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CONTENTS

Editorial

Dr. Babalola J. Ogunkola.....1

Articles

Investigating the Relationship between Parental Involvement and Student Academic Achievement in Barbados

Ian Marshall, David Browne and Claudette Fongkong-Mungal..... 3

Investigating the Factors Influencing Students' Acceptance of Mobile Learning: The Cave Hill Campus Experience

Grace-Anne Jackman 14

Attitudes toward Persons with Albinism among a Sample of Barbadian and Trinidadian Nationals

Jennifer D. Ford 32

Assessment of Lagosians' Perception of Climate Change as a Public Health Concern

Olufemi Kalesanwo, Tovin Musah and Fatona Olugbenga..... 50

Ageing Population and Gender Issues in Asia-Pacific Region

S.C. Jhansi and Santosh K. Mishra..... 61

A Comparison of the Classical Test Theory and the Multidimensional Item Response Theory total scores in a high scoring group of students on a Mathematics Multiple Choice Examination

Patt D. Sealy and Smail Mahdi..... 74

Students' Attitudinal Variables as Correlates of Achievement in Secondary School Mathematics in Barbados

Ryan O. Wilkinson and Babalola J. Ogunkola 88

Principal Leadership Style and Teacher Satisfaction among a Sample of Secondary School Teachers in Barbados

Ian A. Marshall..... 105

Improving Student Appreciation for Universal Design Using a Simulation-based Comparative Approach

Colin Depradine 117

Special Educator Attitudes toward Children with Communication Disorders in the Caribbean

Shameka Johnson and Ovetta Harris133

Notes for Contributors

The Caribbean Educational Research Journal (CERJ) is published twice a year (April and September) by the School of Education of the University of the West Indies, Cave Hill Campus, Barbados. The Journal seeks submission of original articles on topics covering all aspects of education in the Caribbean and in the global community. Research or application-oriented articles that describe, among others, curriculum, pedagogy, professional development or educational facilities issues are considered for publication in this journal.

All articles are refereed by a rigorous review process involving at least two blind reviews by qualified academic professionals. Submissions are judged by sustainability of the content, the intellectual framework and significance to society in general.

CERJ solicits only original contributions that have not been previously published or submitted elsewhere. An important criterion for acceptance of a manuscript for publication is the relevance of the work to the educational/training environment and its potential usefulness for advancing the quality of education at all levels.

CERJ only accepts electronic submission of manuscripts. Submit the manuscripts for review process by sending an email with the paper as an attachment to drbeejay@hotmail.com or babalola.ogunkola@cavehill.uwi.edu. In the body of your email message, include the author(s), name(s), contact information of the corresponding author and the title of your submission. Your submission should be in a file format supported by Microsoft Word (PDF submission will not be accepted). All submissions should be in English. The manuscript should be single-spaced, with a single column, 11-point Arial Narrow justified font, and 1" margins on all sides. A summary (Abstract) of between 150 and 200 words should be included in the first page of your submission.

Tables and figures should be included in the text, approximately where the author thinks that they should appear. Manuscripts should be edited for spelling and grammar. Reference citation ordering and format must follow APA style referencing. References must be complete. The paper should not normally exceed 10 single-spaced pages, including all sections, figures, tables, etc. However, long articles may be considered.



Editorial

The vision of the Caribbean Educational Research Journal is to focus on broadening intellectual resources, understanding, development and exchange of ideas among education professionals so as to offer intellectual contributions towards educational development in the Caribbean. Nonetheless, it is a truism that there are many ways by which the international community exerts some influence on education in a nation or region. Therefore we felt that seeking international input into the journal in all aspects of education is not against good reasoning. Consequently, this edition of the journal features articles from the Caribbean, United States of America, Africa and Asia.

This edition of the journal is undoubtedly a compendium of valuable contributions from reputable authors from all spheres of educational practice. It is therefore offering suggestions to solving identified educational challenges or problems in various countries where the investigations were carried out. For instance Drs. Ian Marshall, David Browne, Claudette Fongkong-Mungal investigated the nature and strength of the relationship between parental involvement and students' academic achievement in Barbados and thereby stressed how important the role of parents can be to the development of the students' cognitive abilities.

In a very interesting and eye-opening study, Dr. Grace-Anne Jackman delved into the world of Mobile learning, using the Unified theory of acceptance and use of technology to determine the critical factors influencing undergraduate students' acceptance of m-learning technologies. She concluded, among other things that social influence had no significant effect on students' intentions to adopt m-learning technologies in the Caribbean context. In a manner that is lucid, Dr. Jennifer Deanne Ford examined the attitudes of some Barbadians and Trinidadians toward persons with albinism and found out that both Barbadians and Trinidadians were positively inclined to persons with albinism.

Dr. Olufemi Kalesanwo, health education expert, led two other researchers (Toyin Musah and Olugbenga Fatona) to determine the perceptions of Lagosians in Nigeria on climate change and its likely public health concerns and suggested that there is an urgent need for environmental education for the Lagosians as far as climate change is concerned. In a contribution from India, Drs. S.C. Jhansi and Santosh Mishra investigated the impact of the growth of the ageing population on women's well being and concluded with the following words: *"the challenge of human service planning for the ageing population has highlighted the importance of mainstreaming gender from a life-cycle perspective in research, policy, and planning in the new millennium."*

In a study in which classical theory was used to score a sample of 3000 examinees on a mathematics multiple choice examinations, Ms. Patt Sealy and Professor Smail Mahdi did a comparison of classical theory and the multidimensional item response theory total scores in a high scoring group of students. They submitted, among other things that a passing or failing grade in a multidimensional test should be based on the scores awarded to an examinee on each dimension and not solely on a total score. On another account Ryan Wilkinson and Dr. Babalola Ogunkola examined the relationship between students' attitudinal variables and academic achievement in secondary school mathematics while Dr. Colin Depradine presented an action research study in an interesting and engaging manner. Finally, Drs. Shameka Johnson and

2 **Editorial**

Ovetta Harris studied the attitudes of special educators in the Bahamas. So, in the final analysis, this edition of the journal is a very important resource material, particularly in the hands of researchers who are interested in related areas of research.

In conclusion, I want to thank the reviewers for the good job they did on the articles eventually chosen to be part of this edition.

Dr. Babalola J. Ogunkola
Managing Editor



Investigating the Relationship between Parental Involvement and Student Academic Achievement in Barbados

Ian A Marshall*, David Browne and Claudette Fongkong-Mungal

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This study investigated the nature and strength of the relationship between parental involvement and student academic achievement, the relationship between parental involvement and active engagement of students and the extent to which parental involvement predicted Student Proximal Academic Outcomes as measured by active engagement of students. Parental involvement and student proximal academic outcomes were measured by Hoover-Dempsey and Sandler's model (1995, 1997, and 2005) and student academic achievement was measured using a standardized test, Barbados Secondary School Entrance Examination (B.S.S.E.E.). The sample was a cohort of 160 1st form students. The results indicated that there was no relationship between parental involvement and student academic achievement; however, there were significant positive relationships between parental involvement and student proximal academic outcomes.

Keywords: Parental Involvement, Modeling, Instruction, Encouragement Reinforcement, Student Proximal Academic Outcomes, Active Engagement, Barbados.

Introduction

A cursory read of the literature on parental involvement would reveal that there is an ongoing debate surrounding firstly definitions of parental involvement, and definitions of academic achievement and secondly, the nature of the relationship between student academic achievement and parental involvement, however defined. As it relates to definitions of parental involvement, Hoover-Dempsey and Sandler (1995) conceptualized it as having two expressions, home-based activities, which include helping with homework, monitoring the child's progress and engaging in activities that would promote the interest of the child, and school based activities, which include attending Parent Teacher Conferences, volunteering at school and attending school functions. Epstein (2009) has identified six key types, namely parenting, communicating, volunteering, learning at home, decision making and collaborating with the community. As it relates to definitions of academic achievement, some researchers have conceptualized academic achievement in terms of standardized test, Henderson and Berla (1994) while others have looked at indirect or distal outcomes, Hoover-Dempsey and Sandler (2005). In terms of relationships between the parental involvement and academic achievement the findings are varied. Some researchers found positive relationships, while other have found negative or no relationships between the variables.

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Objectives

The study was therefore designed to investigate the nature and strength of the relationship between parental involvement and student academic achievement, the relationship between parental involvement and Active Engagement of students and the extent to which parental involvement predicts Student Proximal Academic Outcomes. The research questions were as follows:

1. What are students' perceptions of parental involvement?
2. Are there relationships among the student independent variables of Modeling, Instruction, Encouragement, Reinforcement and the dependent variables of Achievement, Active Engagement and Teacher Relationships?
3. Are there statistically significant differences by gender in the level of parental involvement reported by students?
4. What are the combined and relative effects of modeling, instruction, encouragement, reinforcement, and teacher relations on active engagement of students?
5. What parental involvement variables best predict active engagement of students?
6. Is there a relationship between students' perceptions of parental involvement and student academic achievement as measured by standardized tests?

Theoretical Framework

This paper is grounded in the social cognitive and social learning theories as advanced by Bandura (1986) and the social development and socio cultural theory as advanced by Vygotsky, (1978) and expanded by Rogoff (1990). According to Pajares (2002) there are five central concepts associated with the social cognitive theory as follows:

1. Observational learning/modeling, which suggests that individuals learn through observation
2. Outcome expectations, which reflect individual's beliefs about what consequences are likely to ensue if particular behaviors are performed.
3. Perceived self efficacy, which is concerned with individual's beliefs about the ability to complete a given task successfully.
4. Goal setting, where individuals use forethought to envision the future, identify desired outcomes and generate plans of action.
5. Self regulation, which points to a student's management or control of his/her own learning behaviors through self observation or keeping track of his/her behaviors; self judgment, which evaluates the behaviors; and self reaction, where the individual rewards or discontinues the behavior.

Closely aligned to the foregoing is the social development theory. The central idea associated with this theory as advanced by Vygotsky (1978) is that social interaction plays a fundamental role in the development of cognition, and that the potential for cognitive development depends on the zone of proximal development, a level of development which is attained when children engage in social behavior. Full development of the zone of proximal development depends on full social interaction. Vygotsky (1978) was of the view that parents, caregivers and peers and cultural beliefs and attitudes influenced individual learning.

Socio cultural theory also has its genesis in the work of Bandura 1978 and Vygotsky (1978). This approach expands the theory a bit more and suggests that children's development is embedded in the social relationships, sociocultural tools and sociocultural practices that surround them. (Rogoff, 1990). In other words, as pointed suggested by Green (2008) the social environment that surrounds a child and the individuals (e.g. family members) in it provide information necessary for the child to learn.

Since this paper focuses on parental involvement and student academic achievement it is fitting that one considers the notion of academic achievement in the context of socio cultural theory. Parents, peers and teachers are all part of the cultural space of students and as a consequence they are in prime position to influence student academic achievement. Social cultural and social cognitive theories therefore provide a useful framework for investigating parental involvement and its impact on student academic achievement.

Relevant Literature

Parental involvement and academic achievement

There are those researchers who argue, and indeed, have provided empirical evidence which support the view that there is a positive and direct correlation between parental involvement and student academic achievement, as measured by standardized tests. Henderson and Berla (1994); Epstein (1997; 2001). Other researchers, looking at the link between achievement in elementary and secondary schools have identified the significant role of families and, family-school relations, and parental involvement in education, (Fan & Chen, 2001; Seginer, 2006; Jeynes, 2007; Hill and Chao, 2009 ;).

Jeynes (2007) whose study included 52 studies that involved more than 300 000 participants found a positive relationship between parental involvement and academic achievement. In this study parental involvement was defined as parental participation in the educational processes and experiences of children (Shute, Hansen, Underwood and Razzouk, 2011). Specifically, the Hedges measure was reported and indicated that for overall academic achievement, the effect size for parental expectations was the largest among all the other variables (Hedge's $g = .88$, which represents a large effect size). The remaining variables (i.e., parent-child communication, parents checking homework, and parental style) showed medium effect sizes, Hedges' $g = .32, .38$, and $.40$ respectively, (Shute et al.)

A meta-analysis on the existing research on parental involvement in middle school by Hill and Tyson (2009) found that across 50 studies, parental involvement was positively associated with achievement, and that involvement that reflected academic socialization had the strongest positive association with achievement. Overall, the meta- analysis of the correlational studies demonstrated a positive relation between general parental involvement and achievement in middle school. The correlations ranged from $-.49$ to $.73$; the average weighted correlation across the 32 independent samples was $r = .18$, 95% confidence interval (CI) = $.12, .24$, $Q(31) = 1,581.10$, $p < .0001$ (Hill and Tyson, 2009). These researchers also found that whereas school based involvement- including visiting the school, volunteering at school, and attending school events- was moderately positive in its association with achievement, the evidence suggested that the most salient type of parental involvement was involvement that related to achievement, and involvement that resulted in socialization around the goals and purposes of education and that provided adolescents with useful strategies that they could use in semiautonomous decision making (Hill and Tyson, 2009).

Later research by Altschul (2012) widened the debate and looked at the link between socioeconomic status academic achievement and parental involvement specifically among Mexican American Youth. This study found, among other things, that parental involvement in education mediated the influence of both family income and maternal education on youth's academic achievement, and secondly, that pathways between socioeconomic status, parental involvement and youth academic achievement suggest that Mexican American parents' abilities to invest economic, social, and human capital in their children's education lead to higher academic achievement among youth.

Gender and parental involvement

It has been suggested that gender of parents could be a factor that moderates the level of involvement. Shumow- and Miller (2001) found that fathers and mothers were equally involved at home, but mothers were more involved at school than fathers; that the higher the their education level the more mothers were involved at school, while fathers of all educational levels were less involved at school than mothers; student gender did not make a difference in the level or type of involvement and the more parents were involved at home, the more students felt it was important to perform well in school. Goldman (2005) conducted research involving British parents and found that fathers were more involved than mothers in specific types of activities in their children's out of school learning: such as building and repairing, hobbies, Information Technology, mathematics and physical play. A later survey of parents by Seeds, Goldstein and Coleman (2008) found that fathers helped less often with homework than mothers, however, amongst parents working full time there was no difference. Blau and Hameiri (2012) also investigated gender differences in parental involvement. This research which measured involvement using an online interaction system in seven Israeli secondary schools found that compared to fathers, mothers had higher levels of online parental involvement; they logged into the system more and sent more messages to teachers.

Parental involvement and student proximal academic outcomes

Research by Grolnick & Slowiaczek, 1994; Hoover-Dempsey, Battiato, Walker, Reed, DeJong, & Jones, 2001; Steinberg, Elmen, & Mounts, 1989), suggest that parental involvement may have its most direct and critical influence not on summary measures of achievement, but on student attributes or Student Proximal Academic Outcomes, that lead to achievement (Hoover-Demsey & Sandler, 2005). According to Hoover-Demsey et al. students' development of these attributes may mediate the relationship between parental involvement and student school success.

Research by Green (2009), which used the Hoover-Dempsey, Sandler model of parental involvement and also explored the theory of student proximal achievement outcomes, found significant relationships between student reported parental involvement and student proximal achievement outcomes ($r = .44$, $p < .05$), as well as significant relationships between parent reported parental involvement and student proximal achievement outcomes.

This paper is therefore designed to investigate the relationship between parental involvement and student academic achievement and to determine whether the research provides evidence to support the theory of Student Proximal Academic Outcomes.

Method

Participants

A sample of 160 1st form secondary school students. The cohort consisted of 80 males and 80 females with an average age of 11.5 years.

Instrumentation

Two validated instruments were used for data collection in the study.

The first instrument used for data collection in the study was the Hoover-Dempsey Sandler Parental Involvement Project, Student Questionnaire consisting sixty-seven (67) items, measured using a Likert scale 1= not true, 2= a little true, 3= pretty true and 4= very true, as follows. The instrument measured two broad constructs, Parental Involvement and Student Proximal Academic Outcomes. Parental Involvement included four sub-scales as follows: Parent Monitoring, Parent Instruction, Parent Encouragement, and Parent Reinforcement. Student Proximal Academic Outcomes included two Self Report sub-scales as follows: Active Engagement and Teacher Relationships.

The Parent Modeling sub-scale included items from 1-10. Students were asked to respond to the stem "The person in my family who usually helps me with my homework...". The items included: likes to learn new things; knows how to solve problems; doesn't give up when things get hard; wants to learn as much as possible; ask other people for help when a problem is hard to solve; likes to solve problems; enjoys figuring things out; can explain what he or she thinks to other people. Alpha reliability for the scale was .75.

The Parent Instruction sub-scale included items 11-25. Students were asked to respond to the stem "The person in my family who usually helps me with my homework teaches me". The items included: ways to make my homework fun; to keep trying when I get stuck; to ask questions when I don't understand something; how to get along with others in class; to try the problems that help me learn the most; to take a break from my work when I get frustrated; to follow the teacher's directions. Alpha reliability for the scale was .86.

The Parent Encouragement sub-scale included items 26-37. Students were asked to respond to the stem "The person in my family who usually helps me with my homework encourages me." The items included: when I don't feel like doing my schoolwork; when I have trouble organizing my homework; to develop an interest in schoolwork; to believe I can do well in school; to ask the teacher for help when a problem is hard to solve; to explain what I think to the teacher. Alpha reliability for the scale was .87.

The Parent Reinforcement sub-scale included items 38-50. Students were asked to respond to the stem "the person in my family who usually helps me with my homework shows me that he or she likes it when I..". The items included: stick with a problem until it gets solved; check my work; understand how to solve problems; ask the teacher for help; try to learn as much as possible; have a good attitude about doing my homework. Alpha reliability for the scale was .87.

The Active Engagement Self Report sub-scale included items 52-57, 59-60, 63, 65-67. It required students to respond to statements such as the following: I try to figure out the hard parts on my own; I want to learn new things; I go back over things that I don't understand; I like to look for information about school subjects; I can learn the things taught in school; I want to understand how to solve problems. Alpha reliability for the scale was .72.

The Teacher Relationships Self Report sub-scale included items 51, 58, 61-62, 64. It required students to respond to the following statements: I can explain what I think to most of

my teachers, I can get along with most of my teachers; I can go and talk with most of my teachers; I ask teachers to tell me how well I am doing in class; I can get most of my teachers to help me if I have problems with other students. Alpha reliability for the scale was .71.

The second instrument was the Barbados Secondary School Entrance Examination performance scores. This examination is delivered by the Caribbean Examinations Council (C.X.C.), an established and reputable examining body for the member countries of the Caribbean.

Results and discussion

Research Question 1: What are children's perceptions of parental involvement?

The researchers also used descriptive statistics to answer this question. Encouragement, Modeling, Reinforcement, and Instruction received mean scores that were very close to the maximum scores for the variables. Also the scores for the variables were also tightly clustered around the mean. The Standard Deviation Scores were 4.50, 4.25, 4.78, and 5.62 respectively, see Table 1-1 below. These findings suggest two things. Firstly, that the students' views were highly congruent, and secondly, that the students perceived their parents as exhibiting high levels of parental involvement in the form of encouragement, modeling, reinforcement, and instruction. The level of involvement for all the areas indicated was between 83% and 90%. These findings are consistent with other research which suggests that children's perceptions of events in their environments often mediate the influence of those events on their behavior and learning, (Wong, 2008; Grolnick and Slowiaczek, 1994; Grolnick, Ryan and Deci, 1991).

Table 1-1 Simple descriptive statistics: student reported level of parental involvement

<i>Parental Involvement Mechanisms</i>	<i>Mean</i>	<i>SD</i>	<i>Mode</i>	<i>Score range</i>
Encouragement	42.8	4.5	43	12 to 48
Modeling	33.2	4.2	33	10 to 40
Reinforcement	47.1	4.7	52	13 to 52
Instruction	51.6	5.6	54	15 to 60

Note. The scores are anchored on a four point scale from 1(not true) to 4 (very true). N= 155. SD= Standard Deviation.

Research Question 2: Are there relationships among the four parental involvement mechanisms and Achievement, Active Engagement and Teacher Relationships?

The findings specified that there was no significant relationship between student perceptions of the four parental involvement mechanisms and academic achievement; however, there were significant relationships between the four parental involvement mechanisms and student Active Engagement. Active Engagement was significantly and positively correlated to Modeling ($r = .465$, $p < .01$); Instruction ($r = .613$, $p < .01$) Encouragement ($r = .526$, $p < .01$); Reinforcement ($r = .596$, $p < .01$). There were also significant and positive relationships between the four parental

involvement mechanism and Teacher Relationships, Modeling ($r = .447, p < .01$); Instruction ($r = .420, p < .01$); Encouragement ($r = .328, p < .01$); Reinforcement ($r = .436, p < .01$), see Table 1-2 below. These findings are in concert with those of Hoover-Dempsey and Sandler (2005) and Martinez-Pons (1996) who point to the critical role of parents in providing students with the knowledge and skills necessary for effective engagement with school tasks. It must be noted that the scales used to measure Active engagement and Teacher Relationships included questions which tapped the level of student academic self efficacy, intrinsic motivation to learn, self regulatory strategy use and social self efficacy for relating to teachers. More specifically, the finding as it relates to social self efficacy for relating to teachers underscores the work of Patrick, Hicks and Ryan (1997) and Bandura (1997) which suggested among other things, that students' beliefs in the value of engaging with teachers was shaped by the interaction that their parents had with the same teachers. In other words, the suggestion was that if the parents were engaged in meaningful and productive dialogue with the teachers then it informed in a positive way the relationship between the students and the teachers. Significantly, the aforementioned areas, according to the literature were susceptible to parental influence through involvement activities (Hoover-Dempsey and Sandler, 2005). The findings therefore lend support to the view of other researchers who suggest that parental involvement may have its most direct and critical influence not on summary measures of achievement, but on student attributes that lead to achievement (Student Proximal Academic Outcomes). See the work of (Grolnick and Slowiaczek, 1994; Hoover-Dempsey, Battiato, Walker, Reed, DeJong, and Jones; Steinberg, Elmen, and Mounts, 1998).

Table 1-2 Summary of intercorrelations of independent and dependent variables

<i>Measure</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
1. Achievement	1						
2. Modeling	.28	1					
3. Instruction	.013	.616**	1				
4. Encouragement	.097	.509**	.688**	1			
5. Reinforcement	.008	.482**	.711**	.760**	1		
6. Active Engagement	.035	.465**	.613**	.526**	.596**	1	
7. T. Relationships	.026	.447**	.420**	.328**	.436**	.619**	1

Note. Intercorrelations for student participants (n=155). T= Teacher. ** Correlation is significant at the 0.01 level (2-tailed).

Research Question 3: Are there statistically significant differences by gender in the level of parental involvement as reported by students.

An independent samples 't' test was conducted to determine if there was a significant difference in students' perceptions of the four parental involvement mechanisms. There was a significant difference in the scores for males and females on the variables. On the variable Reinforcement, Males (M = 46.14, SD = 5.29) reported significantly lower levels of perceived parental involvement than females (M=48.03, SD=4.09); $t = -2.498$, $p = 0.001$. Similarly on the variable Instruction Males (M= 50.48, SD=6.23) reported significantly lower levels of perceived parental involvement than females (M = 52.72, SD = 4.78); $t = -2.525$, $p = 0.001$. See Table 1-3 below. According to the Hoover-Dempsey and Sandler (2005) student perceptions of parental involvement mediate the influence of involvement on proximal academic outcomes. Put differently, if the students perceive that their parents are involved in a way that is supportive of their learning then that involvement will have a greater influence on their proximal academic outcomes. The question that needs to be asked therefore is whether or not this is confirmed in the literature. Earlier research by Grolnick and Slowiaczek (1994) suggested that children must perceive and experience parents' involvement if those involvement activities are to influence learning and behavior. Later research by Wong (2008) confirmed that greater perceived involvement and autonomy support predicted better academic performance and less classroom disruptive behavior. This suggestion therefore is that female students were better placed than male students to achieve better academic outcomes. On the other hand, the implication for parents is that they should pay more attention to the levels of perceived parental involvement especially as it relates to their sons.

Table 1-3 T Test for male and female students' perception of parental involvement

N= (155)				
Gender				
	Males	Females	t	df
Reinforcement	46.1 (5.29)	48.0 (4.09)	-2.498*	154
Instruction	50.48 (6.23)	52.72 (4.78)	-2.525*	154

Note. * = $p < 0.001$. Standard Deviations appear in parenthesis below means. Males N = 75, Females N = 80

Research Question 4: What are the combined and relative effects of modeling, instruction, encouragement, reinforcement, and teacher relations on active engagement of students?

This question was answered using multiple regression analysis. The multiple R value ($r = 0.74$) denotes that there was a positive and high relationship between the combination of the selected parental involvement sub-variables and active engagement of students. Moreover, the ANOVA table ($F = 37.627$, $p = 0.000$) shows that the combined contribution of the parental involvement

variables to active engagement of students was significant. The regression model further signify that the selected parental involvement variables in combination, accounted for 55.8 % (R square = 0.558, $P < 0.001$) of the total variance in the active engagement demonstrated by students. On a cautionary note, one must also accept that using simple linear regression does have the limitation of clustering the effects of the independent variables, see Table 1-4 below.

Table 1-4 Combined effects of selected parental involvement sub-variables on active engagement of students

Model	SS	df	MS	f	Sig.
Regression	3115.585	5	623.117	37.6	0.000*
Residual	2467.486	149			
Total	5583.071	154			

Note. Multiple R = 0.747. Multiple R Square = 0.558. Adjusted R Square = 0.543. * = $p < 0.001$

Research Question 5: What parental involvement variables best predict active engagement of students?

In Table 1-4 below the relative effects of the selected parental involvement variables on active engagement of students are captured. The findings registered that Instruction (Beta = .270, $p < 0.001$) and Teacher Relations (Beta = .409, $p < 0.001$) best predict Active Engagement of students. These findings are in accord with those of Hoover-Dempsey and Sandler (2005) who also found that student reports of parental involvement were significant in predicting student outcomes. These findings therefore point to the important role that parents play as the child's first teacher and the role they play in teaching their children to navigate the teacher student relationship and developing their sense of what Bandura (1997) termed social self-efficacy for relating to teachers.

Table 1-4 Relative contributions of the predictor variables to active engagement of students

Predictor Variables	Beta	t	P
Modeling	-.005	-.076	.940
Instruction	.270	3.018	.003*
Encouragement	.084	.938	.350
Reinforcement	.164	1.751	.082
Teacher Relations	.409	6.406	.000*

Note. * = Significant ($p < 0.001$)

Research Question 6: Is there a relationship between students' perceptions of parental involvement and student academic achievement as measured by 2standardized tests.

