. J., Cash, R. W., & Bolton D. L. (1985, August). Development and validation of an instrument to measure statistical anxiety. Paper presented at the annual meeting of the American Statistical Association Statistics Education. Section. Las Vegas, Nevada.
- Darbyshire P, MacDougall C, Schiller W. Multiple methods in qualitative research with children: More insight or just more? *Qualitative Research*. 2005;5:417–435.
- Davrajoo, E. (2007). “Kebimbangan matematik dan hubungan pencapaian pelajar tingkatan empat di Daerah Klang.” Malaysia, Master Thesis, Universiti Putra Malaysia.
- Demaria-Mitton, P.A. (1987). Locus-of-control, gender and type of major as correlates to statistics anxiety in college students. (Doctoral dissertation, The American University, 1987). *Abstracts International*, 48, 1397A.
- Dillon, K.M. (1982). Statisticophobia. *Teaching of Psychology*, 9, 117.
- Evans, G. (1999). Measurement of the physical environment as a stressor. In: Freidman S, Wachs T, editors. *Measuring environment across the life span: Emerging methods and concepts*. Washington, DC: American Psychological Association; 1999. pp. 249–278.
- Fennema, E., & Sherman, J. A. (1976). Fennema-Sherman Mathematics Attitude Scale: Instruments designed to measure attitudes toward the learning of mathematics by females and males. *JAS Catalog of Selected Documents in Psychology*, 6, 31.

- Fisher, K. E. & Julien, H. (2009). Information behavior. In B. Cronin (Ed.), *Annual Review of Information Science & Technology* (Vol. 43, pp. 1-73). Medford, NJ: ASIST and Information Today.
- Foster-Fishman P, Nowell B, Deacon Z, Nievar M, McCann P. Using methods that matter: The impact of reflection, dialogue, and voice. *American Journal of Community Psychology*. 2005;36:275–291.
- Gal, I., Ginsburg, L., & Schau, C. (1997). Monitoring attitudes and beliefs in statistics education. In I. Gal, & J. B. Garfield (Eds.), *The assessment challenge in statistics education*. pp. 37-51. Netherlands: IOS Press.
- Garba, A. Ismail, N., Osman, S., & Rameli, M. R. M. (2020). Exploring Peer Effect on Mathematics Anxiety among Secondary School Students of Sokoto State, Nigeria through Photovoice Approach. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(2), em1815. <https://doi.org/10.29333/ejmste/112622>
- Gorham, J. (1988). The relationship between verbal teacher immediacy behaviors and student
- Gorham, J. (1988). The relationship between verbal teacher immediacy behaviors and student
- Groth, R. E., & Meletiou, M. M. (2017). Research on Statistics Teachers' Cognitive and Affective Characteristics. 10.1007/978-3-319-66195-7_10.
- Hadfield, O. D. & Trujillo, K. M. (1999). Tracing the roots of mathematics anxiety through in-depth interviews with preservice elementary teachers. *College Student Journal*, 33(2). Retrieved January 2, 2007, from <http://www.questia.com/PM.gst?a=o&d=5001892780&er=deny>
- Hamid, H. S. & Sulaiman, M. K. (2015). Statistics Anxiety and Achievement in a Statistics Course among Psychology Students. *International Journal of Behavioral Science*. 9. 55-66.
- Haque, N. & Institute, W. (2011). Photovoice as an Arts-Based Participatory Research Approach. Lillian Wright Maternal-Child Institute Faculty of Health, York University September 23, 2011. www.wellesleyinstitute.com
- Harper D. Talking about pictures: a case for photo elicitation. *Vis Stud*. 2002; 17(1):13-26. Doi: 10.1080/14725860220137345.

- Harvey, A. L., Plake, B. S., & Wise, S. L. (1985). The validity of six beliefs about factors related to statistics achievement. Paper presented at the meeting of the American Educational Research Association, Chicago, IL.
- Hassan, A.A., Jantan. R., and Fauzi, M.A.R.M. (2017). Level of stress and anxiety and sources of stress among secondary school students. *Sci.Int. (Lahore)*, 29(4), 959-963, 2017. ISSN 1013-5316; CODEN: SINTE 8.