A Pearson's Product Moment Correlation was conducted and it revealed that there was no significant relationship between the two variables. This finding is inconsistent with that of

researchers like Henderson and Berla (1994); and Epstein (1997; 2001). However, it be noted that the standardized tests used in this study were single one-shot tests this may have contributed to the contrary finding. Still, the point must be made that the literature in the area is divided on the nature of the relationship between parental involvement and student academic achievement. One of the things that emerge from this study, though not a central focus was the role of homework and to a greater extent after school lessons. A future study could therefore examine the relationship between after school lessons (paid for by parents) and student academic achievement.

Scholarly Significance of the Study

The findings of the study are significant from the point of view that they lend empirical support to the Hoover-Dempsey, Sandler model of parental involvement and expands the body of knowledge that looks at the theory of student proximal academic outcomes and the relationship between active engagement of students and parental involvement. The research also provides baseline data for further Caribbean research on the impact of teacher relationships and the relationship between social self-efficacy for relating to teachers and student proximal academic outcomes, this study to the authors' knowledge represents the first of its kind in the Caribbean. The research also intimates that the level of parental involvement is moderated by select home and work variables, such as time and energy levels of parents. This therefore has implications for the types of parental involvement programmes and initiatives undertaken by schools.

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Investigating the Factors Influencing Students' Acceptance of Mobile Learning: The Cave Hill Campus Experience

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The unprecedented growth in the mobile computing market is creating opportunities within the higher education sector. However, before merging these new technologies with traditional methods, it is critical that the factors that are likely to affect the success of m-learning initiatives be identified. This study uses the Unified Theory of Acceptance and Use of Technology (UTAUT) model to determine the critical factors influencing undergraduate students' acceptance of m-learning technologies. Six hundred undergraduates at the Cave Hill Campus of the University of the West Indies in Barbados participated in the study. The data were analysed using multiple linear regression to determine the effect of four UTAUT constructs on behavioural intentions, moderated by age and gender. The findings revealed that whereas the factors performance expectancy, effort expectancy, and facilitating conditions were significant, positive, determinants of students' intentions to adopt m-learning technologies, social influence had no significant effect in this Caribbean context. This study should be of interest to higher institutions desirous of introducing m-learning initiatives, particularly in developing countries.

Keywords: Technology acceptance, UTAUT, Mobile learning, Caribbean, Higher Education, Developing countries.

Background

The 21st century has seen the growth of mobile computing, particularly in the area of mobile-learning (m-learning) technologies. Research conducted by the Global System for Mobile Communications Association (GSMA) predicts unprecedented growth in the global mobile market, with the number global mobile connections expected to reach 9.7 billion by 2017. In addition, an expected reach of 3.9 billion global mobile subscribers means that over half of the world's population will have access to mobile devices by 2017 (<http://www.gsma-mobileeconomy.com/>). The increased accessibility to mobile networks coupled with a decrease in the cost of mobile devices has significant implications for transforming the educational instructional environment, particularly in the area of m-learning. M-learning, the successor to e-learning can be informally defined as e-learning via the use of mobile devices and wireless transmission (Hoppe et al., 2003). These technologies run the gamete of handheld devices: from gaming consoles and MP3 players to mobile phones, palmtops and tablet PCs – all of which have functionalities useful for sending, receiving and interacting with educational

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content. While e-learning applications still remain the popular mode of choice for integrating technology into teaching practice, m-technologies offer the added advantage of ubiquitous, anytime m-learning applications. This means that the learning environment is no longer restricted within the bounds of the classroom because students can access and engage with course material anytime and from anywhere (Peng et al., 2009). The opportunity to learn “on-the-go” helps to drive the shift from the traditional teacher-centred to a learner-centred, constructivist paradigm, which means that students are given the opportunity to be more in charge of their own learning (Liu, Han, & Li, 2010; Peng et al., 2009; Penuel, 2006). The shift can be easily facilitated in an m-learning environment, since students can communicate with instructors and peers to share discussions, experiments, images, graphics, interactive games and self-constructed tests using the collaborative capabilities of their mobile devices. This creates myriad opportunities for the developers of m-learning tools, applications, and educational content to provide support to teachers with the delivery of lectures and preparation of class tests, assignments, project-based work, on-line forums etc. (Premadasa & Meegama, 2013). Even in these times of budgetary constraints, higher education institutions continue to invest in technology. Therefore, it is important that we seek to understand the main factors influencing the acceptance and use of these emerging educational technologies. This is particularly relevant to the Caribbean region where the setting up of e-learning systems can be accompanied by technical or infrastructural challenges (Thomas, Singh, and Gaffar, 2013). The identification of the factors that influence user acceptance can help in ensuring successful delivery of an enhanced higher education experience.

However, even with the increased use of and demand for mobile technologies, students and educators are yet to fully embrace and accept these m-learning technologies as viable options for their learning environments. Furthermore, the migration from an e-learning to an m-learning environment is not without challenges: both from a technical and support resources perspective, for example, low bandwidth as well as hardware and software limitations (Cmuk, 2007). Therefore, institutions may be reluctant to adopt this technology without having the necessary facilitating conditions and resources in place. As a result, it is important that students’ perceptions and attitudes be considered when assessing the viability of new initiatives such as m-learning (Apostolou et al., 2009).

The Learning Resource Centre (LRC) of the Cave Hill Campus has been charged with the responsibility of investing in and delivering technological services and solutions which can be used to enhance teaching and learning among faculty and students (<http://cavehill.uwi.edu/lrc/>). If m-learning is to be viewed as a viable instructional tool by the LRC, it is critical that the factors that may either inhibit or encourage the acceptance of this technology by the student body be investigated. This study used the UTAUT instrument to explore the level of acceptance of m-learning technologies among undergraduate students of the Cave Hill Campus and focused on the following two research questions:

1. Do the UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) positively influence students’ intentions to adopt m-learning?
2. Do age and gender significantly moderate the influence of the UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) on students’ behavioural intentions to adopt m-learning?

Literature Review

Sharples, Taylor, and Vavoula (2007) define m-learning as “the processes (both personal and public) of coming to know through exploration and conversations across multiple contexts among people and personal interactive technologies” (p. 225). In a similar vein, O'Malley et al. (2003) define it as “any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies.” Both of these definitions include the two distinguishing features of m-learning that differentiates it from e-learning - mobility and ubiquity. Mobility refers to ‘convenience, expediency and immediacy’ (Kynäslähti, 2003) while ubiquity refers to on-demand computing power with which users can access commuting technologies whenever and wherever they are needed (Peng et al, 2009). This “anytime, anywhere” advantage offers significant learning opportunities to students and instructors in higher education. Several of these institutions have already started to integrate m-learning, albeit at different levels of implementation. For example, universities such as Abilene Christian University, Purdue, and Duke have introduced m-learning courses into their curriculum (Pollara, 2011), in Japan, Osaka Jogakuin College provides mobile learning devices to their students (Donaldson, 2011), universities such as Princeton University, Ohio State University, and Stanford University have developed their own mobile apps to communicate information such as course materials, grades, campus news and sporting scores (Fraga, 2012), while in Canada, institutions such as Algonquin College, Durham College and the University of Ontario Institute of Technology provide dedicated spaces and m-learning resources on campus where students can use their mobile devices in a collaborative learning environment (Ally & Palalas, 2011).

In synthesizing research results from institutions that had adopted and integrated wireless mobile computing into their learning environments, Penuel (2006) found several factors motivating this migration. Many of these m-learning initiatives were prompted by a desire to improve the academic success of students, to reduce the digital divide by increasing the equity of access to technology, to prepare students to function more effectively in competitive work environments and to transform the instructive model from a traditional teacher-centred approach to a more student-centred approach (Bonifaz & Zucker, 2004; Penuel, 2006). While these mobile technologies may never completely replace all face-to-face classroom interaction, the integration of these technologies will allow for easier facilitation of blended courses combining offline and online learning with mobile devices. Even with all the potential advantages, students may be hesitant about accepting m-learning. Therefore, it is critical to develop an understanding of the factors that influence the adopting and use of m-learning in higher education institutions.

Technology Acceptance Theories

Technology acceptance models can be used to assess and gauge students' behavioural intentions and determine the factors which most positively influence students' likelihood to adopt new technologies such as m-learning (Apostolou et al., 2009). Since the 1980s several information technology acceptance theories have been proposed and used to explain technology adoption behaviour and its antecedents (Van Schaik, 2009). These include the Theory of Planned Behaviour (TPB) (Ajzen 1985) derived from social psychology, the Technology Acceptance Model (TAM) (Davis, 1986, 1989; Davis et al. 1989), the Technology, Organization, and Environment framework (TOE) (Tornatzky & Fleischer, 1990), and the Diffusion of Innovation model (DOI) (Rogers, 1995). These models have gained popularity and have been used in several studies exploring technology adoption practices; particularly in Western developed

countries (Davies & Graff, 2005; Huang et al., 2007; McCoy et al., 2007; Schepers & Wetzels, 2007; Straub, Keil, & Benner, 1997; Straub, Loch, & Hill, 2001; Wang, Wu, & Wang, 2009; Wills, El-Gayar, & Bennett, 2008). However, there is a corresponding dearth of research on technology acceptance in developing countries (Anandarajan et al., 2000; Al-Ghahtani, 2003; Iqbal & Qureshi, 2012; Maldonado et al., 2011). The situation is even more dire with respect to empirical evidence on the technology adoption practices of students within the Caribbean.

The UTAUT Model

A more recent and frequently used model is the Unified Theory of Acceptance and Use of Technology (UTAUT), which was proposed by Venkatesh, Morris and Davis (2003) and was formulated by integrating components from eight theoretical models (Van Schaik, 2009). One reason for its popularity is that this model has been shown to be more accurately predictive of technology acceptance; accounting for about 70 per cent of the variance in behavioural intentions when compared with previous models such as the Technology Acceptance Model (TAM) which accounted for a maximum of 40 per cent of the variance in behavioural intentions (Alrawashdeh & Al-Mahadeen, 2013; Venkatesh et al., 2003). The UTAUT model focuses on four key constructs; three of which are based on intentional beliefs (i.e., performance expectancy, effort expectancy, and social influence) and the fourth which examines the extent to which external conditions affect the individual (i.e., facilitating conditions). According to the model, these constructs are hypothesized to positively affect other constructs such as behavioural intentions, shown to be an important predictor of technology adoption (Van Schaik, 2009; Venkatesh et al., 2003). The definitions of each of the four key UTAUT constructs as well as a summary of findings from previous research are given below.

- **Performance expectancy** – The extent to which an individual believes that using an information system will help him or her to attain benefits in job performance (Venkatesh et al., 2003). In the m-learning context, this means that students believe they will not only find m-learning technologies useful but that as a result they will accomplish their tasks in a more timely, effective manner. Previous research has shown performance expectancy to be the strongest predictor of behavioural intentions (Morris & Venkatesh, 2000; Venkatesh & Morris, 2000; Wang, Wu & Wang, 2009).
- **Effort expectancy** – The degree of ease which individuals associate with using the new system (Venkatesh et al., 2003). In this context, this is related to the perceived ease of use of the m-learning technology and its associated features.
- **Social influence** – The extent to which individuals perceive that important others believe that they should use the new system (Venkatesh et al., 2003). In this context, this relates to the impact influential persons such as friends or University lecturers have on a student's propensity to adopt the m-learning technologies. While the role of social influence has been shown to weaken over time; it is still deemed to be an influential factor in the early phases of technology adoption (Venkatesh & Davis, 2000).
- **Facilitating conditions** - The degree to which an individual believes that organizational and technical infrastructure exist to support use of the system. In this case, this factor measures the extent to which students believe both the university and the host country provide the necessary support for m-learning (Venkatesh et al., 2003). This construct also measures whether students believe they have the knowledge and the resources necessary to use m-learning.

In the UTAUT model, the variables of age, gender, voluntariness of use and experience have been hypothesized to moderate the effects of the relationships between the four key constructs and behavioural intentions (Venkatesh & Davis, 2000; Venkatesh et. al., 2003). With respect to age and gender, previous research (Morris & Venkatesh, 2000; Venkatesh & Morris, 2000; Wang, Wu, & Wang, 2009) has shown the following:

- Age and gender moderate the influence of performance expectancy on behavioural intentions with the effect being stronger for males and younger individuals.
- The effect of effort expectancy on behavioural intentions is moderated by gender and age; with the effect being stronger for women, particularly younger women.
- The influence of social influence on behavioural intentions is moderated by gender and age; such that the effect is stronger for women.
- The influence of facilitating conditions on behavioural intentions is moderated by age; with the effect being stronger for older users.

Based on the UTAUT theoretical framework, this research explored whether the four key factors performance expectancy, effort expectancy, social influence and facilitating conditions were significant predictors of students' behavioural intentions to adopt m-learning. In addition, the moderating effects of age and gender were also considered. It must be noted that while the original UTAUT model also included voluntariness of use and experience as moderating variables, these variables were not included in this study. Within the current context, the technology is still in its embryonic stages and m-learning applications have not yet been formally integrated as part of the courses. Therefore, at this early stage, there is no compelling argument for the inclusion of voluntariness of use and user experience with the technology. The model used in this study is shown in Figure 1.

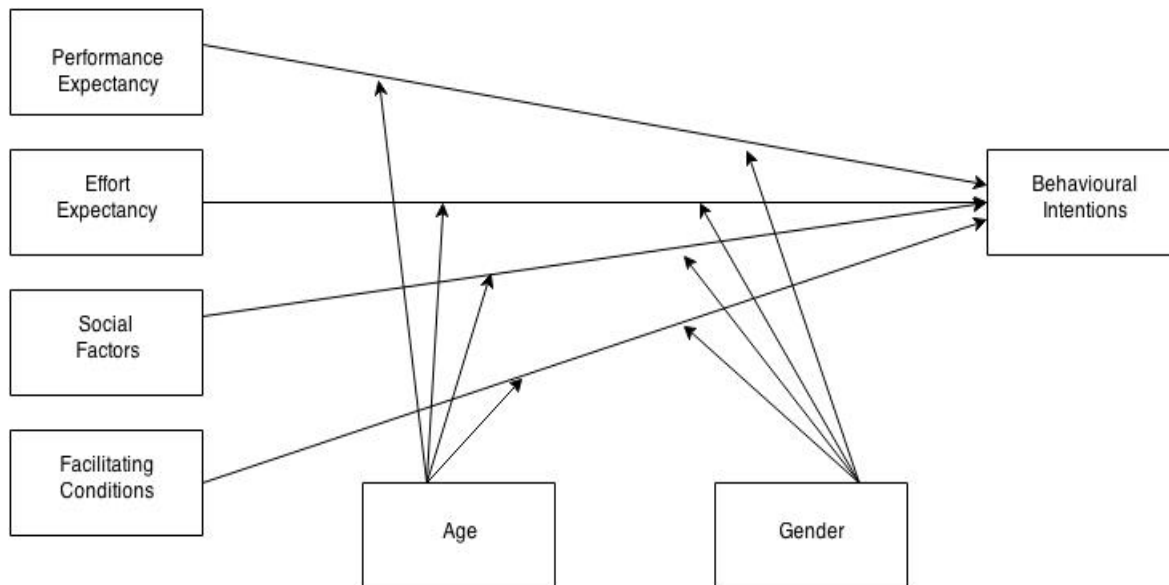


Figure 1. Research Model

Research Methodology**Sample**

The data for this study were collected using a web-based survey instrument which was made available to all undergraduate students during the period October to December, 2012. Participation in the study was completely voluntary and no identifying information was required on the survey. A total of six hundred completed questionnaires were received, representing 8% of the total undergraduate population of 7,529 at the Cave Hill Campus.

Instruments

The questionnaire used in this study consisted of three sections and was based on the constructs defined in the UTAUT model (Venkatesh et al., 2003). Section I was designed to capture the demographic profile of the sample and included items such as students' sex, age and year of undergraduate programme. Section II focused on students' mobile device ownership and their usage of these technologies. Section III contained 18 questions based on the five UTAUT constructs. Performance expectancy (e.g. Mobile technologies are useful in education in general), effort expectancy (e.g., Mobile technologies are easy to use), social influence (e.g., People who influence my behavior think I should use mobile technologies for learning.), facilitating conditions (e.g., In general, my University campus has support for m-learning), and behavioural intentions (e.g., I intend to use m-learning strategies in the next semester) were all measured using a five-point agreement Likert scale (from 1 - strongly disagree to 5 - strongly agree).

Data Analysis

The collected data were analysed using SPSS V 19. Descriptive analyses such as frequencies, means, standard deviations, and correlations were run to examine sample profile and to determine the extent of relationships among the variables. Secondly, a multiple linear regression analysis was conducted to explore the research questions posed regarding the extent to which the four constructs explain the variance in students' behavioural intentions to adopt m-learning. This relationship was examined with and without the inclusion of the proposed mediator variables age and gender.

Item Reliability

The reliabilities of the five scales all exceeded the minimum recommended Cronbach's value of 0.70 (Hair et al., 1998; Nunnally, 1978) indicating adequate internal consistency. The construct performance expectancy consisted of four items ($\alpha = 0.85$), effort expectancy consisted of three items ($\alpha = 0.88$), social influence consisted of three items ($\alpha = 0.72$), facilitating conditions consisted of five items ($\alpha = .81$) and behavioural intentions consisted of three items ($\alpha = .93$). (Refer to Table 1).

Table 1. Reliability coefficients for the five UTAUT constructs

Constructs	No. of Items	Composite Reliability
Performance Expectancy	4	0.85
Effort Expectancy	3	0.88
Social Factors	3	0.72
Facilitating Conditions	5	0.81
Behavioural Intentions	3	0.93

Results

Sample Profile

The students completing the survey ranged in age from 17 to 60 years with a mean of 26.2 (SD=9.3), with 64.0% of the sample being 25 years or younger. Seventy-two per cent of the undergraduate students participating in the survey were female; a close approximation to the 68% (5,123) in the actual undergraduate population. Just over one third (34.6%) of the students were in their first year of study, 29.5% in their second, 27.5% in their third and the remaining 8.5% have been pursuing their undergraduate degrees for at least four years. Table 2 presents the demographic profile of the sample.

Table 2. Demographic profile of sample

	Frequency (n)	Percent (%)
Gender	429	71.5
Female	171	28.5
Male		
Age		
Under 25 years	384	64.0
25 – 30 years	67	11.2
31 – 40 years	79	13.2
Over 40 years	70	11.6
Year of programme		
First		
Second	176	29.5
Third	164	27.5
Fourth	39	6.5
More than four years	11	1.8

Mobile Device Ownership

Cell phone ownership was extremely high among the Cave Hill undergraduate population, with 95.5% (573) of students having a cell phone. Interestingly, rates of ownership were similar across male (95.9%) and female (95.3%) students as well as the four age categories: under 25 years (95.3%), 25-30 years (95.5%), 31-40 years (94.9%) and over 40 years (97.1%). Adoption

of other mobile devices was significantly lower; with 25.5% owning MP3 players, 24.8% tablet devices, 15.8% eBook readers and 1.0% PDAs. In addition, over 45% of the students owned at least two different types of mobile devices. In the case of smartphones, three in four undergraduate students (76.6%) were owners. Ownership was higher among males (80.7%) than females (75.1%). In addition, students in the 25-30 years age group (83.6%) were far more likely to have smartphones than those in the under 25 (78.4%), 30 – 40 (73.4%) or the over-40 age groups (64.3%). Among the undergraduate population, Blackberry was the operating system of choice; with just over two thirds of this group (66.7%) owning a Blackberry phone. Smaller groups of students reported having an Android device (13.1%), iPhone (4.5%), Windows phone (1.0%) or some other type of smartphone (7.7%). With respect to smartphone features, the camera (87.5%), audio recorder (81.8%), video recorder (81.3%), WIFI (73.3%), Internet cable (72.7%), ability to install applications (62.0%), QWERTY (61.8%) were among the most popular features. These results are presented in Table 3.

Table 3. Mobile device ownership

	Frequency (n)	Percent (%)
Types of Mobile Devices		
Smart phone	460	76.6
MP3 Player	153	25.5
Tablet Device	149	24.8
Ebook Reader	95	15.8
PDA	6	1.0
Types of smartphones		
Android	75	13.1
Blackberry	307	53.6
iPhone	26	4.5
Windows Mobile Phone	6	1.0
Other Smart Phone	46	7.7
Don't have a Smart Phone	113	18.8
Smartphone features		
Touch Screen	201	33.5
QWERTY	371	61.8
External Display	132	22.0
Internet Cable	436	72.7
WIFI	440	73.3
Camera	525	87.5
Audio recorder	491	81.8
Video recorder	488	81.3
Office Productivity Software	295	49.2
Ability to Install Applications	372	62.0

Examination of Constructs

Next the means and standard deviations for each of the items comprising the constructs, the five constructs as well as the correlations between the constructs were calculated (see Tables 4 and 5). A descriptive summary of the results is given below.

Performance Expectancy

Performance expectancy had a mean score of 3.81 (SD = 0.76). While the majority of students (90.0%) agreed that “Mobile Technologies are useful in education in general”, only half of the sample felt that “Mobile technologies would improve students’ performance” or that “Mobile technologies would increase students’ productivity”. The construct was significantly positively correlated with the behavioural intentions ($p < .01$ level), with a correlation of .51.

Effort Expectancy

This construct had the highest mean of 4.04 (SD = 0.65) indicating high agreement among students with statements such as “Mobile technologies are easy to use” and “Learning to operate mobile technology is easy”. Over 80% of students agreed or strongly agreed with each of the three statements, revealing students’ perceived ease of use of mobile technologies. The construct was significantly positively correlated with behavioural intentions ($p < .01$), with a correlation coefficient of .27.

Social Influence

This construct had the lowest mean of 3.16 (SD = 0.76). Overall, agreement to these three items was rather low, with fewer than 45% of students agreeing that influential persons in their lives believe they should be using mobile learning technologies. More specifically, only 30% believe that “People who influence my behaviour think that I should use mobile technologies” and 36% agreed that “People who are important to me think that I should use mobile technologies for learning.” A slightly higher percentage (42%) believe that their “University lecturers are supportive of the use of mobile technologies”. The construct was significantly positively correlated with behavioural intentions ($p < .01$), with a correlation coefficient of .40.

Facilitating Conditions

Facilitating conditions had a mean of 3.62 (SD = 0.71). It was interesting to note that students generally believe that they have both the knowledge (77%) and resources (67%) to use m-learning. However, there were lower levels of agreement when students were asked about the existence of infrastructural and policy support for m-learning in Barbados (59%) and at Cave Hill Campus (58%). The construct was significantly positively correlated with behavioural intentions ($p < .01$), with a correlation coefficient of .47.

Behavioural Intentions

In the study, students were asked about their intentions to use m-learning technologies in the near future. The construct had a mean of 3.76 (SD = 0.93). While most (70%) of the students plan to use the m-learning technologies at some point in the near future, they was some uncertainty as to whether their plans would materialize in the next semester (58%).

Table 4. Descriptive statistics for UTAUT items and constructs

	Mean	SD
Performance Expectancy		
Mobile technologies are useful in education in general.	4.26	0.71
Using mobile technologies enable students to accomplish tasks more quickly.	4.01	0.88
Mobile technologies would improve students' performance.	3.48	1.00
Mobile technologies would increase students' productivity.	3.49	1.04
	3.81	0.76
Effort Expectancy		
Mobile technologies are easy to use.	4.15	0.69
Finding or using features in mobile technologies is easy.	3.97	0.74
Learning to operate mobile technology is easy.	4.01	0.75
	4.04	0.65
Social Influence		
People who influence my behavior think I should use mobile technologies for learning.	3.03	0.94
People who are important to me think I should use mobile technologies for learning.	3.12	0.96
Lecturers are supportive of the use of mobile technologies.	3.31	0.94
	3.15	0.75
Facilitating Conditions		
In general, my University campus has support for m-learning.	3.61	0.94
In general, the country in which my university is located has support for m-learning.	3.57	0.94
I have the necessary resources to use m-learning.	3.68	0.98
I have the knowledge to use m-learning.	3.92	0.85
Support is available when problems are encountered with m-learning technologies.	3.30	0.98
	3.62	.71
Behavioural Intentions		
I intend to use m-learning strategies in the next semester.	3.74	0.986
I predict I will use m-learning technologies in my course in the next semester.	3.66	1.020
I have a plan to use m-learning technologies in the near future.	3.87	0.954
	3.76	0.93

Table 5. Correlations among the UTAUT constructs

Constructs	PE	EE	SF	FC	BI
PE	—	.236**	.452**	.369**	.507**
EE		—	.068	.194**	.274**
SF			—	.356**	.399**
FC				—	.471**
BI					—

Note: **Correlation is significant at the 0.01 level (two-tailed).

PE, performance expectancy; EE, effort expectancy; SF, social factors; FC, facilitating conditions; BI, behavioural intentions.

Multiple Regression

A multiple linear regression model was developed for predicting behavioural intentions from the four UTAUT constructs. In the first phase of the regression, a baseline model was run without the presence of the moderating variables, gender and age. The resulting model was statistically significant ($F(4, 595) = 92.42, p < .001$), and accounted for 38% of the variance in behavioural intentions. All four predictors had significant positive effects on students' intentions to use m-learning technologies. An examination of the standardized beta weights indicates that the greatest contributors to the prediction model were performance expectancy ($\beta = 0.30, p < 0.001$) and facilitating conditions ($\beta = .28, p < 0.001$). In addition, there were no multicollinearity problems since the VIFs for the constructs ranged in value from 1.08 to 1.39. The regression coefficients without moderating effects are shown in Table 6.

Table 6. Summary of multiple regression for variables predicting behavioural intentions (without moderating effects)

	B	SE (B)	β	t	Sig. (p)
Performance Expectancy	.368	.046	.303	7.96	.000
Effort Expectancy	.197	.047	.139	4.142	.000
Social Influence	.189	.046	.154	4.139	.000
Facilitating Conditions	.361	.047	.277	7.720	.000

Note. $R^2 = .38$

Next, a second regression was run in which the moderating influences of age and gender were examined. To test these effects, the moderators (age and gender) and their interactions with the four independent constructs were added to the model. The first step in this analysis was to create new group-centred variables based on five quantitative variables (i.e., PE, EE, SI, FC and Age). Next cross-product terms were created between the group-centred constructs and the moderator variables to represent the interaction effects. Finally, the regression model was created hierarchically with the group-mean centred variables added in the first level and the interaction terms in the second level.

The results indicated that the predictive power of the model was not significantly improved with the inclusion of the moderating variables. Of the eight interaction effects, only the influence of performance expectancy on behavioural intentions was significantly moderated by age ($p < .05$). An examination of the simple slopes showed that the effect decreased with age; the relationship being stronger for younger undergraduates. Gender had no significant moderating effect on any of the relationships. With respect to main effects, only effort expectancy ($\beta = 0.22$, $p < 0.05$) and facilitating conditions ($\beta = 0.24$, $p < 0.05$) were both significant predictors of behavioural intentions. However, when the moderating variables and interactions entered in the model, social influence was no longer a significant predictor ($\beta = 0.05$, $p > 0.05$) (See Table 7).

Table 7. Summary of multiple regression for variables predicting behavioural intentions (with moderating effects)

	β	t	Sig. (p)
Performance Expectancy (PE)	.260	2.275	.023*
Effort Expectancy (EE)	.222	2.155	.032*
Social Influence (SI)	.050	.447	.655
Facilitating Conditions (FC)	.238	2.183	.029*
Age	-.076	-2.182	.030*
Gender	.003	.094	.925
PE x Age	-.078	-2.000	.046*
EE x Age	.050	1.315	.189
SI x Age	.032	.877	.381
FC x Age	.055	1.504	.113
PE x Gender	.043	.369	.712
EE x Gender	-.119	-1.160	.247
SI x Gender	.110	.993	.321
FC x Gender	.053	.471	.638

Note. $R^2 = .38$, $p < 0.05$

Discussion and Conclusion

The primary purpose of this study was to use the UTAUT model to investigate the factors that significantly impact Campus Hill Campus' undergraduate student population to adopt m-learning. Overall, a high level of mobile device ownership was found among the students, rivalling that of the USA. Findings from the 2013 Pew Internet survey revealed comparable penetration rates for mobile devices among adults in the US. For example, as of May 2013, 91% and 56% owned cellular and smartphones as compared with 95% and 77% respectively among the Cave Hill's undergraduate population. In addition, a sizeable proportion was likely to have at least two mobile devices in their "digital backpacks." This is in keeping with the rapid information and communication technology (ICT) adopter trends among undergraduate population as reported in previous research studies (Millea, Green, & Putland, 2005; Oblinger & Oblinger, 2005). Cognizant of this, lecturers must work to revamp their pedagogical models to

leverage this reality and embrace the technological know-how of this Generation Z and Net Generation cohort.

With respect to the UTAUT constructs, the results confirmed that there were several factors influencing students' proclivity to use m-learning. Overall, the regression model explained 38% of the variance in students' behavioural intentions and provided partial support for the UTAUT model. More specifically, the results revealed that:

- Consistent with previous research, performance expectancy was the strongest predictor of behavioural intentions (Kijasanayotin, Pannarunothai, & Speedie, 2009; Wang, Wu & Wang, 2009). Furthermore, it was found that age moderated the effect of performance expectancy on behavioural intentions; with the relationship being stronger for younger students. This result which agreed with the findings of Morris & Venkatesh (2000), Venkatesh & Morris (2000) and Venkatesh et al. (2003) indicate that for students to buy into the concept of integrating m-learning technology in their classes, they must first be convinced of its utility and its productivity, particularly younger users of the technology.
- Effort expectancy had a positive direct effect on the students' intentions to use m-learning technologies. This finding which supports that of previous research (Venkatesh & Morris (2000) and Venkatesh et al. (2003) reiterates that students are more inclined to adopt the new technology when they know they have the necessary skills and believe the mobile devices and technologies are easy to use. Therefore Wang, Wu and Wang (2009) suggest that it is important that m-learning systems be designed to be user friendly with easy to use.
- Unlike previous research, (Brown & Venkatesh, 2005; Venkatesh et al., 2003; Venkatesh & Davis, 2000) social influence was not found to be a significant determinant of students' intentions to adopt m-learning. However, given this population of educated, independent thinkers, it is quite likely that the students have acquired enough experience to feel comfortable and confident using the mobile technology, and as a result, the opinions of peers have little effect on their m-learning adoption decisions. This view was supported by Burton-Jones & Hubona, (2006) and Al-Qeisi (2009) who argue that as education and experience increase, users become more empowered and this in turn decreases the effect of social influence on their behaviour.
- Facilitating conditions had a strong positive influence on undergraduate students' intentions to use m-learning technologies, that is, students are more likely to use m-learning if they believe that there is adequate availability of and easy access to organizational and technical resources to support the use of the m-learning system. The original UTAUT model hypothesized that when performance expectancy and effort expectancy constructs are present, facilitating conditions will not have a direct influence on behavioural intentions (Venkatesh et al., 2003). However, other studies have reported a significant effect (Tibenderana et al., 2010; Wang et al., 2010; Wu et al., 2009; Zhou, 2008). Therefore, although the undergraduate students are confident in their ability to use the m-learning technologies, they need to be convinced of the University's and the host country's (i.e., Barbados') support for and commitment to the initiative. Given the slow pace and the challenges which developing countries face in providing the necessary technical and infrastructural enabling environment, it is therefore not surprising that students need that reassurance from the relevant authorities before fully embracing the possibility. In researching the adoption of e-government services in Pakistan, Ahmad, Markkula and Oivo (2013) found that having adequate facilitating conditions is one of

the greatest challenges to technologies advances in developing countries. To mitigate this situation, the researchers stress that it is important that the authorities formulate policies and campaigns pledging their support of the technological initiatives and publicly articulate their plans for moving from a vision to reality (Ahmad, Markkula & Oivo, 2013).

- No significant gender differences were found when modelling the relationships of the four key constructs on behavioural intentions. This means that the significant positive effects for performance expectancy, effort expectancy and facilitating conditions were consistent in size and direction for both male and female undergraduate students. Again, given the nature of the population, this is not a surprising finding. This suggests that the gender gap with respect to technology acceptance is lessening; a finding supported by other researchers who have conducted technology acceptance among student populations (Letchumanan & Tarmizi, 2011; Maldonado et al., 2011; Marchewka, Liu, & Kostiwa, 2007).
- With the exception of performance expectancy, age did not affect any of the other relationships. While this finding is inconsistent with that of the original research (Venkatesh et al., 2003), the nature of the population may account for this occurrence. Given that three quarters of the sample was under 30 years of age, this high level of homogeneity is likely responsible for muting the moderating effect of age.

Implications for Future Research

While this research will add to the discussion on m-learning acceptance in higher education institutions, there are some areas which could be investigated in future studies. First, this study focused solely on the views of the student population. However, the success of any m-learning initiative is highly dependent on the university educators as well. Therefore, future work will incorporate the acceptance perceptions of the university lecturers, who are ultimately responsible for the design and delivery of the courses. Second, the Cave Hill Campus is one of three campuses of the University of the West Indies. Therefore it would be instructive to explore and compare whether students in the other two campuses are influenced similarly by the factors explaining their intentions to use m-learning technologies. Third, m-learning applications are still at an ascent stage of development within the region, therefore it may be challenging for students to visualize exactly how they can be integrated within the traditional modes of delivery. Hence, a second round of surveys is warranted. This should take place after the technologies have gained traction and public discussions among the key stakeholders about the benefits and challenges of m-learning for education delivery, both from an implementation and pedagogical perspective, have been convened.

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Attitudes toward Persons with Albinism among a Sample of Barbadian and Trinidadian Nationals

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The paper explores the attitudes toward albinism among a sample of Barbadian and Trinidadian nationals. The sample of 300 nationals of Barbados and Trinidad consisted of 100 males and 200 females in the 10-30 (n=141); 31-50 (n=97); and 50-75 (N=62) age ranges were chosen as a purposive non-random sample. They completed the Attitude and Behaviour Questionnaire towards persons with Albinism (ABAQ). Factor analysis revealed the factor structure of the Attitudes and Behaviours toward Albinism Questionnaire. The factors of misconception, sympathy, and empathy were identified and the data analysed to assess attitudes toward persons with albinism. . There were nine questions on interaction with persons with albinism and a comment section which revealed through interpretational analysis some underlying feelings by the respondents about albinism. The sex and age categories were analysed to determine any significant differences. The finding suggests that there was positive regard for persons with albinism. Recommendations emanating from the research were advanced.

Keywords: Albinism, attitude, misconception, sympathy, empathy, Jennifer, Deanne, Ford

Introduction

Albinism is a congenital disorder that, affects people from all races. Most children with albinism are born to parents who have normal skin, hair and eye colour for their ethnic backgrounds (Oetting, 1998). The prevalence of all forms of albinism varies considerably worldwide but an overall estimate is that one in 20,000 people worldwide is born with one of the five types albinism. The worldwide estimate is that one percent of the population carries one of the six (6) types of albinism gene, which is on either chromosome 9, 10, 11, 13, 15 or X and when inherited from both parents is responsible for the manifestation of albinism (National Organisation for Albinism and Hypopigmentation 2004a).

People manifest many different hues, from black to brown to white and shades in-between but the genetics behind this spectrum of skin colours have continued to be an enigma. The chief determinant of skin colour is the pigment melanin, which protects against ultraviolet rays and exists in cellular organelles called melanosomes (NOAH, 2004a). The word “albinism” refers to a group of inherited conditions when people have little or none of the pigment melanin in their eyes, hair, or skin. They have inherited altered genes that do not make the usual amounts of this pigment melanin (NOAH, 2004a). The focus of this study is to explore the attitudes toward persons with albinism among a sample of Barbadian and Trinidadian nationals in order to identify any physical and psychological problems that these attitudes may initiate.

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The formation of attitudes and behaviours toward persons with albinism that result are described in this paper. Research on attitudes toward albinism in the urban area of Soweto, South Africa, suggested a continued belief in the mystical powers of people with albinism and professes that when people with albinism die, they vanish (Kromberg et al., 1987). In contemporary media and literature, this death belief is represented in the 1995 film 'Powder', in which a child born with albinism after his mother is struck by lightning is assumed to have mystical powers that result in his vanishing after death (Luna, 2004; Murtha, 1998; NOAH, 2004b). Recently, the controversial film 'The Da Vinci Code' featured a person with albinism as one of the villainous characters.

Witkop (1975) claims that historically, people with various depigmenting conditions, including albinism, have occupied a spectrum of social positions, ranging from outcasts to demigods. Montezuma, Emperor of the Aztecs at the time of Cortez's conquest, maintained a museum of living human biological curiosities; prominent among these people were numerous persons with albinism. Among the San Blas, an Indian group in Mexico, persons with albinism are treated as semi-outcast and are not allowed to marry (Cress-Welsing, 1990).

In the Caribbean, the most popular person with albinism is Winston Foster from Jamaica, more popularly known by his alias of 'Yellowman'. He was born in 1956 and placed in an orphanage. In Jamaica, largely because of the lack of knowledge of the condition of albinism, he was treated with hostility and scorn. He had no one to give him any support and faced a youth fraught with hardship. It was while he was institutionalised that he nurtured a singing career. In recent years, 'Yellowman' suffered with throat and skin cancer, but like the struggles of his earlier days, he has not let these difficulties stand in the way of his aspirations. In spite of the cancer, 'Yellowman' continued his singing career and has become a calmer, more conscious singer, using his lyrics to give the message of tolerance. (<http://www.globalrhythm.net/print.cfm?rubricarticleid=943>)

Psychological Perspective

Erikson (1959) posits that the social environment combined with biological maturation provides each individual with a set of crises that must be resolved. The individual is provided with a sensitive period in which to negotiate successfully each crisis before a new crisis is presented. The results of the resolution, whether successful or not, are carried forward to the next crisis and provide the foundation for its resolution. The crisis for a person with albinism affects them from birth because of the society's mistrust of the mother and the doubt over the paternity of the child (NOAH, 2005). In addition, the ignorance and lack of understanding of the phenomenon continue throughout a person's life as they encounter new situations in their lives (Erikson, 1963).

According to Erikson (1963), adolescents are extremely sensitive about their appearance and this fosters considerable anxiety and self-doubt. Erikson's (1963) psychosocial theory posits that ego identity is a basic sense of who we are as individuals in terms of our self-concept and self-image. In adolescence, our improved cognitive powers allow us to analyze our roles, identify inconsistencies and conflicts in them, and restructure them in forging an identity. Sometimes we abandon earlier roles; sometimes we establish new relationships with parents, siblings and peers (Craig, 1999).

Erikson (1963) sees the tasks of identity formation as the major hurdle that adolescents must cross in making a successful transition to adulthood. Ideally, adolescents enter adulthood with a stable and consistent sense of who they are and how they fit into society. It is during the

period of adolescence that a child will be striving to integrate different roles into one single consistent identity. Teenagers with albinism are especially confused at this time, and find adjusting to life among their peers a little more difficult (Murtha, 1998; Tylor, 1987). Waugh (1999) claims that if the person with albinism feels that he or she is perceived to be different, it can lead to an immense effort to act as 'normal' as possible. This can result in denying altogether that one has albinism and losing touch with a very important part of one's self. A sense of identity helps give direction, purpose and meaning to life (Erikson, 1959, 1963, 1968; Waterman, 1985) and children with albinism sometimes have difficulty forming this sense of identity because of the myths, stigmatisation and misconceptions about albinism (Landau, 1998; Waugh, 1999).

Attitude

The term attitude refers to people's evaluation of virtually any aspect of the social world (Baron, Byrne & Branscombe, 2006; Olson & Maio, 2003; Petty, Wheeler & Tormala, 2003). Bagley, Verma, Mallick and Young (1984) posit that attitude is the predisposition of the individual to evaluate some symbol or object or aspect of his world in a favourable or unfavourable manner including the affective or feeling core of liking or disliking, and the cognitive or belief elements of the attitude (Baron et al., 2006).

Attitude, according to Eagly and Chaiken (1998), is a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour. The two main elements are the attitude object and the tendency to evaluate, where the attitude object can be anything that a person discriminates or holds in his or her mind. The tendency to evaluate is not directly observable but intervenes between certain stimuli and responses. This experience manifests in certain attitudes, which are divided into three components. The three-component model of attitude assumes that attitudes are a combination of three distinguishable modes of experience and reactions to an object: affective, cognitive and behavioural. The affective component entails emotions and feelings elicited by the attitude object; the cognitive component consists of beliefs about the attitude object; and the behavioural component comprises actions and behavioural intentions directed at the attitude object (Hewstone & Stroebe, 2001).

People can have favourable or unfavourable reactions to issues, ideas, specific individuals, entire social groups and objects. Priester and Petty (2001) claim that our evaluations are often mixed, consisting of both positive and negative reactions. Armitage and Connor (2000) posit that ambivalent attitudes are easier to change than those that reflect a uniform position on an issue; as a result, behavioural responses tend to be unstable when attitudes are mixed. Baron et al. (2006) opines that when attitudes are ambivalent they are more susceptible to change, compared with when they are uniformly positive or negative. Attitudes are formed through social learning where our views are acquired in situations in which we interact with others or simply observe their behaviour (Baron et al., 2006).

The salient features of albinism invoke a variety of positive and negative attitudes towards persons with albinism, and about them by self and others. Ehrlich (1973) defines the concept of prejudiced attitudes as an interrelated set of propositions about an object or class of objects that are organized around cognitive, behavioural, and affective dimensions. A modern view claims that attitudes are our evaluations of any aspect of the social world that we acquire through social learning, social comparison, exposure to the mass media and identification with a group (Baron et al., 2006).

Attitudes that persons hold about albinism suggest a lack of knowledge and understanding of the phenomenon as some of the studies reviewed for this paper reveal. Research by Kromberg et al. (1987) found that the birth of a baby with albinism seems to cause a delay in maternal attachment and sadness similar to that described in connection with the birth of an infant with other congenital disorders. In support of this delay in maternal attachment, Ainsworth, Blehar, Waters and Wall (1978) found that when a baby dislikes being touched or has a disability like blindness, mutual attachment is at risk. The baby with albinism is born legally blind and different in appearance from the family, if the caregiver or mother does not initiate attachment there are implications for attachment and the future relationship.

Literature Review

This literature review presents research as it relates to attitudes toward persons with albinism concerning the myths, stereotypes, language and the impact on the social and emotional well being of persons with albinism. A critical review of research literature about albinism by Estrada-Hernández and Harper (2006) revealed that public attitudes toward albinism reflected a general lack of information and a related degree of negativism. Another study by Enzeilo (1989) suggested that there were usually unkind attitudes expressed towards albinos. Lund and Gaigher (2002) suggested that the most serious problem experienced by people with albinism was poor eyesight. However, persons with albinism felt that social problems such as being treated badly by parents, being shy, being subjected to name calling and feeling excluded in mainstream schools made their lives unpleasant.

In the case of albinism, individuals are at risk of isolation, because the condition is often misunderstood. Social stigmatisation can occur, especially within communities of colour, where the race or paternity of a person with albinism may be questioned (Landau, 1998). In addition, social attitudes can affect how persons with albinism perceive themselves and evidence suggests that for a child to be socially competent he or she needs to have a positive self-concept and demonstrate socially acceptable behaviours. Self-esteem influences a child's interaction with peers, and this influence can be either positive or negative (Palmer, 2007). According to Kenrick, Neuberg and Cialdini (1999) self-esteem is the specific attitude we have toward ourselves. This attitude can be favourable or unfavourable thereby creating high or low self-esteem respectively in persons. Persons with albinism are constantly re-evaluating themselves in order to fit in and be accepted in society.

A study by Lund (2001) indicated that if teachers, who are well-respected community members, are well informed about albinism, they will influence local perceptions and attitudes toward albinism. Lund (2001) opines that the distinctive appearance of persons with albinism has a powerful impact on their lives from birth until death. They are always conspicuous, but not always 'seen' as individuals. Additional knowledge about their albinism should increase the self-esteem of those with the condition, enhance their self-image, improve their health prospects and empower them to counter negative attitudes within society. This would enable them to cope better in a society where their acceptance in the black community and even within their own family may be questioned. The recognition that albinism is found world-wide, in every population group, would help them come to terms with their place in society and develop a confident sense of self.

A study was conducted by Lund and Gaigher (2002) of thirty-eight children with albinism, from a special school in the Limpopo province in Africa which recruits primary school children with visual impairment from a wide rural area of the northern province of South

Africa. It is near the Tropic of Capricorn at an altitude of 1230 metres, with an average of 8.5 hours of sunshine per day, leading to high levels of ultraviolet (UV) radiation throughout the year. Of the 131 pupils at the school, 112 or 85.5 percent had albinism. Children in their sixth year at school and more completed a written questionnaire in English with a translator available if required, detailing socio-demographic, educational and health information, as well as protective measures adopted to manage their condition. In this study, only children old enough to express their views in English were included (Lund, 1998, 2001). The participants were asked about their perception of albinism and its causes. Each pupil was examined on a sunny day in autumn, to record cases of sunburn, facial skin lesions and the type of clothing worn.

Lund and Gaigher (2002) concluded that there was an acute lack of information about the causes and consequences of albinism. They posited that any health strategy or intervention programme should not only be geared towards alleviating the skin and eye problems so prevalent among people with albinism, but should also consider the social and psychological problems resulting from the striking difference in appearance between normally pigmented people and those with albinism. In African communities, where traditional explanations concentrate on the misfortune of illness or deviance rather than on a biomedical explanation of its physical causes, such 'deviant' appearances can impact negatively on the socialization of a child with albinism. Intervention programmes that work effectively in western societies cannot be duplicated in non-western societies without taking into consideration those cultural values that influence perceptions and actions about health and disease (Lund & Gaigher, 2002). The foundation for a lifetime of self-esteem and inner strength is being prized and valued as a whole person (Waugh, 1999), and anything that decreases that self-esteem devalues the person. Persons with albinism who feel isolated and different because of people's reaction to them may experience low self-esteem.

Language

Language can shape ideas and create reality. Sometimes the word 'albino' is used hurtfully and many feel it is dehumanizing to refer to a person in terms of a condition. The preferred terms 'person with albinism' and 'people with albinism' put the person first and the condition second (NOAH, 2005). However, for this research while the preferred term is person with albinism the word 'albino' is used sometimes in context where the word 'albino' makes the argument more poignant. In South Africa, persons with albinism who were interviewed by Richard (2000) about their albinism related that language could offend when used in hurtful names as 'Inkawu' when translated means monkey. Another interviewee in the study by Richard (2000) said that because of the absence of sunscreen lotions in rural Malawi, many persons with albinism develop lesions and people laugh and call them 'napweli' or translated means tomato with black spots. Yet another interviewee in the same interview said that the tens of thousand of southern Africans living with albinism have experienced discrimination and abuse and are often regarded as unnatural and even cursed. Albinism is a lifelong curse as white-skinned men in black society are shunned and feared as the products of witchcraft, taunted by children and drunks as 'peeled potatoes', 'monkeys' and 'ghosts'. Some societies in Africa used to sacrifice albinos to idols, banish them from villages or throw them into forests at birth (Richard, 2000).

Myths and stigmatisation

A myth is defined as an unusual traditional story of ostensibly historical events that serves to unfold part of the worldview of a people or explain a practice, belief, or natural phenomenon

(Merriam-Webster Dictionary, 1988). In the case of albinism, many of the myths surrounding the condition suggest that persons accepted the stories told about explanations as to the origins and features of albinism.

Goffman (1987) argues that society establishes categorizations, where certain characteristics are considered normal within a category, the outcome can be referred to as social identity. According to Goffman (1987), social identity is based on first appearances, and occurs through mixed contacts in social situations where stigmatised individuals are in contact with non-stigmatized individuals. Our anticipation of others, our assumptions as to what the person is like, is based often on these first appearances. Goffman distinguishes between people who are discredited and people who are discreditable. Goffman (1987) further describes three types of stigma. The first one is the abominations of the body, like physical deformities, the second are the blemishes of individual character, and the third one is the tribal stigma, referring to race, nationality and religion. A stigmatised person is perceived as a victim who is inferior or someone who is not quite human. In accepting Goffman's definition of a stigma, persons with albinism fall into the group that he calls discredited persons whose differences are evident on the spot.

The study by Lund and Gaigher (2002) reveals that albinism is projected as a condition still deeply immersed in myths and superstition resulting in the stigmatisation and rejection of affected people. It also discloses a physical environment, which is preventing rather than supporting people with albinism from reaching their potential. The myth described in the study by Lund and Gaigher (2002) is that albinism is the result of witchcraft. Myths of this kind suggest that families with babies that have albinism are victims of witchcraft, which has lead to the baby being born with albinism. The three persons with albinism in the study by Ezeilo (1989) included interpersonal, especially heterosexual, problems and society's unkind attitude as disadvantages of their albinism. These persons with albinism admitted that they found it hard to make and keep relationships.

Machipisa (2003) interviewed five persons with albinism and they revealed that there is a traditional belief that if you sleep with an albino woman, you will be cured of HIV. The term 'sleep with' means having sexual intercourse, which results in the person with albinism being exposed to the virus that causes AIDS. This modern day myth about albinism and HIV creates further risk to persons with albinism. Another myth revealed in this interview was that there is a belief in Zimbabwe that if a pregnant woman looks at a person with albinism, she will give birth to a child with the same condition unless she spits on her stomach. The belief is that this action erases any curse placed on the baby in the womb, because of the encounter with the person with albinism (Machipisa, 2003). In a journal article, a young member of the Albinism Society of South Africa makes a plea for understanding about albinism. She opines that persons with albinism are also human beings who just lack pigmentation (Mametsa, 2007).

Attitudes, tales and myths have developed and changed over centuries. One story suggests that albinism is the product of a Negress-gorilla or a Negress-water spirit mating. In some places in South Africa today people with albinism are still referred to as 'nkau', which means monkey. Other myths about albinism refer to blessings as well as punishments, and skills in sorcery as well as healing (Kromberg et al. 1987).

In addition, Waugh (1999) reveals that the media, including literature and film, have contributed to stereotypes of albinism. Some of these characters can be seen in the films like 'Albino', 'Foul Play', and 'The Time Machine' where albinos were the bad guys. It still goes on today in

movies like 'Die Another Day', 'Star Trek: Nemesis' and 'The Matrix: Reloaded', where characters are portrayed with questionable personalities.

Michael McGowan, a person with albinism, who heads NOAH, makes a plea for a better deal for persons with albinism. McGowan advises that the Da Vinci Code is the sixty-eighth film since 1960 to feature an evil albino. It is an incredible statistic when you consider how few albinos actually make it to the silver screen, the proportion of them being depicted as intent on murder and destruction is remarkably high. The problem is that there has been no balance because there are no realistic, sympathetic or heroic characters with albinism that you can find in movies or popular culture. His plea like those of others with albinism is "*stop making us out as mystical freaks and unconscionable assassins*" (Elsworth, 2006).

Unfortunately, the persons who have perpetuated many myths about people with albinism are those who have never met someone with albinism or know anything about albinism. Landau (1999) states, that some people have believed these often unrealistic untruths whole-heartedly. Landau (1999) posits that referring to a person by a distinguishing genetic trait makes that trait the most important thing in a person's life. She further posits that this should not be the case with albinism since human beings are far too complex to be identified by a single aspect that has nothing to do with their intelligence, curiosity, sense of humour, artistic ability, or thoughtfulness (Landau, 1999).

Research by Gaigher et al. (2002) revealed that it is the social context, as much as, and sometimes more than the physical condition, that largely structures and limits the lives of people with albinism. The McBride and Leppard (2002) study found that the use of hats to relieve the heat, glare and sun initiated some ridicule and embarrassment to the wearers, creating further isolation.

Socio Emotional Issues

Waugh (1999) posits that a strong emotional response is a normal part of living, growing, and intellectual development. Since suppressed emotions are often turned inward and causes stress, depression and physical maladies, it is very important to develop healthy ways to express and integrate these emotions. Therefore, it is necessary to recognise feelings and determine their source. Along with the external influences of society, every person has a vital and essential emotional response to their personal experiences with albinism. These personal responses shape who they are and how they adapt to their albinism and will occur throughout life because of the many challenges and frustrations the condition presents.

Neither the public nor those with the condition agree on the issue of whether to identify albinism as a disability. This ambiguity creates a problem in the language used to talk about albinism and the accessing of funding for persons with albinism. The identification of albinism as a disability is complicated further by the concept of legal blindness, which is defined by a visual acuity of 20/200 or higher in the better eye with correction. Only some persons with albinism fit the legal category of visual impairment yet, in spite of varying visual acuity, many of the problems experienced by those with albinism remain similar to those with visual impairment (Waugh, 1999). Braathen and Ingstad (1986) found that in Malawi people with albinism are considered, and consider themselves to be disabled.

Social attitudes toward albinism are often similar to those experienced by other disability and minority groups. These attitudes include a lack of understanding, fear of the unknown, and prejudice based on appearance (Baron et al., 2006). Albinism is a unique condition and it is this uniqueness that has led to separateness and isolation for many people with albinism. Waugh

(1999) claims that a common myth is that people with albinism must have red eyes but people with albinism usually have blue or grey eyes, which appear reddish in certain types of light because the blood vessels are not masked by the pigment melanin. Consequentially, those with albinism have inherited a legacy of irrational notions about themselves.