- Instructional strategies. *Journal of Instructional Psychology*, 32(3), 205-214.
- Kindermann, T. A., McCollam, T. L., & Gibson Jnr, E. (1996). Peer networks and students' classroom engagement during childhood and adolescence. In J. Juvonen & K. R. Wentzel (Eds.), *Social Motivation: Understanding Children's School Adjustment* (pp. 279-311). New York: Cambridge University Press.
- Kindermann, T. A., McCollam, T. L., & Gibson Jnr, E. (1996). Peer networks and students' classroom engagement during childhood and adolescence. In J. Juvonen & K. R. Wentzel (Eds.), *Social Motivation: Understanding Children's School Adjustment* (pp. 279-311). New York: Cambridge University Press.
- Koh, D. & Zawi, M. (2014). Statistics Anxiety among Postgraduate Students. *International Education Studies*. 7. 166-174. 10.5539/ies.v7n13p166
- Lai, G., Tanner, J., & Stevens, D. (2011). The importance of mathematics competency in statistical literacy. *Advances in Business Research*, 2(1), 115-124.
- Luttenberger, S., Wimmer, S., & Paechter, M. (2018). Spotlight on math anxiety. *Psychology research and behavior management*, 11, 311–322. <https://doi.org/10.2147/PRBM.S141421>
- Macher, D., & Paechter, M., & Papousek, I., & Ruggeri, K. (2012). Statistics anxiety, trait anxiety, learning behavior, and academic performance. *European Journal of Psychology of Education*. 27. 483-498. 10.1007/s10212-011-0090-5.
- Macher, D., Paechter, M., Papousek, I., Ruggeri, K., Freudenthaler, H. H., & Arendasy, M. (2013). Statistics anxiety, state anxiety during an examination, and academic achievement. *British Journal of Educational Psychology*, 83(4), 535-549. <https://doi.org/10.1111/j.2044-8279.2012.02081.x>
- Macher, D., Papousek, I., Ruggeri, K., & Paechter, M. (2015). Statistics anxiety and performance: blessings in disguise. *Frontiers in psychology*, 6, 1116. <https://doi.org/10.3389/fpsyg.2015.01116>

- Maina, G., Mauri, M., & Rossi, A. (2016). DSM-5: Anxiety and depression. *Journal of Psychopathology* 2016, 22: page 236-250
- Malanchini, M., Rimfeld, K., Shakeshaft, N. G., Rodic, M., Schofield, K., Selzam, S., Dale, P. S., Petrill, S. A., & Kovas, Y. (2017). The genetic and environmental aetiology of spatial, mathematics and general anxiety. *Scientific reports*, 7, 42218. <https://doi.org/10.1038/srep42218>
- Malik, S. (2015). Undergraduates' Statistics Anxiety: A Phenomenological Study. *The Qualitative Report*, 20(2), 120-133. Retrieved from <http://nsuworks.nova.edu/tqr/vol20/iss2/11>
- Malik, S. (2015). Undergraduates' Statistics Anxiety: A Phenomenological Study. *The Qualitative Report*, 20(2), 120-133. Retrieved from <http://nsuworks.nova.edu/tqr/vol20/iss2/11>
- Marzita, P. (2002). *Factors Associated with Mathematics Anxiety*, Tanjong Malim: Penerbitan Universiti Pendidikan Sultan Idris.
- Mazalan, M. F. (2012). Factor on achievement in learning mathematics anxiety in secondary school in Pontian.
- Ministry of Education (MOE). (2011). *Malaysia Education Blueprint (2013-2025)*.
- Mohamed, S. H. & Tarmizi, R. A. (2010). Anxiety in Mathematics Learning Among Secondary School Learners: A Comparative Study between Tanzania and Malaysia. *Procedia Social and Behavioral Sciences* 8 (2010) 498–504. International Conference on Mathematics Education Research 2010 (ICMER 2010)
- Mutawah, M. A. A. (2015). The Influence of Mathematics Anxiety in Middle and High School Students Math Achievement. *Article in International Education Studies*. October 2015 Vol. 8, No. 11; 2015 ISSN 1913-9020 E-ISSN 1913-9039. DOI10.5539/ies.v8n11p239.