Albinism can have an especially negative effect on young people of all races. However, especially in African American families, the child with this conspicuous colour feels like an outsider (Landau, 1999). In the Caribbean Islands, most of the population is of African descent, so the lack of skin colour is even more conspicuous. It is vital that family members have accurate information about albinism in order to dispel any unpleasant stereotypes they have heard or formed about albinism. There is no single force greater than the family, in helping a child understand and accept his or her self (Waugh, 1999). Albinism often unexpected in a family can be a catalyst for acceptance, understanding, and love that encompasses all family members and each of their individual differences. It is a physical manifestation of uniqueness, with joys and hardships all of its own (Waugh, 1999).

Methodology

Design

This research is exploratory in nature. According to Phillips and Pugh (1998) exploratory research is involved in “tackling a new problem, topic or issue” (p.49) about which little is known. The focus of this paper is to assess the attitudes toward persons with albinism among a sample of Barbadian and Trinidadian nationals.

The following research questions will guide this research:

1. What is the attitude of a sample of nationals in Barbados and Trinidad and Tobago towards persons with albinism?
2. Are there any significant differences with regard to the attitude towards persons with albinism:
 - between the Barbadian and Trinidadian nationals?
 - between male and female Barbadian and Trinidadian nationals?
 - between female Barbadian and female Trinidadian nationals?
 - between male Barbadian and male Trinidadian nationals?
 - between male Barbadian and female Trinidadian nationals?
 - between male Trinidadian and female Barbadian nationals?

A cross sectional design was used to collect data from the sample of nationals in the selected countries. Cohen, Manion and Morrison (2005) claim that the cross sectional design is suitable because different respondents are studied at one point in time. This study employed a multi-method approach, and Campbell and Fiske (1959) call this mixing of different methods a multi-method matrix. However, the idea of mixing moved from seeking convergence to actually integrating or connecting the quantitative and qualitative data (Creswell, 2009). Recognising that all methods have limitations, researchers felt that biases inherent in any single method could neutralise or cancel the biases of other methods.

Target population, sample and sampling procedure

These two countries were chosen because Trinidad represents what is called the ‘big islands’ and Barbados represents what is called the ‘small islands’ of the Caribbean. The researcher lives and

works in Barbados so there was easy access to the participants. The researcher's family of origin still resides in Trinidad and Tobago and her personal experience with albinism was encountered in that country.

The entire sample of 300 persons was a purposive or non random sample and the sample comprised of 120 Barbadian and 180 Trinidadian nationals. Barbados is the smaller country of 270 000 persons and Trinidad and Tobago is the bigger country of 1.3 million persons (CIA World Fact book 2009) hence a smaller group was chosen from Barbados and a larger group was chosen from Trinidad.

Instrumentation

The Attitudes and Behaviours toward persons with albinism questionnaires were administered to a sample of 300 nationals from Barbados and Trinidad and Tobago to gather information on their attitudes toward persons with albinism. The questionnaire contained three demographic questions on age, sex and country of birth. Sex was used as a variable to find out whether there were variations between males and females regarding their attitudes toward persons with albinism. Research by Gavron et al. (1995) suggested that boys with albinism might use coping mechanisms that are less socially positive and that could endanger their physical health. A study Machipisa (2003) purports that female persons with albinism have problems keeping relationships and tended to be single parents.

There were nine questions on attitudes toward persons with albinism consisting of five positive attitudinal statements and four negative attitudinal statements. There were nine questions on interaction with persons with albinism. A comment section was included to garner information from the respondents that the questions did not ask specifically and allow them an opportunity to put their feelings in the response.

Data collection

Three hundred persons were used as a representative sample of the general population in a non-random sampling method. The researcher visited three corporate offices, one in Barbados and two in Trinidad and Tobago and sought permission to conduct the survey. In the corporate office in Barbados, eighteen questionnaires were distributed and collected immediately after completion. The researcher administered and collected forty questionnaires in the two corporate offices in Trinidad and Tobago.

Two campuses of the University of the West Indies were used in this research. One lecturer administered sixty questionnaires to third year undergraduate students on the Cave Hill Campus in Barbados and returned fifty-two. On the St Augustine Campus in Trinidad and Tobago, a lecturer administered one hundred questionnaires to second and third year undergraduate students and returned sixty-eight. The researcher distributed fifty questionnaires to Barbadian men and women in two shopping malls and collected them immediately on completion. Six months later the researcher distributed the remaining seventy-two questionnaires to Trinidadian men and women in three shopping malls and collected them as they were completed. Only willing participants were used in this non-random sample to reduce any perceived bias and complete the survey on attitudes and behaviours toward persons with albinism.

Analysis

Measurement of Attitudes

The attitude questionnaire was rated on a five point Likert scale with a range from one to five where 1 was strongly disagree and 5 was strongly agree. A pilot study of the Questionnaire on Attitudes and Behaviours toward persons with albinism was carried out using 30 persons in the general population who were selected in a convenience sample at a shopping mall and on the university campus in Barbados.

Factor Analysis of Attitude Scale

On the pilot study data of 30 Barbadians on the Attitudes and Behaviours toward Persons with Albinism Questionnaire principal component analysis, using varimax rotation was conducted on the nine items that measure attitudes towards albinism. An assessment of the suitability of the data for factor analysis was assessed using two statistical measures: the Kaiser-Meyer-Olkin (KMO) statistic and the Bartlett's test of sphericity. The results of the KMO statistics (.501) and Bartlett's test ($p < .001$) highlighted that factor analysis was appropriate for the data. The Kaiser's eigenvalue rule was chosen to extract the most appropriate number of factors. Factors with eigenvalues above 1.00 were chosen as the cut-off criterion for factor extraction. The results revealed that three factors were effectively extracted from the analysis based on the eigenvalue criterion. These three factors cumulatively explained 66 percent of the variance in the data. Based on prior recommendations (Field, 2005), items with loadings above .40 were retained under their respective factors (see Table 1). A moderate Cronbach alpha of .5116 was revealed on the reliability scale (SPSS11.01 2001).

Factor 1 (Misconception) comprised four items which were, '*I tend to get angry more quickly at people with albinism*', '*People who look different like persons with albinism scare me*', '*I tend to talk with albinism in a different tone of voice*' and '*I sometimes feel that people with albinism have been punished by God for something they did*'. This factor explained 33.47% of variance.

Factor 2 (Sympathy) comprised two items which were '*I feel sympathetic toward people who are visually impaired because of albinism*' and '*I assume that people with albinism deserve special consideration*'. This factor explained 18.15% of the variance.

Factor 3 (Empathy) comprised three items which included '*My heart goes out to people with albinism*', '*I tend to be more patient with people with albinism*' and '*I am more understanding of people with albinism*'. This factor explained 14.84% of the variance (see Table1).

Table 1*Factor analysis of attitudes and behaviours toward persons with Albinism questionnaire*

Attitudinal Items	Factor 1 Misconception	Factor 2 Sympathy	Factor 3 Empathy
1) People who look different (like a person with albinism) scare me	.867		
2) I tend get angry more quickly at people with albinism	.809		
3) I tend to talk with people with albinism in a different tone of voice	.785		
4) I sometimes feel that people with albinism have been punished by God for something they did.	.536		
5) I feel sympathetic toward people who are visually impaired because of albinism.		.871	
6) I assume that people with albinism deserve special consideration.		.680	
7) I tend to be more patient with people with albinism			.811
8) My heart goes out to people with albinism			.595
9) I am more understanding of people with albinism			.535
Eigenvalue	3.01	1.63	1.34
Percentage variance explained	33.47%	18.15%	14.84%

Note. KMO statistic = .501; Bartlett test = 83.793 (df = 36), $p < .001$.

Description of Attitudes and Behaviours

The factor analysis (see Table 1) done on 9 Likert scaled items measuring attitudes and behaviours toward persons with albinism show the three attitudinal factors of misconception, sympathy, and empathy each capturing a distinct dimension of attitude (see Table 2). Hence, the three aggregate measures of attitudes in this study were misconception, sympathy, and empathy.

The mean and standard deviation of the attitudinal factors in Table 2 show that participants from the total sample of Barbadian and Trinidadian nationals demonstrated moderate to high levels of *sympathy* ($M=3.50$, $SD=.75$) and *empathy* ($M=3.08$, $SD=.63$) towards persons with albinism, and demonstrated low levels of *misconception* ($M=1.50$, $SD=.49$) towards persons with albinism. Hence, the participants have an overall positive attitude towards persons with albinism. Interpretational analysis of the interaction with persons with albinism questions revealed positive regard and a desire to be involved in the community by persons with albinism.

Independent samples t-tests were computed to determine whether there are significant differences between the total sample of Barbadian and Trinidadian nationals in relation to their attitudes toward persons with albinism (see Table 2). A statistically significant difference between Barbadian and Trinidadian nationals was found only on the empathy factor, $t(299) = 2.02$, $p = .04$. The Trinidadian participants reported higher levels of empathy than Barbadian participants did towards persons with albinism. Independent samples t-tests were computed to examine differences in the attitudinal factors of misconception, sympathy, and empathy toward persons with albinism between the various sex groups from the two countries.

The male and female Barbadian and Trinidadian nationals in the total sample (see Table 3) did not differ significantly on the attitudinal factors of misconception, sympathy, and empathy ($p > .05$).

The independent samples t-tests revealed a statistically significant difference between Trinidadian males ($M = 4.09$, $SD = 1.04$) and females ($M = 3.45$, $SD = .72$) on sympathy where the males reported significantly higher levels of sympathy than the females, $t(178) = 2.76$, $p < .01$ (see Table 3). A statistically significant difference between male and female Trinidadian nationals on empathy was also revealed, $t(178) = 4.41$, $p < .01$, where males ($M = 3.85$, $SD = .16$) reported higher levels of empathy than females ($M = 3.10$, $SD = .56$). The male and female Trinidadian nationals did not differ significantly on the attitudinal factor of misconception. The male and female Barbadian nationals did not differ significantly on the attitudinal factors of misconception, sympathy and empathy in this group ($p > .05$) (see Table 3).

Table 2

Means and standard deviations and independent 't' test, on the attitudinal factors for the total sample and of each country sample of Barbadian and Trinidadian nationals toward persons with albinism.

Attitudinal Factors	Total Sample		Barbadian		Trinidadian		‘t’
	N(300)		N(120)		N(180)		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Misconception	1.50	.49	1.53	.56	1.47	.44	.98
Sympathy	3.50	.75	3.52	.72	3.48	.75	.45 2.02*
Empathy	3.08	.63	2.99	.70	3.14	.57	

Note. * $p < .05$.

Table 3

Means and standard deviations and independent 't' test, on attitudinal factors for the Barbadian and Trinidadian nationals in the various sex groups toward persons with albinism.

Attitudinal Factors										
Country And Sex	(N) (300)	Misconception			Sympathy			Empathy		
		<i>M</i>	<i>SD</i>	't'	<i>M</i>	<i>SD</i>	't'	<i>M</i>	<i>SD</i>	't'
All Males	52	1.44	.50	.86	3.61	.75	1.16	3.11	.63	.28
All Females	248	1.51	.49		2.48	.75				
BB Males	41	1.42	.55	1.54	3.49	.62	.44	2.91	.51	.97
BB Females	79	1.59	.55		3.55	.81		3.04	.77	
TT Males	11	1.52	.26	.34	4.09	1.04	2.76	3.85	.17	4.41
TT Females	169	1.47	.46		3.44	.72		3.10	.56	

Note. ** $p < .01$; *** $p < .001$.

Attitude

The Attitudes and Behaviours toward persons with Albinism Questionnaire (ABAQ) revealed that there was an overall positive attitude towards persons with albinism in both countries. The combined sample of Trinidadian and Barbadian nationals demonstrated moderate to high levels of *sympathy* and *empathy* towards persons with albinism. Specifically, the Trinidadian nationals

reported more empathy than the Barbadian nationals did towards persons with albinism. The low level of misconception by the Trinidadian and Barbadian nationals suggest some understanding towards persons with albinism.

This overall positive attitude (see Table 3) is different from research by Lund (2001) and Westhoff (1993) who described negative attitudes, discrimination, and lack of knowledge related to the condition of albinism. The interviews by journalist Small (2002a; 2002b) chronicled the issue of albinism in the Trinidad and Tobago press. Some additional television interviews and educational lectures may have contributed to the increased awareness of the nationals of Trinidad and Tobago. The recent exposure of albinism in the Trinidad and Tobago media may account for the higher levels of empathy in the Trinidadian nationals.

There has also been an increase in media coverage on the British Broadcasting Corporation and in the Barbadian media about the use of body parts of persons with albinism to make “get rich quick potions.” In addition, a recent article claims that four Tanzanian men were sentenced to death for the murders of persons with albinism to harvest their body parts (BBC News, 2009). These current news items keep the challenges faced by persons with albinism in the minds of others and increase the awareness of the condition.

This overall positive attitude is important to the development of an identity for these persons with albinism. This development of identity is supported by the view that individuals can perceive themselves differently depending on where they are at a particular moment in time on what is known as the personal-social identity continuum (Tajfel & Turner, 1986; Turner, 1985).

Trinidadian nationals reported higher levels of empathy than Barbadian nationals did towards persons with albinism. The interview by Holder (2000) was the one time the issue of albinism was highlighted in the Barbados press in the past decade during the collection of data for this research. The lack of exposure to persons with albinism may account for the lesser score on empathy by the Barbadian nationals. However, sometimes during the ‘cropover’ festival in Barbados the public is exposed to the talent of two calypso singers with albinism. The response to these persons is usually very positive. The high level of empathy suggests that the Trinidadians may be more aware of persons in society with albinism and have more understanding about the condition. The on going exposure through the media may be responsible for this attitude. Waugh (1999) posits that it is important that persons with albinism feel included in any society.

Male and female Barbadian and Trinidadian nationals did not significantly differ on the attitudinal factors of misconception, sympathy and empathy (see Table 2), suggesting that the positive attitude was not dependent on sex. The nationals in the two selected countries regardless of sex had a positive attitude towards persons with albinism. In spite of the rarity of the condition of albinism, nationals in the two countries did not harbour any negative feelings towards persons with albinism. Culturally Caribbean nationals embrace many different ethnicities and so acceptance of persons with albinism could be an easy prospect.

Barbadian male and female nationals did not differ significantly on any of the attitudinal factors therefore attitudes of the Barbadian nationals were not dependent on sex (see Table 3). Barbadian male and female nationals had a positive attitude towards persons with albinism regardless of sex. The knowledge of the two calypso singers with albinism in Barbados and the music of ‘Yellowman’ from Jamaica may have influenced the positive regard for persons with albinism in Barbados. The recent Barbadian press article about a female schoolteacher with albinism in Tanzania may have raised some awareness to the condition of albinism.

Review of research on attitudes toward persons with albinism revealed that supplying accurate information and some interpersonal contact with those with albinism appeared to result in a change of attitude towards those with albinism (Kromberg et al., 1987). Other research identified negative and uninformed attitudes toward people with albinism (Estrada-Hernandez & Harper, 2006). A comment by Anthony (23M) a person with albinism in this research is as follows: *"People do not understand and are afraid. Treatment is mostly negative. I believe they judge us because of a lack of knowledge."*

The persons with albinism surveyed accepted that they looked different. They suggested that if people understood that the only difference was their milky white complexion, life might be easier. Research (Kromberg et al., 1992) reveals that different beliefs surrounding albinism were related in part to the effects of visible physical features of the condition of albinism of white skin and hair. A study by Gold (2002) suggests a stigma associated with the absence of skin colour.

Hasanee (2001) reported that people with albinism might experience some social problems. These problems sometimes arise because of the lack of understanding about albinism on the part of others. Persons with albinism may feel alienated because of the different appearance from their families, peers, and other members of their ethnic group.

Summary, Implications and Recommendations

A number of similarities surfaced with the international view on albinism and the participants' view, in Barbados and Trinidad and Tobago, on albinism as it relates to the attitudes toward persons with albinism. Generally, it was found that in Barbados and Trinidad and Tobago, the same attitudes toward persons who are different were meted out to persons with albinism. This was due mainly because of their milky light skin colour, which caused them to stand out among a predominantly dark-skinned population in the Caribbean Region.

This research was initiated because of the researcher's experience with her two siblings who were persons with albinism. The intention was to investigate people's attitudes toward persons with albinism. The persons surveyed displayed keen interest in the research and their participation in this research was invaluable.

In the course of this research, the attempts at raising awareness, to a very rare condition existing in some persons were appreciated. The majority of the participants were unsure if persons with albinism had a normal lifespan. The majority of participants felt that persons with albinism had normal intelligence. Only a small percentage of the population felt that persons with albinism were different and even considered them disabled. This view reflects a change in the attitude towards persons with albinism. The dissemination of this information about albinism is necessary in order to increase knowledge and awareness about albinism. The results of this research may initiate and encourage acceptance of people with albinism in the society through education.

The following suggestions emerged from this research:

1. The Ministry of Health in Barbados and the relevant Ministries in the other Caribbean countries can train staff to identify and be aware of the condition of albinism in order to educate parents and assist them with understanding the condition.

2. The Hospital and the Health Centres in both countries and across the region could offer some of Genetic and Emotional Counselling to parents of children with albinism and persons with albinism.
3. There is need for the formation and maintenance of an albinism support group to assist persons with albinism in all areas. The support group should extend to include support for families of these persons. This group can offer an opportunity for persons with albinism to meet and encourage each other and have the support of others.
4. There needs to be an awareness programme in schools and communities with the help of the media to keep the knowledge base about these persons with albinism current. This programme must release information to dispel any misconceptions about albinism.
5. There must be increased acceptance of persons with albinism and a greater tolerance for anyone who may be perceived as different in society.

Future Research

This research has created a deeper quest for knowledge about albinism by this researcher and by some of the participants. There is need for more Caribbean research on albinism to be undertaken. Firstly, there must be a study on prevalence of albinism in the Caribbean islands. Secondly, there must be a longitudinal study with a larger group of persons with albinism in the Caribbean islands to gain a true assessment of the physiological and psychological effects of albinism.

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Assessment of Lagosians' Perception of Climate Change as a Public Health Concern

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The study examined the perception of Lagosians on climate change and its likely public health concerns. Three variables – gender, level of education and occupation were used to examine the peoples' perception on climate change. The population of the study consists of residents of Lagos metropolis. Purposive/convenient sampling technique was used to select six hundred (600) respondents as the sample size, but only five hundred and seventy-six (576) questionnaires were good enough for data analysis. A self-structured questionnaire with a reliability of (0.7098) 0.71 was used for data collection. T-test and ANOVA analyses were used to test the three (3) hypotheses that were generated, but all were rejected. This implies that all variables examined had influence on Lagosians' perception of climate change. Based on these findings some recommendations were suggested among which are: the need for environmental education as far as climate change is concerned; the need for the government and policy makers to carry the masses along in the formulation and implementation of environmental health policies.

Keywords: Lagosians, perception, climate change, public health concern.

Introduction

Climate change is the greatest environmental challenge facing the world today. According to scientific evidence, rising global temperatures will bring changes in weather patterns, rising sea levels and increased frequency and intensity of extreme weather. The effects will be felt locally, nationally, regionally and internationally; especially in many developing countries that are particularly vulnerable.

The concerns for climate change and its perceived catastrophic consequences worldwide were responsible for the creation of the United Nations Framework Convention on Climate Change (UNFCCC), The UNFCCC is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED) (also known as the Earth Summit informally), held in Rio de Janeiro, Brazil from June 3 to 14, 1992.

The treaty is aimed at stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. According to the terms of the UNFCCC, having received over 50 countries' instruments of

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ratification, it entered into force on March 21 of 1994. About 198 countries are signatory to the treaty (UNFCCC, 1997).

Since 1994, several annual follow-up conferences have been convened by the UNFCCC. Such conferences are known as Conference of Parties to the treaty (or simply, COP). They are aimed at assessing progress in dealing with climate change, for example, beginning in the mid-1990s, these annual conferences negotiated the Kyoto Protocol that established legally binding obligations for developed countries to reduce their greenhouse gas emissions (UNFCCC, 1997).

Nigeria, being one of the signatories to the convention, was ably represented in all these conferences over the years. However, apart from the top-level government officials that shuttle to attend these conferences, there have not been public consultations, debates or legislative oversight regarding this very weighty international commitment. Hence, not much is known of the Nigerian general public perception of this global phenomenon.

Studies made of public perceptions of environmental problems therefore, should include investigations of the way in which the issues are understood by different sections of society and their evaluation of and attitude towards them (Bostrom, Morgan, Fischhoff and Read, 1994). The relative importance of environmental issues to other public concerns has been investigated, as has the degree of public support for action at political, community and personal levels through risk analysis techniques (O'Connor, Bord and Fisher, 1999).

There are a number of international comparisons which seek to explore differences between different societies either through large scale surveys (Bord, Fisher and O'Connor, 1998) or in-depth work with small groups (Dunlap, 1998).

Since we now live in highly pluralist societies a single unique 'public attitude' or 'opinion' on any specific environmental issue is unlikely, although some societies display a more developed consensus than others. In general, the different constituencies of the public must be expected each to present a spectrum of opinion.

Similarly it can be expected that there will be considerable differences between the most commonly held views of the different publics. There is, therefore an issue about the general relevance of work on public perception, even where the results are taken from a sample chosen to represent a cross section of the wider public in a particular society. There is also a question about the degree to which perception should be translated into a propensity for action. Where surveys suggest support for particular official positions or policy initiatives, does this continue to apply even where the consequences might be problematic at an individual level? (Bon, Fisher and O'Connor, 1998; Blake, Guppy and Urmetzer, 1997; Berk and Shulman, 1995).

Despite these methodological issues, several broad common themes have emerged from the work on public perception of the environment. This section aims to describe some of these themes as they apply to the specific issue of health and climate change.

However, within the study of public understanding of the environment, the problem of health impacts of climate change is highly specific and there is little work available. The principle route into the topic is therefore through a combination of work on the broader issues of climate change and health and the environment.

There is a large amount of published work on public understanding of climate change. Much of it derives from interest in the cognitive or psychological processes by which people make sense of risk associated with climate change (McDaniel, Axelrod and Slovic, 1996). There are also works on the understandings people acquire from the representations of the climate change as shown, for example in the media (Bell, 1994). There are a few studies of the way in which the understanding reached is embedded in (and affected by) the broader notions of

citizenship and individual and institutional responsibility in different societies (Harrison, Burgess and Filius, 1995).

The following is an attempt to summarize the broad themes that emerge from this work. There is considerable consensus amongst investigators that the problem of global warming is now understood by lay publics as a reality and as an issue of concern within society. It tends to dominate discussions of global environmental problems. However, most studies suggest that global warming is no longer peoples' main social or environmental concern; crime and unemployment commonly rank above the environment for and of environmental concerns, air pollution and toxic waste are generally perceived as more pressing than climate change (Witherspoon, 1994).

Studies also show that people have a strong tendency to use 'global warming' as a catch-all phrase, so that the problems of stratospheric ozone depletion and air pollution in general often become included within it (Kempton, 1991). There is also evidence that there is a tendency to confuse climate and weather (Gowda, Fox and Magelky, 1997). Some investigators believe this to be driven, at least in part, by the media treatment of recent episodes of severe weather. It is widely recognized that there are cycles of media attention and that these have a powerful role in influencing the type and framing of issues within the public arena for debate (Hilgartner and Bosk, 1988). Environmental issues, including global environmental change, are subject to these cycles of attention (Mazur, 1998) and where periods of higher media attention to environmental issues coincide with particular catastrophic events or risk issues; these are often conflated in both the framing strategies of the media and in lay discussions (Harrison, Burgess and Filius, 1995).

Apart from increased incidence of severe weather, people may attribute changed agricultural yield, species extinction and health effects to climate change; the health impact is seen largely in terms of an increase in skin cancer (Bostrom, Morgan, Fischhoff and Read, 1994). When environmental issues are framed as health concerns any gender variation in the perception of risk tends to disappear (Bord and O'Connor, 1997).

People's perception of the responsibility for action seems diffuse. There is wide understanding that pollution from energy conversion and industry is the prime cause of climate change, but few people make the link between their own energy consumption and greenhouse gas emissions. This is a common finding in studies of public understanding of climate change: the failure to link global impacts to the personal action of individuals (Kempton, 1991).

Studies of public reaction to environmental risk issues suggest a considerable mistrust of governments companies or experts. However, there seems to be strong belief that governments should take the lead in resolving environmental problems (O'Connor, Bord and Fisher, 1998). This is linked to feelings of lack of personal efficacy identified above, as well as the social desire for institutional accountability.

There appears to be a moderate degree of trust in the ability of experts to address climate change effectively, more so than in their ability to address other key concerns such as crime or traffic accidents. However, there is less confidence in expert ability to address climate change than environmental pollution in general or health risks such as AIDS or heart disease (O'Connor, Bord and Fisher, 1998).

Studies of perception between different societies suggest that the patterns described above are broadly repeated, though with differing emphasis. A comparative study of public understanding in the UK and the Netherlands, for example, found that the mistrust of claims of safety was particularly pronounced in the UK. The citizens of the Netherlands had a firmer

‘social contract’ with their government and institutions, and seemed more willing to accept change (Harrison, Burgess and Filius, 1995).

At a local scale, people routinely include issues of health in their evaluations of their environment. In particular, the main issue associated with traffic pollution is that it is a threat to health (Boyes and Stanisstreet, 1998). Perceived risk to health seems to be a major factor in determining whether or not individuals will take environmental action (Segun, Pelletier and Hyunsley, 1998). Studies of claims made by campaigning groups and the media suggest that such groups tend to focus on the health aspects of environmental issues, probably because these make a powerful and direct appeal to the individual, motivating people politically but without making an overtly party political point (Garvin and Eyles, 1997).

Experience in the United Kingdom suggests that the most effective campaigns for both non-government organizations (NGOs) and government are those where health effects can most directly be linked to environmental pollution in public perception. The unleaded petrol campaign in the UK was driven by the health impacts of exposure to lead. In Germany the leading issue was that unleaded petrol was essential for the introduction of new vehicle technology (catalytic converters) reduce other pollutants from petrol driven vehicles. This was translated into action in the two countries in different ways. In Germany there was political and individual support for the Federal German Government Campaign in Europe for stringent emission standards, but little interest in unleaded petrol as an issue in its own right. In the UK the Government ran an aggressive campaign to promote unleaded petrol with vigorous NGO and public support, but failed to elicit much enthusiasm from the public for the campaign on vehicle emission standards.

The main focus of public concern at a global level seems to be the belief that the stratospheric ozone layer will be affected by global warming, with the threat of increasing levels of skin cancer (Bostrom, Morgan, Fishchhoff and Read, 1994).

This is interesting in itself as it suggests that the link between the ozone layer and health has been established, even in countries like the UK with generally low levels of sun. There seems therefore to be no intrinsic reason why an issue of global concern cannot be linked to local health impacts. Despite the considerable volume of published and well publicized work on health impacts of climate change, there are few studies which have explored the detailed public understanding, beyond the general appreciation that there may be health effects mostly linked to skin cancer. However, it is likely that the issue will enter the public domain more forcefully following the publication of this report. As the debate moves from scientific and policy circles to the public arena an explosion of contested understandings and competing claims can be expected. There will then be a vigorous public debate with the potential for a more informed discussion of public health in a changing climate. There will also be an opportunity to study public understanding of the specific health issues likely to arise as climate changes.

Despite considerable public awareness of climate there is little evidence to indicate whether there is good understanding of its health impacts. Such evidence as there is tends to the conclusion that public understanding conflates climate change with the depletion of the stratospheric ozone layer and thus skin cancer. There is, however, the prospect that the connection between climate change and health, once established by the public, will invigorate the debate on the scale and nature of action to be taken. Therefore the objective of this study is to assess the perceptions of Lagosians regarding climate change as a public health concern.

Climate Change and Human Health

Climate change refers to any significant long term change in current normal climate conditions, such as temperature, precipitation, extreme weather events, snow cover and sea level rise. There is a clear scientific consensus that the world's climate is changing, largely as a result of human activities, and that this will bring about changes in weather conditions and other natural system in general, climate change is anticipated to result in generally warmer temperature, shorter and milder winters, longer and hotter summers, more frequent or more intense severe weather events such as hurricanes, thunderstorms, wildfires, flood and droughts. (Public Health Agency of Canada 2013, Center for Disease Control and Prevention 2014).

Climate change is a complex phenomenon and a range of unanticipated ecological effects may result. Many of these ecosystem effects could have indirect health effects. Increased concentrations on ground-level carbon dioxide and longer growing seasons could result in higher pollen production, worsening allergic and respiratory disease. Increased carbon dioxide concentrations in sea water may cause oceans to grow more acidic and is likely to contribute to adverse ecosystem changes in the world's tropical oceans. This would have potentially dramatic implications for fisheries and the food supply in certain regions of the world. (Australian Department of Environment and Heritage, 2005, CDC, 2014)

The United Nations University Institute for Environment and Health Security (UNU-EHS 2007) reported that the impact of extreme weather events around the globe has already created millions of environmental refugees. These refugees have been displaced from their homes and countries due to sudden extreme weather events and slower environmental shifts such as an increase in desert area, diminishing water supplies and rising sea levels.

Climate change can impact health in the following ways:

- Changes in precipitation and temperature could increase the amount of water-borne and food-borne diseases and diseases transmitted through insects (also known as vector-borne diseases).
- Changes in climate can lengthen the transmission session of certain vector-borne diseases and expand their geographic range.
- More variable precipitation patterns can increase the risk of water-borne diseases. In Canada it has been shown that there is an increased risk of having water-borne disease outbreak with higher precipitation.
- Climate change could increase the frequency, timing, intensity and duration of many extreme weather events such as severe storms, floods, hurricanes, wildfires and droughts.
- Extreme weather events can cause a range of direct and indirect health effects, from mental disorders to infectious diseases.
- Hurricanes and forest fires are also recurring natural disasters that raise important health risks for Canadians and worsen as the result of a changing climate.
- Heats causes' heat stroke, heat syncope (fainting) and heat cramps, and worsen many pre-existing conditions such as cardiovascular and respiratory diseases.
- Extreme heat can also increase the levels of pollen and allergens that trigger asthma attacks.
- Poor air quality is already a serious public health issue in Canada and expected to become an even greater burden as climate change continues.
- Heart disease, respiratory diseases and allergies are some of the major health issues related to air pollution.

The Roles of the Health Educators in Climate Change and Human Health

The goal of Health Education is promotion of healthy life style and modification of individual behaviours and social environment.

In relating this goal to climate change and human health, health educators, should ensure effective teaching of health education in both school settings and at community level in order to inculcate healthy lifestyle in all and sundry. Promotion of personal and environmental sanitation at all levels should be further intensified especially in developing nations e.g. Nigeria, Ghana. Small family size and effective use of family planning devices should be encouraged in the individual, family and community lives. Public should be educated on the customer health services so as to be able to make informed decisions on health products they consume for example buying of fairly used products like cars, electronic appliances should be discouraged because they contribute to climate change. Deforestation should be minimized while tree planting should be embraced by all and sundry.

Statement of the Problem

Africa is the continent most vulnerable to the impacts of change because widespread poverty and low levels of technical development limit adaptation capabilities.

The impacts of climate change are predicted to affect the livelihood of Africans in many ways. Climate change is likely to affect the distribution patterns of infectious diseases e.g. there is likely to be an increase in mosquitoes which spread dengue and yellow fever.

Climate change has been documented in the literature to have negative impact on human as a result of human activities which is responsible for green house gas emission into the atmosphere. Lagos is industrialized city which is densely populated. Considering the activities of the residents, there is possibility of increasing the release of green gas emission into the air. Since behavioral intervention has been noted to be a product of perception, it is therefore imperative to determine the perception of Lagos residents on climate change as a public health problem for better intervention.

The following research hypotheses were generated and tested for the purpose of the study:

1. There is no significant difference in the perception of male and female respondents on climate change as a public health concern in Lagos, Nigeria.
2. There is no significant difference in the perception of the respondents based on the level of education in Lagos, Nigeria.
3. There is no significant difference in the perception of the respondents based on occupation in Lagos, Nigeria.

Methods

Design

This is a descriptive survey research, which employed the questionnaire for the purpose of collecting data on Lagosians' perception of climate change as a public health concern.

Sample and Sampling Procedure

Six hundred subjects were drawn from the five (5) divisions of Lagos State (Ikeja, Badagry, Ikorodu, Lagos Island and Epe) with the use of purposive/convenient sampling technique (120 respondents per division). 576 out of 600 copies were retrieved in good condition giving a response rate of 96%, same were coded and analyzed.

Instrumentation

The instrument was a self structured questionnaire which consists of two sections.

Section A: demographic information and Section B: perception of climate change as public health concern.

The questionnaire was validated using test-retest method giving reliability co-efficient of 0.71.

Procedure

The researchers visited the different divisions along with three research assistants that were trained in the administration of the questionnaires. Apart from soliciting for co-operation, the respondents were informed of the purpose of the study and the need for factual and objective response. Participants filled the questionnaire at individual pace and the completed copies were retrieved immediately. 576 out of 600 copies were retrieved in good condition giving a response rate of 96%, same were coded and analyzed.

Data Analysis

Frequency counts and percentages were used to present data in tables, while T-test and Analysis of variance (ANOVA) were used to test the hypotheses at 0.05 significant levels.

Results

Table 1: Distribution of the respondents by sex

	Frequency	Percent	Valid Percent	Cumulative percent
Valid Male	306	53.1	53.1	53.1
Female	270	46.9	46.9	100.0
Total	576	100.0	100.0	

The table shows that 53.1% of the respondents were male while 46.9% were female.

Table 2: Distribution of the respondents by age

	Frequency	Percent	Valid Percent	Cumulative percent
Valid 18-24 yrs	90	15.6	15.6	15.6
25-31 yrs	279	48.4	48.4	64.1
32-38 yrs	117	20.3	20.3	84.4
39-45 yrs	63	10.9	10.9	95.3
46-52 yrs	18	3.1	3.1	98.4
56-59 yrs	6	1.0	1.0	99.5
60 yrs & above	3	.5	.5	100.0
Total	576	100.0	100.0	

The above table shows that 15.6% of the respondents were between ages 18-24, 48.4% were 25-31 years, 20.3% were between 32-38 years, 10.9% were of 39-45 years, 3.1% were between 46-52 years, 1.0% was of 56-59 years and .5 were above 60 years.

Table 3: Distribution of the respondents by level of education

	Frequency	Percent	Valid Percent	Cumulative percent
Valid None	18	3.1	3.1	3.1
Below first degree	198	34.4	34.4	37.5
First degree	288	50.0	50.0	87.5
More than first degree	51	8.9	8.9	96.4
Professor	21	3.6	3.6	100.0
Total	576	100.0	100.0	

The above revealed that 3.1% of the respondents had no education, 34.4% of them were below first degree, 50% which was the highest percentage had their first degree, 8.9% had a second degree and 3.6% of them had an additional professional qualification.

Dependent variable: perception

Scheffe

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Civil Servant	Industrial Worker	-2.38*	.69	.003	-4.07	-.69
	Self Employed	-.82	.56	.339	-2.20	.55
Industrial Worker	Civil Servant	2.38*	.69	.003	.69	4.07
	Self Employed	1.56	.75	.116	-.28	3.39
Self Employed	Civil Servant	.82	.56	.339	-.55	2.20
	Industrial Worker	-1.56	.75	.116	-3.39	.28

*.The mean difference is significant at the .05 level.

Table 7 shows that the F-value (6.077) is significant at 0.05 ($p < 0.05$). Therefore, respondents significantly differ in their perception based on occupation. The multiple comparisons on the table 7 revealed that the difference is significant between industrial workers and civil servants.

Discussions of Findings

The findings have revealed that women perceived climate change as a public health concern more than their male counterpart. This implies that climate change cannot be perceived directly in the way by individual because of the temporal scale associated with it. In addition, human perception of climate is strongly influenced by expectations, which may have little relationship to the true nature of climate as provided by the instrumental record (Rebetez, 1996). This finding also concur with the study of Semenza, Hall, Wilson, Bontempo, Sailor and George (2008) which found out that almost all respondents (USA) have heard about climate change or global warming, are rather concerned (women more than men) and some 50% reported behaviour changes like decreased energy usage at home, reduced gasoline consumption, increased recycling and some other bahaviours. Furthermore, respondents significantly differ from their perception based on level of education. This means that education play a major role in supporting efforts toward addressing climate change. The outcome of the study is also in line

with the position of Leal et.al (2007). Occupation as one of the variables under study has also influenced the perception of the respondents and the difference is significant between industrial workers and the civil servants. The finding support the outcome of (Thompson and Jayapaul, 1997) that industrialists among other workers have perceived climate change as a public health problem.

Conclusion

There is clear linkage between the environment and health problems. Climate change would likely have an increasingly severe impact on health particularly with regard to vector and water borne diseases. With change in climate and other stress factors, peoples' perception and behaviour must also change in order to effectively cope with the situation. Carbon dioxide has an effective lifetime of about 100 years. This means that any changes in the atmosphere will take a long time to develop. If we cut down on the amount of carbon dioxide we use, the rate of climate change will slow down. The challenges of climate change however, calls for meaningful cooperation between individuals and government. Furthermore, climate change issue is not a monopoly of the Ministry of Environment and Forest (MOEF). Other relevant ministries such as health, agriculture, livestock, water resources, planning etc should work together to mitigate and combat the impacts of climate change.

Recommendations

- There is the need for continuous education on climate change; hence, government should intensify efforts in raising awareness on the causes and consequences of climate change which will serve as further means to work towards a reduction of greenhouse emission.
- The need for government/policy makers to carry the masses along in the formulation and implementation of environment and health policies is recommended.
- Integrate gender concerns and perspectives in policies and programmes for sustainable development.
- Extended range weather forecasts are fundamental for all climate change adaptation strategies.
- Individual-level mitigation can be a policy option under favourable contextual conditions but must be accompanied by mitigation efforts from industry, commerce and government.

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Ageing Population and Gender Issues in Asia-Pacific Region

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While the majority of the world's elderly population resides in the developing countries, the Asian and Pacific region is home to the largest number of older persons. Worldwide, the number of people aged 60 and over will increase from about 600 million in 2000 to almost 2000 million in 2050, of whom about half will reside in Asia. During the second half of the twentieth century, countries in Asia and the Pacific region have experienced unparalleled declines in mortality and fertility. The present paper examines the impact of the growth of the ageing population on women's well being. The challenges for setting gender-sensitive policies for women and the elderly are discussed in the context of Hong Kong and the Asia-Pacific region. Also, the contribution of the ESCAP and MIPAA in addressing gender issues in ageing population has been looked into. The paper concludes that in Asian societies, ageing issues are generating an active debate about gender, the family, the organization of the workplace, and the policy approaches to address these challenges. Given the fact that people over 65 will constitute close to one-quarter of the population in Asia by 2050, and over one-third of the population in Hong Kong by that time, more refined age grouping with sex-disaggregated data will provide a more useful data base for policy-makers and researchers. Further, the challenge of human service planning for the ageing population has highlighted the importance of mainstreaming gender from a life-cycle perspective in research, policy, and planning in the new millennium.

Key Words: Ageing population, gender issues, Asia-Pacific Region, demographic changes, life-cycle approach, and developed countries.

Introduction

Population ageing is defined as “the process by which older individuals make up a proportionally larger share of the total population over a period of time.” Population ageing has been a global issue since the early 1980's. While the majority of the world's elderly population resides in the developing countries, the Asian and Pacific region is home to the largest number of older persons. Worldwide, the number of people aged 60 and over will increase from about 600

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million in 2000 to almost 2000 million in 2050, of whom about half will reside in Asia. During the second half of the twentieth century, countries in Asia and the Pacific region have experienced unparalleled declines in mortality and fertility. Consequently, the age structure of their populations is in rapid transition from 'young' to 'old', with some countries are at different stages in this transition. Ageing is the final stage and inevitable consequence of this phenomenon. Gender analyses of the growing ageing population and decreasing support ratio illustrate specific concerns faced by women both as the elderly and as caregivers of the elderly. Women constitute the majority of the oldest old age group; they are more likely to lack financial support; they are more likely to be living with family members without their spouses, and cared for by female family members.

Gender analyses of the growing ageing population and decreasing support ratio illustrate specific concerns faced by women both as the elderly and as caregivers of the elderly. Women constitute the majority of the oldest old age group; they are more likely to lack financial support; they are more likely to be living with family members without their spouses, and cared for by female family members. A life-cycle approach is adopted to examine the impact of the growth of the ageing population on women's well being. Sex-disaggregated data and gender analyses are necessary tools for research and policies on ageing.

The present paper examines the impact of the growth of the ageing population on women's well being. The challenges for setting gender-sensitive policies for women and the elderly are discussed in the context of Hong Kong and the Asia-Pacific region. Also, the contribution of the ESCAP and MIPAA in addressing gender issues in ageing population has been looked into.

Population Ageing in the Asia-Pacific Region

The sources of population aging lie in two demographic phenomena: (a) *rising life expectancy*, and (b) *declining fertility*. An increase in longevity raises the average age of the population by raising the number of years that each person is old relative to number of years in which he is young. A decline in fertility increases the average age of the population by changing the balance of people born recently (the young) to people born further in the past (the old). Of these two forces, it is declining fertility that is the dominant contributor to population aging in the world today. More specifically, it is the large decline in the total fertility rate over the last half century that is primarily responsible for the population aging that is taking place in the world's most developed countries.

The Asia-Pacific region is most diverse in its population composition. The region houses probably the second oldest country in the world:

- *Japan*, with an elderly population of 23.2 per cent in 2000, and the biggest elderly population in absolute numbers; and
- *China*, with nearly 130 million older persons in the same year.

The other more developed countries in the region also have high percentages of the population aged 60+, ranging from 10 to 20 per cent. Such countries are:

- *Australia*,
- *Hong Kong*,
- *China*,

- *New Zealand*, and
- *Singapore*.

Developing countries like Sri Lanka and Malaysia have the percentage of elderly people as high as 10 or slightly over 10. In comparison, some South-east and South Asian countries, such as Cambodia, Lao People's Democratic Republic, Maldives, Nepal, Pakistan, Papua New Guinea, are still youthful with lower proportions of older persons, around 5 to 7%. Despite this fact, most countries in the region will experience considerable growth in their elderly populations in the next few decades when the proportion of people aged 60+ will triple or quadruple to over 20 or 30 per cent. Table-1 shows the current and projected percentage of the elderly population of selected countries and areas in the region.

Growth of the Ageing Population

The world is entering substantially uncharted waters in terms of the size of its elderly populations. Between 2000 and 2050, the share of the population aged 60 and over is projected to increase in every country in the world; the same is true for the 80+ population in all but one country (Mali). Worldwide, the largest absolute increases are yet to come.

Table-1: Demographic profile of selected countries and areas in the Asia-Pacific region

	Country/ Area	Total Population in 2000 (million)	Aged 60+ in 2000 (%)	number	Aged 60+ in 2025 (%)	Aged 60+ in 2050 (%)
East Asia						
1	China	1,275.3	10.1	128,788,420	19.5	29.9
3	Japan	127.0	23.2	29,486,340	35.1	42.3
5	Mongolia	2.5	5.6	141,860	10.7	23.1
6	Rep. of Korea	46.7	11.0	5,141,410	24.1	33.2
South-East Asia						
7	Cambodia	13.1	4.4	576,580	6.7	11.7
8	Indonesia	212.0	7.6	16,118,990	12.8	22.3
10	Malaysia	22.2	6.6	1,466,420	13.4	20.8
11	Myanmar	47.7	6.8	3,246,930	12.1	21.6
12	Philippines	75.6	5.5	4,160,930	10.4	19.5
13	Singapore	4.0	10.6	425,920	30.0	35.0
14	Thailand	62.8	8.1	5,087,250	17.1	27.1
15	Viet Nam	78.1	7.5	5,860,270	12.6	23.5
South and West Asia						
16	Bangladesh	137.4	4.9	6,734,530	8.4	16.0
17	India	1,008.9	7.6	76,679,240	12.5	20.6
18	Iran	70.3	5.2	3,657,160	10.5	21.7
19	Maldives	0.2	5.3	15,423	6.2	12.1

20	Nepal	23.0	5.9	1,359,520	7.1	12.4
21	Pakistan	141.2	5.8	8,192,860	7.3	12.4
22	Sri Lanka	18.9	9.3	1,759,900	18.0	27.6
23	Turkey	66.6	8.4	5,600,110	14.2	23.0
The Pacific						
26	Australia	19.1	16.3	3,119,430	24.8	28.2
27	New Zealand	3.7	15.6	589,370	25.4	29.3
28	Papua New Guinea	4.8	4.1	197,180	6.5	12.1

Source: *World Population Ageing 1950 – 2050*, Population Division, DESA, United Nations, 2002.

Declines in mortality at younger ages, medical advances, and better health care have resulted in longer life expectancy in both the developing and the developed world. At the same time, birth control has reduced the size of the younger population. These achievements in the 20th century have changed the world's demographic proportions. These demographic changes also pose as one of the key challenges in social policies and human services in the 21st century.

Statistics compiled by the United Nations show that in 1999, 10% of the world population was 60 years and older. By 2050, this percentage will rise to 22% (United Nations Population Division, 1999). In Asia, the corresponding proportion of the population aged 60 and over is 9% in 1999, and 24% in 2050. In China, the proportion is 10% in 1999, and 30% in 2050. In Hong Kong, the proportion of elderly is even higher: 14% in 1999, and an estimated 40% in 2050, the highest in Asia. Table-2 presents the proportions of aged population in the Asia-Pacific region.

Table-2: Proportion of ageing population in Asia in 1999 and 2050

Country or Area	% Total Population aged 60 & over in 1999	% Total Population aged 60 & over in 2050	% Ageing Population aged 80 & over in 1999	% Ageing Population aged 80 & over in 2050
Asia	9	24	9	18
China	10	30	10	23
Hong Kong	14	40	14	31
Japan	23	38	16	31
Macau	9	35	14	32
S. Korea	10	30	8	24
Cambodia	5	14	7	11
Indonesia	7	22	7	15
Malaysia	6	21	9	18
Philippines	6	20	9	14
Singapore	10	31	13	36
Thailand	8	30	10	21
Vietnam	7	23	10	17

Source: United Nations Population Division (1999). *Population Ageing 1999*. NY: UN publications.

The increased life expectancy enjoyed by the world population also means that the life span beyond age 60 is much longer than demographers have previously envisaged. Most census statistics categorize the elderly population in one age group: that of age 60-65 and over. A large proportion of the population remains economically active beyond age 60. A large proportion of the population also lives beyond age 80. In many Asian countries, the statutory retirement age is 60 or 55.

In Hong Kong, males may expect to live another 20 years and females another 24 years at age 60. These demographic changes mean that the undifferentiated grouping in census statistics would limit the usefulness of these figures. The activity level, care demand, and health needs of people in their 60s, 70s, and 80s and beyond are varied.

The elderly population could be further differentiated into the modest old (age 60 to 79) and the oldest old (80 and over) (United Nations Economic and Social Council, 2000). In 1999, 9% of the elderly population (over age 60) is aged 80 and over; in 2050, this proportion is expected to rise to 18%. In China, the corresponding proportions are 9% in 1999 and 23% in 2050. In Hong Kong, they are 14% in 1999 and estimated to be 31% in 2050 (Table-1).

The potential support for the elderly population comes from the economically active population. The potential support ratio is calculated on the basis of the proportion of the population aged between 15 and 64 to that aged 65 and over. With the decreasing fertility in Asia, this ratio will decrease from 11 in 1999 to 4 in 2050. In China, the ratio will drop from 10 to 3; in Hong Kong, the ratio will drop from 7 to 2.

Gender Composition of the Ageing Population:

Sex – disaggregated data will highlight the differential implications of ageing for men and women. Except for countries in which women suffer from severe forms of discrimination, women worldwide have a higher life expectancy than men. This means that women will form the majority of the elderly population, especially in the oldest old age group. The female to male ratio of the world population in year 2000 is 1.1 for the 60-69 age group, with:

- 1.3 for the 70-79 age group,
- 1.8 for the 80-89 age group,
- 2.9 for the 90-99 age group, and
- 4.0 for the centenarians.

(Source: United Nations Economic and Social Council, 2000.)

In Asia, women constitute 53% of the population aged 60 and above and 62% of the population aged 80 and above in 1999. In China, 52% of the population aged 60 and 65% of the population aged 80 are women; in Hong Kong, the corresponding figures are 51% and 63% respectively (Table 3).

Table – 3: Demographic characteristics of the ageing population in Asia

Country or Area	% Currently Married Men/Women aged 60 & over	% Men/Women aged 60 & over in labour force in 1995	Women as % of population aged 60 & over in 1999	Women as % of population aged 80 & over in 1999
Asia	78/44	51/19	53	62
China	73/48	42/14	52	65
Hong Kong SAR	82/50	--	51	63
Japan	86/51	49/21	56	67
Macau	--	--	56	67
S. Korea	87/37	46/25	59	74
Brunei Darussalam	83/50	50/0	50	53
Cambodia	--	51/38	64	59
Indonesia	84/36	62/32	54	58
Malaysia	84/44	47/21	53	56
Philippines	81/49	67/35	53	58
Singapore	83/45	27/7	53	62
Thailand	80/47	50/27	55	63
Vietnam	84/45	53/32	59	72

Source: United Nations Population Division (1999). *Population Ageing 1999*. NY: UN publications.

Gender Dimensions in Quality of Ageing

Longevity does not directly imply higher status for women. Life expectancy has to be considered in conjunction with the quality of life. These demographic patterns of ageing show that the elderly woman is likely to be widowed or single, and would be economically dependent. Women's lifetime overall labour force participation rate worldwide is lower than that of men especially after marriage. A high proportion of women leave the paid labour force after marriage and childbirth; more of them are employed on a part-time basis; they predominate in the informal sector.

Further, for women who remain in the labour force, they face an earlier statutory retirement age than men do in many countries. As a result, their lifetime earnings are substantially lower than those of men. They do not receive the benefits of pension schemes or provident funds, which are tied to paid employment.

Box-1: Ageing Population, World and Asia-Pacific Region-Key Facts

- **World:**

- The world's population aged 60 years and over stands at 759 million, representing 11 per cent of the total population (2010)
- By 2050, it is anticipated that the world's population aged 60 years and over will have passed the 1 billion mark, representing 15 per cent of the total population

- **Asia-Pacific:**

- Asia and the Pacific is currently home to 55 per cent of the world's elderly population (2010)
- By 2050, Asia and the Pacific will be home to 62 per cent of the world's elderly population
- By 2050, one in four people in our region will be aged 60 years and over

Source: <http://www.unescap.org/sdd/issues/ageing/ageing.asp>, Accessed on October 24, 2011.

With the overall labour force participation rate of 48% among women in Hong Kong (Census & Statistics Department, 1996), the proportion of elderly women facing financial hardship will be substantial. At present, the elderly people constitute almost 60% of all recipients of the social security assistance scheme from the government. Women are the majority recipients in this category. The difference in the gender ratio of welfare recipients increases with advancing age, with women constituting 70% of those recipients aged 80 or above. The proportion of elderly women who have to rely on social security assistance is a trend that needs to be monitored.

Furthermore, in many traditional societies, women have limited access to rights of inheritance or property ownership. Thus, they would need to depend on the family or the state for financial support and living arrangements. In Asia and the developing countries where family values are strong and government funding is limited, elderly support and services are still largely dependent on the family. Reduced government spending is shifting care back to the family. Only a small proportion of the elderly population lives in institutions. In China, multi-generation households are the major living arrangements for the elderly. Unlike old people in more developed Western countries, the proportion of Chinese old people living alone is much lower:

- 8.0% and 10.2% for the modest old men and women, and
- 13.2% and 15.2% for the oldest old men and women.

The limited facilities available for institutional care also account for the extremely low proportion of institutionalized elderly (less than 2% for the extremely old men and 1.1% for women). For Chinese elderly women, their lower social and economic status is one of the explanations cited for their even more limited access to long-term care facilities.

Asian family values have been revered as a celebrated cause for family care. However, co-residency of family members per se does not indicate the types of support or care received by the elderly person. There is little research or data on the types of physical, emotional, and economic care transferred between family members. There is often an assumption that living with family members will serve the needs of the elderly persons. Little is known about the preferences of the elderly people in terms of:

- *their living arrangements,*
- *the mutual benefits to both generations, and*
- *the extent of elderly abuse in these co-residency situations.*

Violence against elderly women is a topic that is receiving increasing attention in the field of domestic violence. Quality of life of the elderly people is closely related to their health. The health status of the elderly population is an area that lacks reliable and internationally comparable data (United Nations Economic and Social Council, 2000). The conventional categorization of old age means that persons over age 65 are excluded in many large-scale studies on physical and mental health. Even when epidemiological studies are available, the rates of various health problems for elderly men and women need to be viewed in context given the multiplicity of pathological conditions in old age and the gender differential life expectancies. Health at older age is also linked to lifelong health. In countries where women are being discriminated, older women's health status would be traced to the disadvantages they confront from early life, including:

- *inadequate nutrition and education,*
- *poorer maternity protection, and*
- *less access to health care.*

It has been shown that marital status is an important determinant of health for the elderly person. Married people's longevity may result from pre – selection, protection, or greater financial security (United Nations Economic and Social Council, 2000). Unmarried older women are more likely to live in poverty, and are more vulnerable to risks especially in countries where there is inadequate formal support system. On the other hand, it has been shown in a longitudinal study on ageing in Beijing that intergenerational social support is related to the psychological well-being of older Chinese parents. Intergenerational exchanges of social support include providing instrumental support to children, not just receiving support from children. These exchanges of social support and satisfaction with children have positive effects on the morale of the older parents.