- Mutodi, P. & Ngirande, H. (2014). Exploring Mathematics Anxiety: Mathematics Students' Experiences. Doi:10.5901/mjss.2014.v5n1p283. E-ISSN 2039-2117. ISSN 2039-9340. *Mediterranean Journal of Social Sciences*. Vol 5 No 1. January 2014
- Mutodi, P. & Ngirande, H. (2014). The Influence of Students' Perceptions on Mathematics Performance. A Case of a Selected High School in South Africa. *Mediterranean Journal of Social Sciences*. 5. 10.5901/mjss.2014.v5n3p431.

- Naidu, R. & Arumugam. (2014). Non-Statistics Major Student's Attitude Towards Introductory Statistics Course At Public Universities.
- Nykiforuk, C. I., Vallianatos, H., & Nieuwendyk, L. M. (2011). Photovoice as a Method for Revealing Community Perceptions of the Built and Social Environment. *International journal of qualitative methods*, 10(2), 103–124. <https://doi.org/10.1177/160940691101000201>
- Onwuegbuzie, A. J. (1993). The interaction of statistics test anxiety and examination condition in statistics achievement of post-baccalaureate non-statistics majors. Unpublished doctoral dissertation, University of South Carolina.
- Onwuegbuzie, A. J. (1997). Writing a research proposal: the Role of library anxiety, statistics
- Onwuegbuzie, A. J. (1997). Writing a research proposal: the Role of library anxiety, statistics
- Onwuegbuzie, A. J. (1998a). Statistics anxiety: a function of learning style? *Research in the Schools*, 5, 43-52.
- Onwuegbuzie, A. J. (1998b). The dimensions of statistics anxiety: A comparison of prevalence rates among mid-southern university students. *Louisiana Educational Research Journal*, 23, 23-40.
- Onwuegbuzie, A. J. (2003). Modeling statistics achievement among graduate students. *Educational and Psychological Measurement*, 63(6), 1020–1038.
- Onwuegbuzie, A. J. (2004) Academic procrastination and statistics anxiety, *Assessment & Evaluation in Higher Education*, 29:1, 3-19, DOI: 10.1080/0260293042000160384
- Onwuegbuzie, A. J., & Wilson, V. A. (2003). Statistics Anxiety: Nature, etiology, antecedents, effects, and treatments--a comprehensive review of the literature, *Teaching in Higher Education*, 8:2, 195-209, DOI: 10.1080/1356251032000052447
- Onwuegbuzie, A. J., DaRos, D., & Ryan, J. M. (1997). The components of statistics anxiety: A phenomenological study. *Focus on Learning Problems in Mathematics*, 19, 11–35.
- Onwuegbuzie, A. J., DaRos, D., & Ryan, J. M. (1997). The components of statistics anxiety: a phenomenological study. *Focus on Learning Problems in Mathematics*, 19 (4), 11-35.

- Onwuegbuzie, A. J., DaRos, D., & Ryan, J. M. (1997). The components of statistics anxiety: A phenomenological study. *Focus on Learning Problems in Mathematics*, 19, 11–35.
- Onwuegbuzie, A.J. (1998c). Statistics anxiety: A function of learning style? *Research in the Schools*, 5, 43-52.
- Onwuegbuzie, A.J. (1999). Statistics anxiety among African-American graduate students: An affective filter? *Journal of Black Psychology*, 25, 189-209.
- Onwuegbuzie, Anthony J.; Wilson, Vicki A. (2000). Statistics Anxiety: Nature, Etiology, Antecedents, Effects, and Treatments: A Comprehensive Review of the Literature. 34 p.; Paper presented at the Annual Meeting of the Mid-South Educational Research Association (28th, Bowling Green, KY, November 17-19, 2000).
- Pan, W. and Tang, M. (2005). Students' perceptions on factors of statistics anxiety
- Perepiczka, M., Chandler, N. & Becerra, M. (2011). Relationship between Graduate Students' Statistics Self-Efficacy, Statistics Anxiety, Attitude toward Statistics, and Social Support. *The Professional Counselor* Volume 1, Issue 2 |Pages 99–108. 2011 NBCC, Inc. & Affiliates www.nbcc.org. Retrieved at: <http://tpcjournal.nbcc.org>. doi:10.15241/mpa.1.2.99.