A Life-Cycle Approach to Gender and Ageing

Gender issues in lifelong health shows that the physical, mental and social status of men and women in old age is rooted in the gender context throughout their lives. Starting from the prenatal period, childhood, puberty, adulthood, and through later life, females and males are exposed to different experiences in life on the ground of their gender. Access to social resources and vulnerability to risks are influenced by cultural factors such as low valuation of girls and women as compared to that of boys and men.

“Discrimination against women and discrimination against the elderly are a double jeopardy to the elderly women”. The growth of the ageing population, and in particular, the increase in the number of widows and older single women, is one of the new challenges affecting the full implementation of the Beijing Declaration and Platform for Action, that was adopted by over 180 governments worldwide in 1995 to advance the status of women (Commission on the Status of Women, 2000). In the five - year review of the 1995 Beijing Conference on Women, women and ageing is highlighted as a cross - cutting issue for the original 12 critical areas of concern in the Platform for Action, including:

- *poverty,*
- *economy,*
- *health,*
- *violence against women,*
- *environment, and*
- *institutional mechanism for the advancement of women.*

These critical areas of concern are interrelated and have impact on the rights and status of women in old age. The gender dimension of ageing is not only restricted to the elderly population, but has differential implications on the life cycle of women and men. Programmes for the elderly may create, maintain or reinforce those gender roles and relations that are detrimental to the well-being and status of women. For example, family care for the dependent elderly person affects women and men differently. Especially in Asia, women are the predominant providers of informal care. The economic contributions of these caregivers are unrecognized, unrewarded, and neglected by society, perpetuating the life cycle of disadvantage to women.

With the increasing labour force participation of women on the other hand, there are conflicting demands and stress placed on women at mid-life. Many middle-aged women bear the triple burden of:

- *childcare,*
- *elderly care, and*
- *personal careers.*

The bulk of domestic and emotional labour still falls on the shoulders of women, irrespective of their employment status. Instead of re-examining whether the traditional form of sexual division of domestic labour is still appropriate in the new millennium, women are thrust into a “no-win situation”. Career-oriented women bear the guilt and blame for neglecting their family, even though their employment contributes to the economy of the family and the society. Women who try to balance employment with family responsibilities face the risk of discrimination at work. Women who stay home to take care of the family put themselves in an economically dependent situation and face financial risks in old age.

Challenges and Opportunities

The population of the Asia-Pacific region is rising at an unprecedented pace. It is estimated that the number of older persons in the region will triple from 419 million in 2010 to more than 1.2 billion by 2050. By this time, one in four people in the region will be over 60 years old. This transition will be more pronounced in East and North-East Asia, where more than one in three people will be older than 60 years by 2050. This demographic transformation is unmatched in scale anywhere else in the world.

Such a rapid increase in the population of older persons has deep social, economic and political implications. Rural-to-urban migration and changing family structures have left many older persons without traditional means of support. A large number of older persons in the region have to no secure source of income due to a lack of social protection. Most countries’ health systems cannot meet the needs of older persons. *In addition*, there is rising demand for

'age-friendly' and 'barrier-free' environments so that older persons can enjoy continued freedom of movement and can actively participate in society.

The feminization of the ageing population is notable, with women constituting the majority of the older population and an even greater majority of the "oldest old" population (80 years and older). Older women, more so than older men, tend to live alone due to the death of a spouse. Older women are also more vulnerable to poverty and social isolation, and face greater risks of physical and psychological abuse due to discriminatory social attitudes. It is, thus, critically important to address the gender dimension of population ageing.

Population ageing presents not just challenges, but also opportunities. Older persons play crucial roles in supporting families and communities. Whether through giving such support or through directly engaging in economic activity, older persons also contribute to the economic well-being of society. Home to the largest proportion of the world's population of older persons, the Asia-Pacific region should lead the way in:

- a) *recognizing the role of older persons, and*
- b) *promoting their full participation in the development process.*

Implications for Policy and Research

The rapid growth of the ageing population in the 21st century is a major concern in human service planning. International experts in population and development have recognized the fundamental relationship among population, gender and development. A comprehensive policy on ageing requires the compilation of sex-disaggregated data and the use of gender analyses to provide a gender perspective in policy formulation and programme implementation. Given the predominance of women in the ageing population, gender-sensitive policies and programmes are needed to address the specific concerns of elderly women. In Asian societies, ageing issues are generating an active debate about gender, the family, the organization of the workplace, and the policy approaches to address these challenges.

Current census reports have lagged behind the demographic changes in the ageing population. The older age groups are undifferentiated after age 65 in most census data. Research studies usually restrict their target respondents to those under the age of 65. Given the fact that people over 65 will constitute close to one-quarter of the population in Asia by 2050, and over one-third of the population in Hong Kong by that time, more refined age grouping with sex-disaggregated data will provide a more useful data base for policy-makers and researchers. Use of sex-disaggregated data in research will lead to very different conclusions in policies, especially when there are substantial sex differences.

Gender analyses will identify the potential contributions and specific needs of elderly women and men in terms of:

- *economic security,*
- *living arrangements, health and well-being, as well as*
- *active participation in the community.*

Gender analyses can also be used to evaluate the differential impact of policies and programmes on women and men. A life-cycle approach to gender analyses will provide a comprehensive perspective for interrelated policies on human services. For example, the benefits

of intergenerational exchanges in family care are not restricted to care of the elderly, but also childcare options for the younger couples.

Contribution of the ESCAP AND MIPAA:

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) is the regional development arm of the United Nations for the Asia-Pacific region. Established in the year 1947, with its headquarters in Bangkok, Thailand, the ESCAP seeks to overcome some of the region's greatest challenges. It also serves as the "*inter-governmental platform*" in Asia and the Pacific to strengthen regional cooperation and enhance government capacity to design and implement policies that empower and protect older persons.

The ESCAP's programme on ageing focuses on:

- *Serving as an intergovernmental platform to:*
 - *Develop* regional response to the demographic transition
 - *Share* knowledge and good practices in addressing population ageing challenges
 - *Promote* the Madrid International Plan of Action on Ageing, identify gaps and regional priorities
- *Providing technical assistance to Governments to:*
 - *Design* and implement policies/programmes that empower and protect older persons
 - *Review* and appraise the implementation of the Madrid International Plan of Action on Ageing

Furthermore, the Madrid International Plan of Action on Ageing (MIPAA) was adopted at the United Nations Second World Assembly on Ageing held in Madrid in 2002. Subsequently, the General Assembly endorsed the Plan on December 2002 during its 57th session. The Second World Assembly on Ageing brought together delegates from more than 160 Governments, intergovernmental institutions and NGOs to respond to the opportunities and challenges of population ageing.

The Plan responds to the opportunities and challenges of population ageing and promotes the development of a society for all ages. It calls on Governments to integrate the rights and needs of older persons into national and international, economic and social development policies. The aim is "*to ensure that persons everywhere are able to age with security and dignity and to continue to participate in their societies as citizens with full rights*".

The Madrid International Plan of Action on Ageing is a practical tool to assist policymakers to focus on the key priorities associated with population ageing. It addresses a wide range of issues with implications for the lives of older people around the world, including:

- *social protection,*
- *health,*
- *urbanization,*
- *labour,*
- *education,*
- *nutrition,*
- *training of carers,*
- *housing,*
- *infrastructure, and*
- *images of ageing.*

The three priority directions outlined in the Plan are:

- *Older persons and development,*
- *Advancing health and well-being into old age, and*
- *Ensuring enabling and supportive environments.*

Specific recommendations designed to be adapted to the circumstances in each country are included. The Plan recognizes the many different stages of development and the transitions that are taking place in various regions, as well as the interdependence of all countries in a globalizing world.

Policy Priorities

A national strategy on how to meet the challenges of aging is essential to ensure that the goal of having an active older population is achieved by developing coordinated national and local policies and practices in a range of welfare, health and economic sub-fields. As mentioned, the Madrid Plan identifies three priorities for international efforts. What ESCAP did in formulating the Shanghai Implementation Strategy was to adapt these priorities for Asia with reference to special considerations such as economic and political diversity, geographical barriers to service accessibility, and social and cultural diversity, including differences in language.

Concluding Observations

In view of the growing ageing population, governments in the Asia-Pacific region are beginning to address the needs of the elderly population in more focused policies. In Hong Kong, for instance, an Elderly Commission was set up in the year 1998 in order to:

- *advise the government on the formulation of a comprehensive policy for the elderly,*
- *coordinate the planning and development, and*
- *monitor the implementation of programmes and services for the elderly.*

Ensuring financial security for the elderly is considered fundamental to achieving the policy objective of caring for the elderly. However, no alternative scheme is planned for ensuring the financial security of women who contribute to the economy in the informal sector or as ‘homemakers’. Further, in the area of “family care”, providing the necessary community care and support services is an important policy that will facilitate the family to take up the care-giving role. In addition to providing more day care and home services to the elderly in need, some national governments are reviewing the mode of provision of home help service and the introduction of day respite services as forms of support to families caring for their elderly members. *On the other hand*, initiatives to encourage the elderly to lead an active life have remained in the traditional models of social welfare that engage the elderly person in social and recreational activities or in voluntary social services. The vast potential of the human talents from different groups of the elderly population could be looked upon as resources for both the family and the community. For example, the possible contributions of active elderly parents to childcare within the family as well as in the community could be:

- a) *explored,*
- b) *organized, and*
- c) *promoted.*

Most importantly, long-term planning for future ageing population needs to take into account not only the current needs and potentials of elderly persons, but also the situation of different cohorts of the population who will become the elderly in the future. A life-cycle approach to gender analysis will provide a comprehensive perspective to gender-sensitive planning for the ageing population.

There was an awakening to the gender perspective in the social sciences at the end of the 20th century. The gender deconstruction of social research and policies has raised the sensitivity of social scientists to the differential interpretation of data and outcome. With rapid changes in gender roles and relations in the last century, the cultural lag in gender attitudes and beliefs has to catch up with the social reality. *To sum up*, the challenge of human service planning for the ageing population has highlighted the importance of mainstreaming gender from a life-cycle perspective in research, policy, and planning in the new millennium. The Asia-Pacific region needs strengthened policy measures and social and economic adjustments in preparation for the region's rapid transition to an ageing society.

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A Comparison of the Classical Test Theory and the Multidimensional Item Response Theory total scores in a high scoring group of students on a Mathematics Multiple Choice Examination

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Classical Test Theory was used to score a sample of 3000 examinees on a Mathematic Multiple Choice Examinations. Four scores were assigned to each examinee: a total correct score, which is the sum of all the items answered correctly and a score on each of three profile dimensions assigned by test constructors. Students who got 57% or more were selected for rescoring using MIRT; Bayes' estimation procedure implemented in the program TESTFACT was used. Since MIRT scores are Z-scores, each MIRT score was converted to a T-score for easy interpretation. Using MIRT, the 30 top students received "A's" and "A+'s"; whereas, under CTT, each examinee in this group got a straight grade A. When the total correct score was examined in the 30 students from the bottom of this high scoring group, all obtained a passing grade using a CTT scoring technique but a failing grade using a MIRT procedure. If a test is determined to be multidimensional a multidimensional scoring procedure should be used to estimate the student's ability; in addition, a passing or failing grade should be based on the scores awarded on each dimension and not solely on a Total Score; because, a total score ignores the individual's areas of strength in the subject and this could lead to incorrect interpretation of the examinee's ability.

Keywords: Dimensionality, Classical Test Theory Total Score, Multidimensionality, Latent trait, TESTFACT, Item Factor Analysis, MIRT score, T-score.

2000 AMS Subject Classification: 97D60; 97Cxx; 97K80.

Introduction

Walker and Beretvas (2000) argue that the primary reason for examining students in mathematics is to quantify the level of their mathematical ability. They further argue that since no measurement is free of measurement error, any one-dimensional procedure used to measure a multidimensional test may exacerbate this measurement error.

In solving Mathematics problems, students are required to recall basic facts, reason solutions, interpret questions, read and translate statements into mathematical equations and make connections between different topics in Mathematics. Hence, by design, many Mathematics tests are multidimensional.

The results of any Mathematics examination have implications for parents, students, teachers, and school administrators: Parents and students are aware that a pass in mathematics is a prerequisite for entry into many universities and for many jobs; teachers are cognizant that

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judgments about their competence in the class room are ‘tied’ to the examination results of their students; and, administrators know that their schools are considered “good” or “not good” depending upon the number and quality of passes scored every year at the end of the examination period. It is therefore imperative that the appropriate scoring procedure be used to score multidimensional tests since the number of passes and the ranking of students are likely to vary with each different procedure.

According to Rotou *et al.* (2001) test scores obtained using MIRT procedures are likely to be very different from those obtained using a CTT procedure. Hence, any decision made about a particular individual’s success, failure or ranking relative to other students taking the same examination will be dependent upon the particular scoring procedure used. The purpose of this study is to rescore a Mathematics Multiple Choice Test, previously found to be three dimensional, Sealy (2009), using a MIRT procedure. Before looking at the MIRT scores, we have organized this paper as follows: firstly, we present the theoretical frame work which includes a summary of the multidimensional model and formulae used to score the mathematics test on each dimension; secondly, selecting the sample, determining the dimensionality and assigning interpretable multidimensional scores are discussed in methodology; thirdly, the method of determining the parameters in the model selected is discussed; fourthly the results and discussions of the CTT scores and MIRT scores are presented; and, finally we conclude with an interpretations of our findings.

Theoretical framework

“Many tests are constructed in such a way that each item presents a problem that can be solved by some characteristic cognitive behaviour that the test intends to measure”, see, Kelderman and Rukes (1994). Hence, tests are either one-dimensional or multidimensional. According to Ackerman (1994), in a one-dimensional test, the items measure the same trait or the same multiple of composite traits.

In multidimensional tests, on the other hand, items measure more than one trait; items distinguish between different trait levels; and, examinees have different levels of proficiency on more than one of these traits, see Ackerman (1994) and Reckase and McKinley (1991). In the multidimensional case, Reckase and McKinley (1991) also argued that an “increase in any one – or a combination – of the abilities required for solving the item...” increases the probabilities of answering the item correctly. Ackerman (1994) explains that it is the ‘interaction between the characteristics of the item and the latent abilities of the examinees...’ that determines the dimensionality of the test and hence the number of latent abilities required for solving the test items.

On the one hand, a CTT total score is the sum of all the items answered correctly and it does not take the dimensionality of the test into consideration; on the other hand, the dimensionality must be known before a test is scored using any MIRT procedures.

Two procedures may be used to determine the MIRT total score. Rotou *et al.* (2001) suggest determining the probability of getting a correct response on each item for each examinee and placing the results in a table which takes the form of an N by K matrix; N being the number of

examinees and K, the number of items. The matrix entries are P_{ij} which is the probability that person j gets item i correct. Summing the probabilities in row j, will give the MIRT total score for a particular candidate j. In the second method, the TESTFACT program uses Bayes' (EAP expected a posteriori) as explained by Bock and Aitkin (1981) to generate MIRT scores on each of the three dimensions. Two facts are required in calculating MIRT ability scores using Baye's procedure: the number of correct items in the item response vector and which particular items are answered correctly. For example, as stated "If θ_{jk} is the j th ability score, $k = 1, 2, 3, \dots, nfact$ for examinee j, $j = 1, 2, 3, \dots, N$, then the factor scores are $E(\theta_{ik} | x_{i1}, x_{i2}, \dots, x_{in})$ where x_{ij} is the item j score for the examinee i" (Dutoit, 2003 p. 800). In this paper, only the second method is used because of the amount of calculations required in the Method 1.

For dichotomous data, the model relating the probability of successfully answering an item and the characteristics of the item, which takes guessing in to consideration, was presented by Birnbaum (1968) in the 3PLM as follows:

$$P(u_{ij} = 1 | \theta_j, g_i, b_i) = g_i + \frac{1 - g_i}{1 + e^{\left[-1.7a_i(\theta_j - b_i) \right]}}$$

and, Embretson and Reise (2000) presented the multidimensional extension of this 3PLM to M3PLM as

$$P(u_{ij} = 1 | \underline{\theta}_j, \delta_i, g_i, \underline{\alpha}) = g_i + (1 - g_i) \frac{e^{\sum_{k=1}^m (\alpha_{ik} \theta_{jk} + \delta_i)}}{1 + e^{\sum_{k=1}^m (\alpha_{ik} \theta_{jk} + \delta_i)}}$$

Where θ_{jm} is the trait level of person j on *dimension m*; δ_i , the easiness intercept for item i

which is given by $\delta_i = d_i \sqrt{1 + \sum_{i=1}^N \alpha_{im}^2}$ where d_i is the difficulty of item i, and N is the

number of items tested. The term g_i , the pseudo guessing parameter for item i , is given by

$$g_i = \frac{1}{\# \text{ of response alternatives}}, \text{ or it may be calculated with the aid of BILOG, a program used}$$

to estimate parameters in one-dimensional data see, Du Toit (2003).

In this paper, the pseudo guessing parameter was estimated using BILOG.

In the research works of Reckase (1985) and Reckase and McKinley (1991), they developed formulae that may be used to determine the characteristics of items for a M2PLM.

By extension, for a test with m dimensions, the multidimensional item discrimination may be written as follows:

$$MDISC_i = \sqrt{(a_{1i}^2 + a_{2i}^2 + \dots a_{mi}^2)}.$$

(In the M2PLM the parameter m is 2.).

For the multidimensional item difficulty Reckase (1985) defined discrimination in terms of D , "...the distance to the point of steepest slope in a direction from the origin..." and α , "the angle needed to describe that direction" as

$$D_i = -\frac{d_i}{MDISC_i}$$

and

$$\alpha_j = \cos^{-1} \left(\frac{a_{1j}}{MDISC} \right).$$

When the characteristics of the items are known, the probability of answering an item correctly in the multidimensional space may be determined.

Using these formulae the multidimensional item discrimination and difficulty were substituted into the M3PLM and the probability of a correct response was determined.

Methodology:

An anonymous proportionate stratified random sample of 3000 Mathematics item response vectors was extracted from the CSEC type Mathematics multiple choice examination. The examination consisted of 60 items and each item presented four response alternatives to each candidate. The result for each item was dichotomized: a “one” was recorded for a response and a “zero” for an incorrect response. Using a Classical Test Theory’s total score, the 3000 data values were ranked in descending order. Students who scored 57% or greater were identified as “high scoring students”, and all high scoring students were rescored using MIRT; an MIRT score was recorded on each of the three dimensions for all students. Also recorded, is an examinee’s MIRT total score found by adding the scores on each dimension. The total score was converted to a T-score for ease of interpretation. The MIRT and CTT scores of the first 30 students and the last 30 students in the ranked high scoring group of 1656 examinees are reported in this, paper. Each total score was converted to a grade based on the following chart taken from (UWI handbook 2007-2008) which is available online:

Table 1: Grade equivalents.

A+	86-100	B	60-62	C	47-49
A	70-85	B-	57-59	D+	43-46
A-	67-69	C+	53-56	D	40-42
B+	63-66	C	50-52	F	0-39

We assumed that the grades above closely approximate those of the C.X.C examining body. Hambleton *et al.* (1991), Embretson and Rise (2000) and Bock and Schilling (2003) argued that perfect scores –all items answered correctly or all items answered incorrectly affect IRT procedures. Consequently, all examinees meeting either of these two conditions were removed from the sample before any analysis was done.

The data set was assumed to fit the multidimensional extension of the 3 parameter logistic model. However, before investigating the dimensionality of the data sets, the lower pseudo guessing parameter was estimated to be 0.188 using the BILOG program on the entire sample of 3000 values. Embretson and Rise (2007) pointed out that difficulties sometimes occurred when unique parameters were estimated and they recommend using a common guessing parameter if this happens. That suggestion was followed with this sample and the value 0.188 represents the common guessing parameter.

The pseudo guessing parameter was inputted into TESTFACT which was run in its exploratory mode to *assist* in determining the dimensionality of the item response data set for the high scoring group.

Wood (2003) described the chi square statistic used to determine the dimensionality of the data set as follows:

$$\chi^2 = 2 \sum_{l=1}^{2^n} r_l \ln \frac{r_l}{NP_l}, \text{ with the number of degrees of freedom given as:}$$

$Df = 2^n - 1 - n(m+1) + \frac{m(m-1)}{2}$ where 2^n is the number of distinct response patterns and r_l is

the frequency of the pattern l . $\bar{P}_l$ is calculated from the maximum likelihood estimates.

$N = \sum r_l$ is the number of cases.

n is the number of items in the test and m is the number of factors.

The TESTFACT program replaced 2^n , in the formula for the number of degrees of freedom,

by N_R , the number of cases in the sample, when the data was entered as individual observations.

Also, the chi-squared value given in the output was calculated by a slightly different formula:

$$\chi^2 = \sum_{j=1}^{N_R} W_j \ln \frac{W_j}{W_T \times p_j}$$

Where, W_j is the sum of weights for pattern j , W_T is the total sum of weights, and p_j is the marginal probability for pattern j , see, Wood (2003)

The hypothesis tested was H_o : an m factor model fits the data versus the alternative H_1 : an $m+1$ factor model fits the data, and the resultant test statistic was $\chi^2_{df_m - df_{m+1}}$

For a specified level of significance, α , we manually changed the parameter m incrementally and

the full information analysis was repeated until $\chi^2_{df_m - df_{m+1}} > \chi^2_{df_m - df_{m+1}, \alpha}$

or $\chi^2_{df_m - df_{m+1}} < 0$ was reached, whichever occurred first. In addition to this chi squared test,

both the 2D M3PLM and the 3D M3PLM were fitted to the data set and the model which provided the better fit was selected.

The test constructors subjectively assigned three profile dimensions to the test in the following

ratio: P1:P2:P3: 18:24:18. Sealy (2009) showed empirically, using the principles of MIRT, that

the data set consisting of the item response vectors of the high scoring group *only* was three dimensional. Consequently, the high scoring group was rescored using the3D, M3PLM and the results were compared to the scores generated using CTT total score.

For easy interpretation the MIRT z scores were converted into T-scores as follows: T-score = $10z + 50$ where 10 is the standard deviation, 50 is the mean and z is the normalized score, Nitko (1996). For instance, if $T = 40$ then $z = -1$ is the corresponding standardized score. So, the T-score values have the appeal of the CTT total score while retaining their relationship with the standardized z scale.

Parameter estimation

TESTFACT was used to estimate the trait levels and item parameters in this paper. The program uses marginal maximum likelihood (MML) to determine the estimates; and, all parameters are determined to minimize errors.

The probability of observing a particular response pattern in an *n-item* test conditioned on ability θ_j is modeled using a likelihood equation. In this paper the 3PLM was used.

Consider the response pattern of item scores for person j:

$$\underline{x}_i = [x_1, x_2, \dots, x_n].$$

Since $\underline{X}_{i1}$ is a random variable with a Bernoulli distribution, from the principle of local independence, it follows that

$$P(\underline{X}_i = \underline{x}_i | \theta_j) = P(x_i | \theta_j) = \prod_{i=1}^n [\phi_i(\theta_j)]^{x_i} [1 - \phi_i(\theta_j)]^{1-x_i}, \quad (1)$$

where, $\phi_i(\theta_j) = P(x_i = 1 | \theta_j) = P_i$.

In any population a number of students will have the same response pattern. Hence using the frequencies of the response patterns, the trait level distribution may be specified from the empirical data: each different response pattern corresponded with a different trait level.

The marginal probability $P(\underline{x})$, which is the probability of a particular response pattern for person with unknown ability, according to Embretson and Reise (2000), is given as the sum of the probabilities over the discrete trait levels. If $q = \{1 \text{ to } Q\}$ are quadrature points and each quadrature point corresponds with a given latent trait then for the 3PLM

$$P(\underline{x}_i | a_i, d, c_i) = \sum_{q=1}^Q P(\underline{x}_i | \theta_q, a_i, d, c_i) P(\theta_q) \quad (2)$$

a represents the item's discrimination, d , its difficulty, c its pseudo guessing parameter and θ the latent trait.

The latent trait is considered to be a continuous variable. Taking this into consideration equations 1, for an m -dimensional model, may be written as follows:

$$\begin{aligned} P(\underline{x}_i | \theta_j) &= \int_{-\infty}^{\infty} \dots \int_{-\infty}^{\infty} \prod_{i=1}^n P(\underline{x}_i | \theta_j) g(\theta) d\theta_1 \dots d\theta_m \\ &= \int_{-\infty}^{\infty} \dots \int_{-\infty}^{\infty} \prod_{i=1}^n [\phi_i(\theta)]^{x_{ij}} [1 - \phi_i(\theta)]^{1-x_{ij}} g(\theta) d\theta_1 \dots d\theta_m \end{aligned} \quad (3)$$

$P(\underline{x}_i | \theta)$ is the probability of observing a response pattern given some latent trait. And, $g(\theta)$ is the probability of observing the empirically determined distribution. The integral is evaluated using numerical integration.

In Bock *et.al* (1988) the expression in (1) is symbolized as follows:

$$\bar{P}_l = P(\underline{x}_i | \theta_j) = \int_{\theta} L_i(\theta) g(\theta) d\theta = \sum_{q_m=1}^Q \dots \sum_{q_2=1}^Q \sum_{q_1=1}^Q L_i(X) A(X_{q_1}) \dots A(X_{q_m}). \quad (4)$$

Where X is a multidimensional quadrature point, and $A(X)$ is the weight corresponding to a given quadrature point.