- Pérez-Edgar, K., & Fox, N. A. (2005). Temperament and anxiety disorders. *Child and Adolescent Psychiatric Clinics*, 14(4), 681-706.
- Perney, J., & Ravid, R. (1991). The relationship between attitudes towards statistics, math self- efficacy concept, test anxiety and graduate students' achievement in an introductory statistics course. Unpublished manuscript, National College of Education, Evanston, IL.
- Puteh, M. (2002). Factors Associated with Mathematics Anxiety, Tanjong Malim: Penerbitan Universiti Pendidikan Sultan Idris.
- Puteh, M. (2002). Qualitative research approach towards factors associated with mathematics anxiety
- Rachman, S. (1998). *Anxiety*. East Sussex, UK: Psychology Press Ltd.
- Rachman, S. (1998). *Anxiety*. East Sussex, UK: Psychology Press Ltd
- Richardson, F. C., & Woolfolk, R. L. (1980). Mathematics anxiety. In I. G. Sarason (Ed.), *Test anxiety: Theory, Research, and applications*. Hillsdale, NJ: Erlbaum.
- Ruggeri K., Diaz C., Kelley K., Papousek I., Dempster M., Hanna D. (2008). International issues in education. *Psychol. Teach. Rev.* 14, 65–74.

- Schacht, S., & Stewart, B. J. (1991). What's funny about statistics? Interactive/user-friendly gimmicks for teaching statistics. *Teaching Sociology*, 20, 329-332. <http://dx.doi.org/10.2307/1318981>
- Schell, K., Ferguson, A., Hamoline, R., Shea, J., & Thomas-Maclean, R. (2009). Photovoice as a teaching tool: learning by doing with visual methods. *International Journal of Teaching and Learning in Higher Education*. 2009; 21(3):340-352.
- Skoy, E., & Werremeyer, A. (2020). Comparing Photovoice to Traditional Reflection to Identify Student Learning on a Medical Mission Trip. *American journal of pharmaceutical education*, 84(4), 7599. <https://doi.org/10.5688/ajpe7599>
- Summary of the State of Johor Forest Management Plan for the Period between 2006–2015. Johor State Forestry Department. pp. 7/71–11/71 [XVIII/XXIII]. Archived from the original (PDF) on 29 July 2018. Retrieved 28 July 2018.
- Swift, P., Cyhlarova, E., Goldie, I., & O'Sullivan, C. (2014). Living With Anxiety. Understanding the role and impact of anxiety in our lives. Mental Health Awareness Week 2014.
- University of Kansas. (2019, January 16). 'Statistics anxiety' is real, and new research suggests targeted ways to handle it. ScienceDaily. Retrieved May 19, 2020 from www.sciencedaily.com/releases/2019/01/190116111131.htm
- University of Kansas. (2019, January 16). 'Statistics anxiety' is real, and new research suggests targeted ways to handle it. Science Daily. Retrieved June 2, 2020 from www.sciencedaily.com/releases/2019/01/190116111131.htm
- Vakkari, P. (2008). Trends and approaches in information behaviour research. *Information Research*, 13(4), paper 361. Retrieved from <http://InformationR.net/ir/13-4/paper361.html> (Archived by WebCite® at <http://www.webcitation.org/6p8Xa1qUE>)
- Valero, P. & Skovsmose, O. (2002) (Eds.). *Proceedings of the 3rd International Mathematics Education and Society Conference*. Copenhagen: Centre for Research in Learning Mathematics, pp. 1-5
- Valero, P. & Skovsmose, O. (2002) (Eds.). *Proceedings of the 3rd International Mathematics Education and Society Conference*. Copenhagen: Centre for Research in Learning Mathematics, pp. 1-5

- Wang C, Burris M. Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education and Behaviour*. 1997; 24:369–387. DOI: 10.1177/109019819702400309
- Wang, C., & Burris, M. A. (1994). Empowerment through photo novella: portraits of participation. *Health Educ Q*. 1994 Summer; 21(2):171-86.
- Wentzel, K. R., & Watkins, D. E. (2002). Peer relationships and collaborative learning as contexts for academic enablers. *School Psychology Review*, 31(3), 366-377.
- Williams, A. (2010). Statistics Anxiety and Instructor Immediacy. *Journal of Statistics Education* Volume 18, Number 2 (2010), www.amstat.org/publications/jse/v18n2/williams.pdf
- Williams, A. (2015). Statistics Anxiety and Worry: The Roles of Worry Beliefs, Negative Problem Orientation, and Cognitive Avoidance. *Statistics Education Research Journal*, 14, 53-75.
- Williams, A. S. (2010). Statistics Anxiety and Instructor Immediacy. *Journal of Statistics Education* Volume 18, Number 2 (2010), www.amstat.org/publications/jse/v18n2/williams.pdf. DOI:10.1080/10691898.2010.11889495
- Williams, A. S. (2013). Worry, intolerance of uncertainty, and statistics anxiety. *Statistics Education Research Journal*, 12(1), 48–59. [Online: [http://iase-web.org/documents/SERJ/SERJ12\(1\)_Williams.pdf](http://iase-web.org/documents/SERJ/SERJ12(1)_Williams.pdf)]
- Williams, A. S. (2015). Statistics Anxiety and Worry: The Roles of Worry Beliefs, Negative Problem Orientation, and Cognitive Avoidance. *Statistics Education Research Journal*, 14(2), 53-75 Retrieved at: <http://iase-web.org/Publications.php?p=SERJ>. International Association for Statistical Education (IASE/ISI), November, 2015.
- Williams, A. S. (2015). Statistics anxiety and worry: The roles of worry beliefs, negative problem orientation, and cognitive avoidance. *Statistics Education Research Journal*, 14(2), 53–75.
- Wilson, V. (1997). Factors Related to Anxiety in the Graduate Statistics Classroom.
- Wilson, V.A. (1996). Factors related to anxiety in statistics. Unpublished doctoral dissertation, University of Southern Mississippi, Hattiesburg.
- Wilson, V.A. (1999). Student response to a systematic program of anxiety-reducing strategies in a graduate-level introductory educational research course. Paper

- presented at the annual meeting of the American Educational Research Association, Montreal, Quebec, April.
- Wilson, V.A. (1999a, April). Student response to a systematic program of anxiety-reducing strategies in a graduate-level introductory educational research course. Paper presented at the annual meeting of the American Educational Research Association, Montreal.
- Wilson, V.A. (2000). Stress and stress relief in the educational research classroom. Poster session presented at the annual meeting of the American Educational Research Association, New Orleans, LA, April.
- Wolfe, M. L. (1992). Development and Validation of a Pre-Post Instruction Course Evaluation Questionnaire: a Pilot Study. ERIC Document Reproduction Service No. ED254556.
- Zahan, F.N., Kawsar, L.A., Islam, M.A., and Bhuia, M.R. (2020). Internal consistency and structure of the statistics anxiety rating scale: A multivariate analysis among undergraduate students of SUST, Sylhet. *SUST J Sci Tech*, Vol 30(1) 2020, 40 – 48. ISSN 1682-895X
- Zahan, Farha & Islam, Md Atiqul & Kawsar, Luthful. (2020). Relationships among Statistics Anxiety, Depression and Academic Performance. 19. 2020
- Zakaria, E., & Noh, N. M. (2008). “The effects of mathematics anxiety on matriculation students as related to motivation and achievement,” *Eurasia Journal of Mathematics, Science and Technology Education*, vol. 4, no. 1, pp. 27-30.
- Zakaria, Effandi & Nordin, Norazah. (2008). The Effects of Mathematics Anxiety on Matriculation Students as Related to Motivation and Achievement. *Eurasia Journal of Mathematics, Science and Technology Education*. 4. 27-30. 10.12973/ejmste/75303.
- Zanakis, S. H., & Valenzi, E.R. (1997). Student anxiety and attitudes in business statistics. *Journal of Education for Business*, 73, (1), 10-16.
- Zeidner, M. (1991). Statistics and mathematics anxiety in social science students: Some interesting parallels. *British Journal of Educational Psychology*, 61(3), 319–328. <https://doi.org/10.1111/j.2044-8279.1991.tb00989.x>
- Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, 52, 30–41.