Let r_i be the frequency of a given response pattern x_i for an n item test in a sample of N

examinees. If there are s distinct patterns then $l = 1$ to $s \leq (N, 2^n)$ and $\sum_{l=1}^s r_l = N$. Hence, r_l has a

multinomial distribution with parameter N . And, the probability of the sample data likelihood is given as follows:

$$L_m = P(X) = P(r_1, r_2, \dots, r_s; N \bar{P}_1 \bar{P}_2, \dots, \bar{P}_s) = \frac{N!}{r_1! \dots r_s!} \bar{P}_1^{r_1} \bar{P}_2^{r_2} \dots \bar{P}_s^{r_s}.$$

Taking logs of both sides we get the following:

$$\ln L_M = \ln P(X) = \ln \left(\frac{N!}{r_1! \dots r_s!} \right) + \sum_{l=1}^s r_l \ln \bar{P}_l \quad (5)$$

This shows that the log likelihood is a function of the marginal probability weighted by the frequency of the given response pattern. To determine estimates of the item parameters we look for the values that maximize the data log likelihood. That is $\ln L_m$ is differentiated and the result is set equal to zero. Bock et.al (1988) differentiated $\ln L_m$ with reference to some general item parameter v_i and got the following results:

$$\frac{\partial \ln L_m}{\partial v_j} = \sum_l^s \frac{r_l}{\bar{P}_l} \int \left(\frac{x - \phi}{\phi(1 - \phi)} \right) L_l \frac{\partial \phi}{\partial v_j} g(\theta_j) d(\theta_j) = \int \frac{\bar{r}_j - \bar{N}\phi}{\phi[1 - \phi]} \frac{\partial \phi}{\partial v_j} g(\theta_j) d(\theta_j). \quad (6)$$

where

$$\bar{r}_j = \sum_{l=1}^s \frac{r_l x_{lj} L_l(\theta_j)}{\bar{P}_l} \quad (7)$$

And

$$\bar{N} = \sum_{l=1}^s \frac{r_l L_l(\theta_j)}{\bar{P}_l} \quad (8)$$

According to Bock et.al (1988), the integral in 3 which corresponds with the maximization procedure in the EM algorithm may be calculated by numerical integration methods, and 4 and 5 represent expectation steps. In the expectation stage according to Embretson and Reise (2000), the expected number of persons at each trait level (represented by quadrature points) is computed as well as the number students passing each item.

With reference to the 3PLM these frequencies are substituted into the estimation equations 6 below, and the values of the parameters that maximize these likelihood equations:

$$\sum_{k=1}^q \left(\frac{\bar{r}_{ik} - \bar{N}_{ik} P_i(X_k)}{P_i(X_k)[1 - P_i(X_k)]} \right) \frac{\partial P_i(X_k)}{\partial \begin{bmatrix} c_i \\ a_i \\ g_i \end{bmatrix}} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad (9)$$

are found in Du Toit (2003) where,

$$\bar{r}_{ik} = \sum_l^s r_l x_{li} P(x_l | X_k) \frac{A(X_k)}{P_{xl}}, \text{ such that } x_{li} \text{ is the score 0 or 1 for item i in pattern l, and}$$

$$\bar{N}_k = \sum_l^s r_l P(x_l | X_k) \frac{A(X_k)}{P_{xl}}.$$

If convergence is not reached a second expectation procedure is used with the new estimates and a second maximization procedure is also used. When convergence is achieved a Newton-Gauss procedure is used to get the final estimates Embretson and Reise (2000).

Results and discussion

Table 2: CTT and MIRT scores for the first 30 examinees

SCORES OF THE FIRST 30 EXAMINEES									
Person	CTT			TOTAL	MIRT			zttotal	T-score
	P1	P2	P3		Dim1	Dim2	Dim3		
1	18	24	17	59	1.225	0.772	1.899	3.896	88.96
2	18	23	18	59	1.829	0.213	1.57	3.612	86.12
3	18	23	18	59	1.689	0.787	1.411	3.887	88.87
4	18	24	17	59	1.259	0.237	1.842	3.338	83.38
5	18	23	18	59	1.689	0.787	1.411	3.887	88.87
6	18	24	17	59	1.747	0.59	1.672	4.009	90.09
7	18	23	18	59	1.237	0.85	1.672	3.759	87.59
8	18	24	17	59	1.747	0.59	1.672	4.009	90.09
9	18	24	17	59	1.225	0.772	1.899	3.896	88.96
10	18	24	17	59	1.747	0.59	1.672	4.009	90.09
11	18	24	17	59	1.747	0.59	1.672	4.009	90.09
12	18	23	17	58	1.69	0.707	1.216	3.613	86.13
13	18	23	17	58	1.245	0.215	1.77	3.23	82.3
14	16	24	18	58	1.708	0.644	1.514	3.866	88.66
15	17	23	18	58	1.36	0.714	1.254	3.328	83.28
16	17	24	17	58	0.897	1.004	1.545	3.446	84.46
17	18	23	17	58	1.729	0.909	1.434	4.072	90.72
18	18	23	17	58	1.797	0.101	0.962	2.86	78.6
19	17	23	18	58	1.599	0.636	1.48	3.715	87.15
20	17	24	17	58	1.619	0.456	1.229	3.304	83.04
21	18	22	18	58	1.343	0.753	1.286	3.382	83.82
22	17	23	18	58	1.639	0.848	1.202	3.689	86.89
23	18	24	16	58	1.248	-0.044	1.61	2.814	78.14
24	18	23	17	58	1.171	0.972	1.568	3.711	87.11
25	18	23	17	58	1.171	0.972	1.568	3.711	87.11
26	18	22	18	58	1.809	0.52	1.325	3.654	86.54
27	18	23	17	58	1.971	0.797	1.343	4.111	91.11
28	18	23	17	58	1.773	0.252	0.5	2.525	75.25
29	18	22	18	58	1.658	-0.49	1.668	2.836	78.36
30	18	22	18	58	1.724	-0.12	1.668	3.272	82.72

Table 3: CTT and MIRT scores for the bottom 30 examinees

SCORES OF THE LAST 30 EXAMINEES

person	CTT			total	MIRT			Ztotal	TSCORE
	P1	P2	P3		Dim1	Dim2	Dim3		
1627	10	16	8	34	-0.781	-0.885	-0.848	-2.514	24.86
1628	11	16	7	34	-1.536	-0.15	-0.311	-1.997	30.03
1629	9	16	9	34	-1.144	-0.189	-0.67	-2.003	29.97
1630	11	15	8	34	-0.529	-0.407	-0.933	-1.869	31.31
1631	10	14	10	34	-0.031	-0.719	-1.58	-2.33	26.7
1632	11	14	9	34	-0.584	-0.656	-1.012	-2.252	27.48
1633	13	9	12	34	-2.034	-0.988	0.434	-2.588	24.12
1634	12	14	8	34	-0.985	-1.058	-0.18	-2.223	27.77
1635	10	14	10	34	-0.224	-2.583	0.135	-2.672	23.28
1636	10	15	9	34	0.305	-2.644	-0.484	-2.823	21.77
1637	10	16	8	34	0.499	-2.025	-0.652	-2.178	28.22
1638	9	12	13	34	0.327	-2.125	-1.141	-2.939	20.61
1639	13	14	7	34	-1.246	-2.075	0.419	-2.902	20.98
1640	8	17	9	34	-0.251	-2.684	0.207	-2.728	22.72
1641	10	15	9	34	-0.171	-2.411	0.305	-2.277	27.23
1642	12	15	7	34	-1.111	-2.222	0.548	-2.785	22.15
1643	12	13	9	34	-0.708	-0.946	-0.641	-2.295	27.05
1644	11	13	10	34	-1.213	-0.801	-0.2	-2.214	27.86
1645	10	15	9	34	-0.782	-0.051	-1.04	-1.873	31.27
1646	11	12	11	34	-1.067	0.222	-1.026	-1.871	31.29
1647	11	17	7	35	-0.949	-0.752	-0.477	-2.178	28.22
1648	8	15	11	34	-0.138	-0.55	-1.559	-2.247	27.53
1649	12	16	6	34	-1.166	-0.088	-0.731	-1.985	30.15
1650	12	12	10	34	-0.967	-0.645	-0.358	-1.97	30.3
1651	13	12	9	34	-0.274	0.002	-1.602	-1.874	31.26
1652	12	12	10	34	-1.779	0.016	-0.599	-2.362	26.38
1653	10	13	11	34	-0.212	0.151	-2.007	-2.068	29.32
1654	10	14	10	34	-0.946	0.445	-1.39	-1.891	31.09
1655	11	14	9	34	-0.626	-0.243	-1.062	-1.931	30.69
1656	9	15	10	34	-0.379	-0.647	-1.26	-2.286	27.14

From **table 1** the range of the CTT total marks = $59-58 = 1$ and the range of the MIRT total marks = $91.11 - 75.25 = 15.86$ for the first 30 students. In **Table 2** the range of the CTT total marks = $34-34 = 0$ and the range of the MIRT total mark = $31.31 - 20.61 = 10.70$. If students are ranked according to total test scores, under CTT there would only be two positions in the top group: 11 persons would be in first position and 19 persons would be in second position. In the bottom group there would also only be two positions: 29 students scored the same mark and only one student got a different mark using CTT scoring methods. However under MIRT scoring procedures, each student in the two groups identified was assigned a unique score and hence a unique rank order position.

Conclusion

If the examination results are based on a total test score, students who get a high total score using the CTT analysis may not get a similar high score with the MIRT procedure. In this study, many students were given a failing grade when the MIRT methodology was employed and the total MIRT score was the only criterion used to estimate the student's ability; yet, these same students got a passing grade using the CTT procedure. Clearly, if the total test score is being used to evaluate a student's overall performance the *results* will be dependent upon which methodology is used - CTT or MIRT.

However, a total test score does not give an accurate impression of a person's mathematical ability on a multidimensional test. Modeling the data multi-dimensionally allows the analyst to make inferences about an examinee on *each* of the latent traits needed to describe the entire latent space. In this paper three constructs were assigned to the test by test constructors: Recall, reasoning and comprehension. The dimensionality of the item response data set was also found to be three. Therefore, it is our view that all candidate should be accessed on each of the three dimension empirically determined; consider a student, for example, who gets a failing grade. This student may have demonstrated competence in reasoning ability – one of the three dimensions measured by the test. If this quality is important to a potential employer or a graduate advisor it will go unnoticed since a failed subject may not be considered by either person. According to Gosz and Walker (2002), a Classical Test Theory total test score on a multidimensional test could lead to an inaccurate estimation of a person's ability. That point has been corroborated in our study. Hence, we believe that a multidimensional test should be modeled using a multidimensional procedure; and, that special attention needs to be paid to the scores on each dimension and what information is reported, whether the overall performance is a passing or a failing grade.

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Students' Attitudinal Variables as Correlates of Achievement in Secondary School Mathematics in Barbados

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This study was designed to determine the relationship between and amongst variables: students' perceptions of mathematics usefulness, parents' involvement and mathematics teacher influence on achievement in mathematics. A sample of 170 4th and 5th form students who comprised of 116 girls and 54 boys participated in this study. Two instruments were used for data collection. Data analysis involved the interpretation of frequencies, t-test and regression analysis. Results of the frequencies showed that students had positive perceptions of the usefulness of mathematics and the influence of their mathematics teachers. However they displayed negative perceptions of their parents' involvement in reference to their achievement of mathematics. The results also showed there was no significant differences amongst male and female students on any of the three variables as it pertained to mathematics achievement. Mathematics usefulness ($t = -.770$; $df = 168$; $p = .442$), teacher influence ($t = 1.120$; $df = 168$; $p = .228$) and parental involvement ($t = -.728$; $df = 168$; $p = .467$). Additionally the contribution of the three variables though small contributed to mathematics achievement accounting for 6.2% ($R \text{ square} = 0.062$, $P < 0.05$) of the total variance. Also, all the variables except students' perceptions of parental involvement contributed significantly to mathematics achievement with students' perception of their mathematics teacher contributing the most and students' perception of parental involvement, the least. Hence teachers ought to continue to encourage and show interest in the progress of their students and provide the necessary intervention students might require to enhance their problem solving skills; which would directly improve students' performance in mathematics. Likewise parents should become more involve in their children education in mathematics and be more aware of the challenges they encountered in the subject.

Key words: students' perceptions, teacher influence, parental involvement, mathematics usefulness and mathematics achievement

Background

Literature is replete of the claims of how important mathematics is. For instance, Igboke (2003) in recognizing the linkages of mathematics to science and technology asserts that without mathematics there will be no science and without science there will be no technology, and without technology there will be no modern society. In other words, mathematics is the precursor of science and technology; and a requisite element in modern societal development. Financial systems, system of measurement, and many other aspects of life encountered daily; along with the ability to carry out basic computations are highly dependent upon mathematics. Individuals who are unable to carry out these basic mathematical functions, or lack the understanding of how

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mathematics is used to construct and develop the things around them find themselves severely disadvantaged.

Unfortunately, many of the students in secondary institutions are exhibiting poor attitudes toward mathematics and perhaps, as a consequence, there has been a decline in mathematics achievement in Barbados and the wider Caribbean. Data collected from the Caribbean Examination Council (CXC) confirms this worrisome trend.

Table 1:
Percentage Passes in Mathematics in the Caribbean (2006 – 2011)

Year	Total Entries	Number of students receiving passes grades 1-3	Percentage (%) passes at grades 1-3
2006	98,951	33,739	34%
2007	101,892	32,343	32%
2008	105,040	40,267	38%
2009	106,684	39,535	37%
2010	122,451	43,936	36%
2011	118,517	36,752	31%

Source: CXC Statistical Bulletin (2011)

Table 1 above, shows the total number of passes for the periods January and May, of all the entries in the subject of mathematics in the Caribbean during the last six years. In the above table Grade I, Grade II and Grade III represent passing grades. This table shows that of the 653,535 entries for the six year period 226,572 students received a passing grade. This statistic represents a 35% pass rate of the students who would have been entered for mathematics.

Table 2
Percentage Passes in Mathematics in Barbados (2006 – 2011)

Year	Total Entries	Number of students receiving passes grades 1-3	Percentage (%) passes at grades 1-3
2006	4,999	2,160	43%
2007	4,962	2,027	41%
2008	5,124	2,478	48%
2009	5,120	2,266	44%
2010	5,036	2,257	45%
2011	4,820	1,886	39%

Source: CXC Statistical Bulletin (2011)

The data in Table 2 shows the number of passing grades of students entered in Barbados for the subject mathematics during the periods January and May. Passing grades are identified in the same way as shown in Table 1. Data in Table 2 reveals that for the same six year period, there were 13,074 students receiving a passing grade. Hence, of the 30,061 students entered during that six year period, approximately 43% of the entrants received a passing grade.

The statistics from both tables show that for the six year period, the pass rate for the Caribbean and Barbados was below fifty percent. This has dire implications not only for Barbados but for the wider Caribbean, because of the importance of mathematics to local and regional development. Hence there is a need carry out an investigation in to the perceive factors that impact on students' mathematics achievement with the intention of understanding the nature of their interaction and to what extent they contribute underachievement in mathematics.

Factors often highlighted as being important in impacting on students' attitude towards mathematics are parental support, teacher qualities as perceived by the students and mathematical usefulness. Bolaji (2005) in a study of the influence of students' attitudes towards mathematics found that the way in which teachers implemented their methodologies and strategies along with their personalities, greatly accounted for the positive attitude displayed by students. The white paper on education (July, 1995) sought the views of Barbadian secondary school children as it related to how teachers could improve their teaching methods to promote students' interests and attitudes. About 25% of the responses suggested that teachers needed to work on improving their relationship with students as well as being more understanding. Some 23.9% said that teachers needed to listen more attentively and show a greater degree of patience. Studies done by Georgewill (1990) found that teachers, who were untrained and lacked a cordial relationship with their students negatively impacted on their students' attitude and performance in mathematics. He further stated that where a cordial relationship existed between teachers and their students, these students felt more comfortable in asking questions and as a result better understood the subject.

The way in which the concepts of mathematics are conveyed to students can also contribute to the way that students perceive its usefulness. Liegl (2012) is of the view that students may not see the example as the reasoning to how mathematics content and processes being presented is useful or important to them. He further stated that the challenge is not to necessarily show that mathematics is important to society as it is to show how important and useful mathematics can be to the students. In a study conducted by GoodyKoontz (2008) also lends support to Liegl (2012) as he revealed that many students were of the belief that explanations and examples used in the class should highlight the usefulness of mathematics. In interviews conducted by GoodyKoontz, students suggested that if mathematics is taught in such a way where they can see the connection of mathematics and the real world through real life scenarios, it would help them to learn the subject better and develop more favourable perceptions towards the discipline in the future.

As it relates to parental involvement, research has shown that parents' involvement positively affected the children academic performance (Fan and Chen, 2001). Fennstein and Symons (1999) concurred with this premise and concluded that parental involvement definitely has a positive effect on academic achievement in both primary and secondary schools. Usually, parents are more involved in their children's education because of the dreams and aspirations they have for them to achieve and become productive citizens. Jacobs and Harvey (2005) defined parental aspirations as the quality and level of education they would like their children to attain from secondary education through to postgraduate university. According to Ma (2001) these aspirations by parents and their perceptions of mathematics have contributed immensely to how their children perceive themselves as it relates to participating and achieving at an advance level in mathematics.

Other factors besides parental influence, teacher influence and mathematical usefulness—such as peer influence, socio-economic status and motivation—play a role in affecting secondary students' attitudes. However, since the former have gained more attention locally these three factors will be examined specifically in this study.

Statement of the Problem

This study seeks to determine the extent to which students' attitudinal factors (perceived mathematics usefulness, perceived mathematics teacher influence and perceived parental support) jointly and individually contribute to achievement in mathematics, with a view towards offering possible suggestions to improve mathematics achievement.

Research Questions

In an attempt to investigate students' mathematics achievement, this study will be guided by the following questions.

1. What is the perception of the students on mathematics usefulness, mathematics teacher and parental support?
2. Is there a significant difference in the perceptions of male and female students as it relate to mathematics usefulness, mathematics teacher and parental support?
3. What is the joint contribution of students' perception of mathematics usefulness, mathematics teacher and parental support to mathematics achievement?
4. What are the relative contributions of mathematics usefulness, mathematics teacher and parental support to mathematical achievement?

Methodology**The Research Design**

The research design employed was a descriptive survey design, which assumed the characteristics of an ex- post facto study in which the existing status of the independent variables were only determined during data collection without any manipulation of the variables by the researcher.

Sampling and Sampling Procedures

There were four secondary schools randomly selected from the twenty-two secondary schools in Barbados for the purpose of conducting this research. The sample of students used from these schools consisted of fourth and fifth year students. The ages of these students in the sample ranged from 14-17 years. Students of these forms would have been chosen because they would have passed the qualifying mathematics exam and would be now in preparation for their CXC Mathematics examination. The sample of this study consisted of 170 students of which 54 were boys and 116 girls. The sample of 170 students was so chosen that they were selected at a rate of 43 students per school.

Instrumentation

There were two instruments used to collect data for the purpose of this study. These are:

- (i) *The modified Fennema-Sherman (2008) Mathematics Attitude Scale*
- (ii) *The Mathematics Achievement Test*

The Modified Fennema-Sherman (2008) Mathematics Attitude Scale

For the purpose of assessing students' attitudes towards mathematics, a Modified Fennema-Sherman Mathematics Attitude Scale was used. This scale contained items which allowed the researcher to determine students' attitude by investigating three components of students' attitudes towards mathematics outlined in chapter one. These were:

- (i) *Mathematical usefulness*
- (ii) *Students' perception of teacher influence*
- (iii) *Students' perception of parental influence*

The mathematics attitude scale employed the likert scale format which consisted of the categories: Strongly Agree, Agree and Undecided, Disagree and Strongly Disagree. Table 3 below show how the attitudinal variables within the mathematics attitude scale were broken down according to the number of questions for each.

Table 3:
Components of attitude towards mathematics and the items which measure these components

Items	Components of attitude towards mathematics
1-11	Mathematical Usefulness
12-23	Teacher influence
24-31	Parental influence

Again, The Modified Fennema-Sherman (2008) Mathematics Attitude Scale was employed to measure students' perception of parental and teacher influence. Students were asked to respond to 12 items for the teacher attitude scale and 8 items for the parental attitude scale. The items 12-23 investigated the students' perception of their teacher's influence. These items specifically sought to find out the teachers' interest in students; teachers' confidence in students ability; and also the teacher's enjoyment in the teaching of mathematics as perceived by the students. Similarly, items 24-31 investigated parental support as perceived by the students. On the parental support scale characteristics such as parents' enjoyment of mathematics; the ability of parents to help their children with mathematics; the perceived usefulness of mathematics by the parents; and general encouragement given by the parents was investigated. The Crombach alpha reliability coefficients of ($\alpha = 0.74$) and ($\alpha = 0.71$) were obtained for the modified Fennema-Sherman (2008) Mathematics Attitude Scale and the Mathematics Achievement Test respectively.

Procedure

Permission to carry out the research for the study in the four secondary schools used in the process was first sought from the Ministry of Education. After permission was granted an official letter was sent to the principals of each of the four Secondary schools outlining the purpose of the research along with the instruments that would be used in the data collection process. Once the principals were satisfied that the research was legitimate and was solely for academic purposes, dates were set to bring the instruments to each school for the data to be collected. On the specified day for data collection, the researcher gave specific instructions for the

questionnaire to be done first and the CXC Multiple Choice papers to be done after the completion of the questionnaires.

Data Analysis

For research question 1, descriptive statistics were run so as to determine and report on the means and standard deviations from the tallied scores of the likert scale, for each variable from the questionnaire used, t- test was used for research question 2 and regression analysis for questions 3 and 4.

Results

Research Question 1

What is the perception of the students on, Mathematics usefulness, Mathematics teacher and Parental support?

Table 4 addressed students' perception of mathematics usefulness by showing the number of respondents and percentages in relation to their level of perception as identified by the likert scale. The table took in to consideration the eleven questions on the attitude scale which sought to gauge to what degree the students perceived the usefulness of mathematics in their lives, from negatively as well as positively worded statements, where the positive statements sought to attain the positive views of the students applicability of mathematics in their lives, while the negatively worded questions sought to achieve the converse. The results from the table revealed that the students over all showed a positive perception on this particular variable.

However in further analysis of table 4 when the questions were compared, similar responses were observed. For example question 1 sought to find out if knowing mathematics will help the students earn a living and as seen in the table some 90% of the students agreed. However question 7 sought to find out if Mathematic would not have been important to their life's work and some 68% of the respondents agreed, which accounted for more than half who also agreed. Reasons for such variant responses by the students could have been as a result of their career choices and their perception on life in general, where they recognized the need for mathematics was not a major requirement for employment but they still appreciated its importance.

Table 5 further substantiated these findings in Table 4 as it showed the mean scores and standard deviations for the variable mathematical usefulness according to gender. The results from this table showed that indeed the perception among females and males as it pertained to mathematical usefulness was positive, with males ($M=45.1481$, $SD = 7.71279$) and females ($M=44.1552$, $SD = 7.87799$). However it must be noted that the perceptions of males with reference to the variable was slightly more positive.

Table 4
Students' perceptions of mathematical usefulness

	Mathematics Usefulness	SA	A	U	D	SD
1	Knowing mathematics will help me earn a living	98(57.6%)	62(36.5%)	8(4.7%)	2(1.2%)	
2	I'll need mathematics for my future work	83(48.8%)	52(30.6%)	26(15.3%)	7(4.1%)	2(1.2%)
3	Math is a worthwhile, necessary subject	84(49.4%)	64(37.6%)	18(10.6%)	2(1.2%)	2(1.2%)
4	I will use mathematics in many ways as an adult	66(38.8%)	63(37.1%)	30(17.6%)	11(6.5%)	
5	I'll need a good understanding of Math for my future work.	66(38.8%)	65(38.2%)	28(16.5%)	10(5.9%)	1(.6%)
6	I study Math because I know how useful it is.	55(32.4%)	67(39.4%)	26(15.3%)	15(8.8%)	7(4.1%)
7	Math will not be important to me in my life's work	64(37.6%)	53(31.2%)	27(15.9%)	14(8.2%)	12(7.1%)
8	I don't expect to use much Math when I get out of school	59(34.7%)	49(28.8%)	33(19.4%)	23(13.5%)	6(3.5%)
9	I see mathematics as something I won't use very often when I get out of high school.	60(35.3%)	51(30%)	24(14.1%)	23(13.5%)	12(7.1%)
10	Doing well in Math is not important for my future	73(42.9%)	48(28.2%)	28(16.5%)	13(7.6%)	8(4.7%)
11	Math is not important for my life	70(41.2%)	63(37.1%)	22(12.9%)	7(4.1%)	8(4.7%)

Table 5
Students' perceptions of Mathematical Usefulness according to gender

Sex of Student	Mean	N	Std.Deviation
Female	44.1552	116	7.87799
Male	45.1481	54	7.71279
Total	44.4706	170	7.81682

Table 6
Students' perceptions of their teacher influence in mathematics

	Perception of Teacher	SA	A	U	D	SD
1	My teachers have been interested in my progress in Math	6(32.9%)	74(43.5%)	6(15.3%)	10(5.9%)	4(2.4%)
2	I would talk to my math teachers about a career that uses math.	17(10%)	52(30.6%)	53(31.2%)	38(22.4%)	10(5.9%)
3	My teachers have encouraged me to study more Math.	44(25.9%)	82(48.2%)	21(12.4%)	17(10%)	6(3.5%)
4	My teachers want me to take all the Math I can.	27(15.9%)	45(26.5%)	52(30.6%)	35(20.6%)	11(6.5%)
5	Math teachers have made me feel I have the ability to go on in mathematics	50(29.4%)	66(38.8%)	32(18.8%)	13(7.6%)	9(5.3%)
6	My teachers think I'm the kind of person who could do well in Math	56(32.9%)	74(43.5%)	28(16.5%)	5(2.9%)	7(4.1%)
7	Getting a teacher to take me seriously in Math is a problem	60(35.3%)	56(32.9%)	31(18.2%)	18(10.6%)	5(2.9%)
8	It's hard to get Math teachers to respect me	68(40%)	58(34.5%)	31(18.2%)	8(4.7%)	5(2.9%)
9	I have a hard time getting teachers to talk seriously with me about Math	62(36.6%)	62(36.6%)	31(18.2%)	13(7.6%)	2(1.2%)
10	My teachers think advanced Math will be a waste of time for me	60(35.3%)	57(33.5%)	36(21.2%)	12(7.1%)	5(2.9%)
11	I feel that Math teachers ignore me when I try to talk about something serious	63(37.1%)	66(38.8%)	24(14.1%)	12(7.1%)	5(2.9%)
12	My teachers would not take me seriously if I told them I was interested in a career in science and mathematics	72(42.4%)	55(32.4%)	27(15.9%)	12(7.1%)	4(2.4%)

Table 7
Students' perceptions of their teacher influence according to gender

Sex of Student	Mean	N	Std.Deviation
Female	46.3793	116	7.87915
Male	44.7778	54	8.36585
Total	45.8706	170	8.04689

Table 6 and 7 above displayed the results of the students' perceptions on how their teacher influenced their liking for mathematics and encouraged them to pursue it, by taking into consideration the twelve items on the attitude scale computing this variable. From the results shown in Table 6, students showed a positive perception of their teacher influencing their liking for mathematics and their decision to pursue mathematics at a higher level. However results showed that for statements that could have been considered as being negative, the students' responses were similar to the positively worded questions. This can be seen when comparing for example statements 3 and 9. Statement 3 sought to determine whether teachers encouraged students to study mathematics at a higher level and some 70% of the respondents agreed.

Likewise, statement 9 sought to determine if students had any challenges getting teachers to talk to them seriously about mathematics and 70% also agreed that they encountered challenges. Statements 2 and 12 also revealed some interesting findings, where only 40% of the students agreed that they would talk to their mathematics teacher about a career in mathematics, while about 75% of the respondents agreed that they would talk to their teacher about a career in mathematics. Hence although the general perceptions of the students were positive, there were issues of negative perceptions as it pertained to some of the items, which could have contribute to poor attitudes and simultaneously a decline in mathematics achievement.

Table 7 shows the means and standard deviations of males and females as it pertains to this same variable teacher influence. From the table results showed males having (M=44.7778, SD=8.36585) and females having (M=46.3793, SD=7.87915). From the data presented, it shows that the perceptions of females on this particular variable were slightly more positive than that of their male counterparts.

Table 8
Students' perception of Parental Involvement

	Perception of Parents	SA	A	U	D	SD
1	My father seems to enjoy doing mathematics	22(12.9%)	9(17.1%)	62(36.5%)	26(15.3%)	31(18.2%)
2	My mother seems to enjoy doing mathematics	19(11.2%)	31(18.2%)	50(29.4%)	35(20.6%)	35(20.6%)
3	My father would usually be able to help with my Mathematic homework problems if I asked him	17(10%)	42(24.7%)	36(21.2%)	39(22.9%)	36(21.2%)
4	My mother would usually be able to help with my Mathematic homework problems if I asked her	25(14.7%)	50(29.4%)	24(14.1%)	41(24.1%)	30(17.6%)
5	My parents / guardians are usually interested in helping me with my mathematics homework	28(16.5%)	61(35.9%)	30(17.6%)	34(20%)	17(10%)
6	My mother thinks that learning mathematics is important for me	84(49.4%)	56(32.9%)	23(13.5%)	2(1.2%)	5(2.9%)
7	My father thinks that learning mathematics is very important for me	73(42.9%)	46(27.1%)	39(22.9%)	4(2.4%)	8(4.7%)
8	My parents / guardians want me to do well in mathematics classes	114(67.1%)	38(22.4%)	12(7.1%)	1(.6%)	5(2.9%)

Table 9
Students' perception of parental involvement according to gender

Sex of Student	Mean	N	Std.Deviation
Female	27.3276	116	5.49114
Male	27.9815	54	5.35703
Total	27.5353	170	5.44161

Table 8 and 9 above display the results of the students' perceptions on how they viewed their parents' involvement in terms of assisting them with their homework, encouraging and lending support as it pertained to doing mathematics at a higher level, by taking in to consideration the eight items that formed the sub scale on the attitude scale computed to form this variable being analyzed. From the results shown in Table 8, students' perceptions of their parents' involvement in the subject were negative over all. Further analysis of this table showed that for statements 2 and 3 where students' perceptions were sought as it pertained to their

mothers and fathers liking for the subject, approximately 30% of them agreed they liked doing it. This figure represented a small percentage of the respondents and could have been seen as one of the reasons for the negative perceptions.

Statements 6 and 7 were also compared, as they sought to determine to what extent parents saw mathematics as being important to their children. The table showed that 81% of the respondents agreed that their mothers thought that mathematics was important to them, while 70% thought their fathers were of the belief that mathematics was important to them. These findings accounted for some 11% difference when mothers and fathers views on the subject were compared, with mothers more seeing the importance of mathematics to their children's lives. It must be noted that although both mothers and father did not like doing mathematics, they acknowledged the importance and relevance of the subject. However these particular views would not have impacted too much on the outcome since the perceptions were generally negative.

Table 9 confirmed these results as it showed the means and standard deviations of males and females to this same variable parental involvement. From the table results showed that males had ($M=27.9815$, $SD=5.35703$) and females had ($M=27.3276$, $SD=5.49114$). However further inspection of the results from Table 9 showed that the perceptions of females on this particular variable were negative while for the males a positive perception was revealed.

Research Question 2

Is there a significant difference in the perceptions of male and female students on Mathematics usefulness, Mathematics teacher and Parental support?

Table 10
Students' means and standard deviations for the Independent Samples t- test

	Sex of Student	N	Mean	Std. Deviation
Students' perceptions of mathematical usefulness	Females	116	44.1552	7.87799
	Males	54	45.1481	7.71279
Students perceptions of their teachers	Females	116	46.3793	7.87915
	Males	54	44.7778	8.36585
Students' perceptions of their Parents involvement	Females	116	27.3276	5.49114
	Males	54	27.9815	5.35703

Table 10 above shows the means and standard deviations computed for males and females students' perceptions for the attitudinal variables mathematical usefulness, parental involvement and teacher influence. An independent samples t-test was conducted to compare the scores of mathematical usefulness, teacher influence and parental involvement for males and

females. The results from this test conducted revealed that no significant difference was found amongst the variables mathematics usefulness ($t = -.770$; $df = 168$; $p = .442$), teacher influence ($t = 1.120$; $df = 168$; $p = .228$) and parental involvement ($t = -.728$; $df = 168$; $p = .467$).

Research Question 3

What is the joint contribution of students' perception of mathematics usefulness, mathematics teacher and parental support to mathematics achievement?

Table 11

Joint contribution of the independent variables mathematics usefulness, mathematics teacher and parental support to mathematics achievement

Multiple R = 0.250					
Multiple R Square = 0.062					
Adjusted R square = 0.045					
Standard Error = 6.494					
Analysis of variance (ANOVA)					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	465.570	3	155.190	3.680	.013 ^b
Residual	7001.024	166	42.175		
Total	7466.594	169			

Table 11 shows the three variables mathematics usefulness, parental involvement and teacher influence, when taken together yielded a Multiple Regression coefficient (R) of 0.250, a Multiple R Square of 0.062 and Adjusted R Square of 0.045. From the results recorded the interpretation that can be made is 6.2% of the variance in mathematics achievement can be explained by the combined influence of the three variables. The table also shows that the analysis of variance for the multiple regression data produced on the F – ration of 3.680 which is significant at the 0.05 level. This indicates that the effectiveness of the predictor variables in predicting mathematics achievement could not have occurred by chance. However it ought to be stated that even though the multiple regression coefficient (R) of 0.250 is small for the total contribution of the predictor variables the data shows that their contribution is significant since ($p < 0.05$).

Research Question 4

What are the relative contributions of mathematics usefulness, mathematics teacher, parental support to mathematical achievement?

Table 12

Relative contributions of the predictor variables of mathematics achievement of students in Barbados

Unstandardized Coefficient	Standardized				
Coefficient					
Model	β	Std.Error	Beta	T	Sig
Constant	10.999	3.933		2.796	.006
Students' perceptions of mathematical usefulness	-.152	.075	-.179	-2.014	.046
Students perceptions of their mathematics teachers	.231	.071	.279	3.240	.001
Students' perceptions of their Parents involvement in mathematics	-.007	.095	-.006	-.079	.937

In Table 12 above, the beta weights provided an indication of the relative contributions for each of the predictor variables in predicting mathematics achievement. The table showed that the variables mathematics usefulness and teacher influence are both significant at the 0.05 level but that of parental involvement is not significant. The table further showed that the variable

Discussion

Research question one sought to find out the perceptions of students to Mathematic usefulness, parental involvement and their perception of the influence of their mathematics teacher. The results of each of these three variables were discussed according to the relevant literature.

Students' Perceptions of Mathematics Usefulness

The results showed that for this variable the students' perceptions were positive which accounted for approximately 90% of the respondents. These findings were supported by Fan, et al (2005) who found that of 1215 Singapore secondary students sampled on the usefulness of mathematics, the data showed that students believed mathematics was useful (91%), the number of students who thought that it was important (89%), and learning mathematics is not wasting their time (84%). In another study conducted by Kislenko & Lepik (2005) further support of the findings was evident as results showed that (86%) of students from this study conducted, agreed that mathematics was important and (77%) of the respondents acknowledged the usefulness of mathematics in their lives. From these results it was clear that students did have very positive perceptions of mathematics as being important, useful and relevant in their everyday lives. The reason for such positive perceptions could have been attributed to the fact that students have realised that from embracing mathematics, there are many career opportunities that can be afforded to them as they sought to improve their way of living and developing themselves in to future successful individuals.

Students' perceptions of their Mathematics Teachers

Students' perception of their mathematics teacher encapsulated the extent to which the teacher was accessible, approachable, enjoyed teaching mathematics and had a good teacher student rapport. The results for this particular variable showed that the perception of the students were positive which accounted for approximately 91% of the respondents. These results therefore suggested that the majority of students agreed that their teachers had met the criteria and were influential in being able to motivate them to attain some level of success in mathematics and also pursue the subject at a higher level. These findings were supported by research conducted by Bolaji (2005) which showed that the influence of students' attitude towards mathematics were significantly based on the teachers' method of mathematics teaching and his personality, which greatly accounted for the students' positive perceptions and attitude towards mathematics. Also in a study done by Gunes & Gokcek (2011), by which they sought the perceptions of students concerning their attitudes towards mathematics as the teacher being the main factor. The results showed that students showed positive attitudes towards mathematics and had positive perceptions of their teachers who were friendly, warm, supportive, attached importance to their lesson in all aspects and also being able to attract and maintain students' attention. However in this same study, the students developed negative attitudes and also had negative perceptions of the teacher when the teacher punished students as a response to failure in problem solving, being boring, asking hard questions, making them anxious or perceived to be unfair. The study further revealed that students' attitudes and perceptions became negative when the teacher's instruction was poor and showed a poor command of the content area. These findings reaffirm the need for teachers to exhibit the characteristics needed for students to adopt good attitudes towards Mathematics and simultaneously improve mathematics achievement.

Students' Perceptions of their Parents' Involvement

The results for this variable showed that the students' perceptions of their parents' involvement were negative; which accounted for approximately 80% of the respondents. This means that the students did not think that their parents' involvement was that significant to their achievement in mathematics. In a study done by Bishop and Forgasz (2006) that sought to distinguish between direct and indirect parental influence, argue that direct parental influence, such as helping children with mathematics difficulties, had a less important impact on students' mathematics performance. These findings of Bishop and Forgasz supported the findings of this study, since the characteristics not seen as important to the students were also defined for this variable. However, as it pertained to indirect parental influence such as parental encouragement, parental expectation and parents' attitudes towards mathematics. The findings showed that the students' perceived these characteristics as having a significant impact on their attitudes towards mathematics. These particular findings however contradict the findings of this study, as these mentioned characteristics were considered not to be significant to the students' achievement in mathematics. As the data revealed some of the characteristics showed to have positive perceptions amongst students while other characteristics did not. This could be solely due to the fact that the students within this study have taken responsibility for their own studying and future and did not need the motivation and assistance from their parents.

Differences in Males' and Females' Perceptions of Mathematics Usefulness

When the data was tested using an independent samples t-test to determine whether there was a significant difference amongst girls and boys as it pertains to mathematical usefulness. The

results from table 10 revealed that there was no significant difference found between boys and girls on mathematics usefulness ($t = -.770$; $df = 168$; $p = .442$). These findings are supported by Murimo (2012) who also sought to make the same determination, as to whether if there were any gender differences as it pertains to the same variable. The results showed that no significant difference was found, however the mean scores of the boys were greater than that of the girls for mathematics usefulness the same as for this study. In another study conducted by Farooq & Shah (2008) on students' attitudes towards mathematics of which 685 students were sampled, also found that there was no significant difference amongst male ($M = 36.79$) and female ($M = 37.34$) students on mathematics usefulness ($t = 1.091$). It must be noted also that the standard deviations though large were approximately the same which might account for the results. Reasons for these findings can be attributed to the fact that no longer is mathematics seen as a male dominated discipline but is rather pursued by females as well, as they identify the value of mathematics to having a good career and improving other aspects of their lives. It can also be that traditionally mathematics that was mainly taught by males is now being taught by more females, hence contributing to females having more positive perceptions of the usefulness of Math.

Differences in Males' and Females' Perceptions of Mathematics Teachers

The results from this study showed that there was no significant difference among male and female students' perceptions of their mathematics teachers ($t = -.770$; $df = 168$; $p = .442$). These findings were also supported by research done by Farooq & Shah (2008) who found no significant difference amongst male and female students on the same variable with means of ($M = 39.59$)($M = 40.29$) respectively and ($t = 2.298$). These findings showed that male and female students share the same perceptions of their mathematics teachers and as a result mathematics achievement according to gender was not solely determined by the perceptions of their mathematics teacher.

Differences in Males' and Females' Perceptions of Parental Support

From the test conducted on the data the results revealed that there was no significant difference between male and female students' perception of their parents' involvement as it pertains to mathematics achievement ($t = -.728$; $df = 168$; $p = .467$). These findings are supported by those of Kleanthous & William (2010) who explore the perceived parental influence on students' achievement in mathematics among 563 students in Cyprus. The findings revealed that the perceived parental influence was not statistically significant to students' mathematics achievement. However the findings of these studies contradicted those of Olatoye & Agbatogun (2009) who in their study found that parental involvement significantly influenced the mathematics achievement of students. It can be assumed that the reason why there was no significant difference found among the male and female students, can be due to the fact that they all come from similar households where the parents were not actively involved in their children's academic pursuits. Hence the children take on the responsibility of their own achievement without any main intervention from the parents. This interpretation is supported by the low means of both male ($M = 27.9815$, $SD = 5.35703$) and female ($M = 27.3276$, $SD = 5.49114$) students on this variable. This analysis further substantiates the beliefs of Olatoye & Agbatogun (2009), that if parents play more of an integral role in their children's academics mainly in mathematics and Science, the high fail rate in mathematics would be eradicated as a result of the students being stimulated through motivation and encouragement.

The Relative and Joint Contributions of Mathematics Usefulness, Mathematics Teacher, Parental Involvement to Mathematics Achievement

The results showed that the contribution of the variables mathematics usefulness, Influence of the mathematics teacher and parental involvement had a Multiple R Square of 0.062 which equated to 6.2% of the variance in mathematics achievement, with a Multiple Regression coefficient (R) of 0.250 which was significant at ($p < 0.05$). As was seen the multiple regression coefficient though significant was small. One possible reason for such a small coefficient can be attributed to the fact that there are other variables that also contribute to mathematics achievement along with what has been under consideration for this study.

The results further showed that how students perceived their teacher was determined to be the best predictor for this study as it pertained to mathematics achievement. This particular finding contradicted that of Pederson, Elmore, and Bleyer (1986) who found that parent's attitudes were more significant predictors of student achievement in mathematics than other factors. According to Yee and Eccles (1988), student effort was more important than apparently innate ability in students' success in mathematics and parents played a significant role in the effort of their children. In studies done by Larwin & Jordan (2010) found that literacy amongst all other variables was the best predictor to mathematics achievement, which also contradicted the findings of this study. Base on the fact that teacher influence was identified as the best predictor, showed that the students do think that it was important for their teacher to be able to communicate with them, have a good understanding of the subject matter and encourage them to like mathematics and pursue it at a higher level are significant to their achievement in mathematics. This result further underscores Rowe (2003) as he asserts that the places where students are expected to be taught are schools, which are the most functional parts of the educational system. Therefore the need for effective schools and effective teachers are more important than any kind of school resources.

Conclusion

The findings of this study showed that students had positive perceptions of their teachers and the usefulness of mathematics, however perceptions of their parental involvement was negative. Therefore it's recommended that:

- Teachers ought to continue to encourage and show interest in the progress of their students and provide the necessary intervention students might require to enhance their problem solving skills; which would directly improve students' performance in mathematics.
- Students are regularly informed as to the importance and relevance of mathematics to their everyday lives.
- Parents become more involve as it pertains to their children education in mathematics and be more aware of the challenges they encounter in the subject.

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Principal Leadership Style and Teacher Satisfaction among a Sample of Secondary School Teachers in Barbados

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This study was designed to investigate the relationship between principal leadership style as measured by the independent variables of planning, decision making, communicating, organizing and coordinating, delegating, evaluating, and social and professional support, and the dependent variable of teacher satisfaction. The study focused on four research questions as follows: (1) what are teachers' perceptions of principals' leadership style? (2) Is there a relationship between principals' leadership style and teacher satisfaction? (3) Is there a difference in male and female teachers' perceptions of principal leadership style? (4) Is there a difference in the male and female teachers' level of satisfaction? The study employed purposive sampling to survey a cohort of 101 educators as follows: ninety (90) teachers and eleven (11) principals drawn from eleven secondary schools. The study found significant correlations between the dependent variable of teacher satisfaction and principal leadership style as measured by planning $r = .332$ $p < 0.01$, decision making $r = .326$ $p < 0.01$, communicating $r = .325$ $p < 0.01$, organising $r = .360$ $p < 0.01$, professional support $r = .263$ $p < 0.01$, and evaluating $r = .398$ $p < 0.01$. The study also found a significant difference in one of the sub-scales of principal leadership. In the area of delegation was there a significant difference in the way in which male and female teachers perceived principal leadership style. Female teachers ($M = 42.6$, $SD = 6.0$) reported significantly higher means than male teachers ($M = 39.5$, $SD = 5.5$), $t(88) = -2.449$, $p < .05$. However, male teachers ($M = 3.10$, $SD = 1.1$) and female teachers ($M = 3.00$, $SD = .71$) did not differ significantly on levels of satisfaction, $t(88) = .533$, $p = n.s$. The present research findings suggest that every effort must be made by principals to adapt their leadership styles to promote school environments that would engender greater levels of teacher satisfaction. More specifically, principals would need to engage in leadership practices that promote higher levels of teacher empowerment, and teacher professional development.

Keywords: principal leadership style, teacher satisfaction, Barbados, teacher perceptions.

Introduction

Even to the casual observer it is clear that the contemporary environment of the school principal is more complex. Leaders are expected to lead schools through the challenges posed by an increasingly complex environment, curriculum standards, achievement benchmarks, programmatic requirements, and other policy directives from many sources that generate complicated and unpredictable requirements for schools. At the same time principals are also expected to function in the capacity of human resource manager and ensure that his/her members of staff are sufficiently motivated and satisfied to assist in the realisation of school wide goals. The literature has suggested that much rest on the shoulders of the principal, in fact according to

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the literature on high performing schools, principal leadership is key to effective schools. The question therefore is how is the principal able to navigate in an environment where it seems as if he/she is serving several masters and where perceptions of the principal's leadership could be misconstrued by teachers, parents, students, superiors and civil society. Principals have the unenviable task of keeping all stakeholders satisfied in an era of heightened accountability, which one can argue is akin to 'running the gauntlet'. In this paper, the researcher will restrict the discussion to one stakeholder, the teachers, and examine teachers' perceptions of principal leadership and the relationship between their perceptions and their level of satisfaction.

Objectives

The purpose of this study, which employed a survey research design, was to examine the nature of the relationship between principal leadership and teacher satisfaction. The research questions were: (1) What are teachers' perceptions of principals' leadership style? (2) Is there a relationship between principals' leadership style and teacher satisfaction? (3) Is there a difference in male and female teachers' perceptions of principals' leadership style? (4) Is there a difference in the male and female teachers' level of satisfaction?

Theoretical Framework

The theoretical framework employed in this study was symbolic interactionism. This approach to social inquiry is based on three major premises:

- (1) *individuals act toward things and people on the basis of the meanings that things have for them;*
- (2) *the meaning of such things are derived from, or arise out of, the social interaction that individuals have with one another; and*
- (3) *these meanings are handled in, and modified through, an interpretive process used by individuals to deal with the things and other people they encounter (Blumer, 1969; Mead, 1934).*

Put another way symbolic interactionism examines perceptions and meanings that people construct in their social settings. In concert with the perspective of (Blumer, 1969; Mead, 1934), this study was designed to investigate the meanings teachers and principals constructed from their interaction with each other in the context of the teaching, learning and administrative environment. The purpose was to get an idea of the level of congruence or disparity that existed between teachers' perceptions of the principals' leadership style and the principals' own perceptions of their leadership style and the impact these perceptions had on the teachers' level of satisfaction.

Relevant Literature

Principal Leadership

A look at the literature indicates that initially, researchers focussed primarily on developing operational definitions of leadership. Cawelti (1982) defined leadership as a product of an environment made up of people and suggested that leaders must be expected to lead, offer a sense of direction, motivate others towards the accomplishment of goals and be concerned with helping others.

Hersey, Blanchard, and Johnson (1996) defined leadership as a process of influencing the

activities of a group or individual in efforts toward goal achievement. Newstrom and Davis (2002) see leadership as the process of influencing and supporting others to work enthusiastically toward achieving objectives. It is the critical factor that helps an individual or a group identify its goals and then motivates and assists in achieving the stated goals.

Over time the researchers shifted their focus to treat the concept of effective schools, effective teachers and by extension effective principals. According to this view, principals in effective schools are assertive leaders, who are willing to act independently in the interest of the school, are committed to school improvements, emphasize instructional leadership and communicate their wishes to their staff and stress academic standards (Shoemaker and Fraser, 1981).

Other researchers have considered the impact of the principal's leadership style on the school as a whole. In this vein are Maehr and Braskamp (1986) who opine that school principals can manipulate the culture, climate and effectiveness of an organisation, and these manipulations affect the job satisfaction of people within the organisation. They maintain that by exercising certain leadership behaviours principals can influence their school's instructional environment, a complex constellation, involving the attitudes and behaviours of teachers, students, parents and the community at large toward education.

Griffith (2000) takes the concept of the overarching principal's influence and suggests that it can be encapsulated in six metaphors, Master Teacher, Administrative Agent, Gamesman/Politician, School Manager, Maintenance Manager and Missionary. As Master Teacher, Instructional Leader and Principal Teacher, he/she makes frequent visits to classrooms and provides detailed suggestions for improving the quality. Secondly, as Administrative Agent, he/she sets clear and high achievement goals, maintains an orderly school environment, encourages the teaching of the 'basics', monitors student achievement progress, and is actively immersed in day-to-day school activities.

The principal also emphasizes curriculum and student achievement, provides a positive instructional environment, evaluates student performance, develops instructional improvement plans, supports teachers, and facilitates communication.

In addition he/she maintains a strong task orientation where the focus is on the development of curriculum and instruction rather than on management or human relations activities. Thirdly, he/she is Gamesman/Politician, negotiating and satisfying the many and divergent needs and demands internal and external to the school, is concerned with discerning the needs of the external environment (parent and community), providing a bridge between the external environment and the school, and facilitating coordination among classroom teachers. Fourthly, as School Manager, he/she creates conditions to achieve consensus on instructional programmes, goals, and academic standards; maintains student discipline; allocates school resources effectively; buffers classrooms from outside interferences; knows community power structures; and maintains appropriate relations with parents.

Fifthly, as Maintenance Manager, he/she is concerned with well-designed and operating school support functions, such as programme planning and budgeting, business operations, and differentiating job tasks and positions. He/she is also concerned primarily with resource allocation and student discipline. Sixthly, as Missionary, he/she is concerned with meeting the social needs of students, school staff, and parents through positive school climate; manages interpersonal relations, providing a supportive environment, one in which teachers may make mistakes, not feel at risk, develop open professional, collegial relations, and trust the principal and other teachers.

Research by Harris, Day and Hadfield (2003) while supporting the basic principles of effective schooling, and by implication effective principals, point to some other variables which must be considered in any analysis of principal leadership. Their research showed that the principals who were effective achieved that success because they held and communicated clearly, visions and values which were shared by all the stakeholders in the school, they empowered staff by developing climates of collaboration, by applying high standards to themselves and others, by seeking the support of various influential groups within the school community and by keeping 'ahead of the game' through ensuring that they had a national view of what is and what is to come.

From the foregoing, it is clear that the role of principal is not an easy one; in fact, Newstrom and Davis (2002) make the point that the principal in today's school is expected to be a type of super person to meet all the demands on his expertise and time.

Principal Leadership and Teacher Satisfaction

Henderson and Henderson (1996) in a survey of Texas public school teachers in 1996 found that 44 percent of respondents were seriously considering leaving the profession. According to a 2004 report from the National Centre for Educational Statistics, 7.4 % of teachers left the profession between 1999 and 2001. An increase as compared to previous Teacher Follow-Up Surveys; while approximately 9% and 23 % of public and private school teachers left the profession between 1999 and 2002, (Latham and Vogt 2007).

This state of affairs in schools brings into focus the role of the principal and teachers' perception of his/her leadership style. An examination of the Caribbean situation reveals a comparable picture to what obtains in the American and British educational jurisdictions. Wilson (1980) studied the effects of administrative resource factors on teacher satisfaction and found that principals' communication patterns, school climate, school size, workload and availability of resources influenced the teachers' job satisfaction among a sample of Jamaican teachers.

Brown (1983) in Jamaica also looked at job satisfaction and principal leadership style among a sample of college teachers and found that leadership style was a factor influencing teacher satisfaction. Likewise Dunn (1986) and Jones (1988) in Jamaica investigated leadership style and its relationship to various school variables. Dunn (1986) found that the teachers' perception of leadership style and group cohesion influenced job satisfaction while, Jones (1988) discovered among other things, that delegation, which is in the domain of principal leadership was significantly related to job satisfaction.

Supersaud (1993) looking at the Trinidadian experience found that there was a correlation between the level of participative decision making exercised by the principal and the level of commitment and morale among teachers. Simmonds (1994) in Jamaica revealed that there was a positive and significant relationship between teachers' perceived leadership behaviour of principals and teacher performance, while James (1998) in St Vincent identified a relationship among selected teacher factors and levels of job satisfaction.

Bogler (2001) also reported some findings that point to principal leadership style. The most salient findings are as follows: teachers' occupational perceptions strongly affect teachers' satisfaction. However, teachers' occupational perceptions are influenced by principals' transformational leadership and by participative decision making style. Principals' transformational leadership affects teachers' satisfaction both directly and indirectly through teachers' occupational perceptions. Principals' transactional leadership affects teachers negatively and teachers' satisfaction increases as they perceive their principals' leadership style as more

transformational and less transactional.

Based on the foregoing it follows that the way in which teachers perceive principal leadership style is worthy of closer examination. But what exactly is perception? Perception as a psychological construct is defined as the selection, organisation and interpretation of sensory input. It involves organising and translating sensory input into something meaningful (Weitan, 2007).

When applied to the relationship between the principals and the teachers, the sensory input could be regarded as all those symbols, clues and messages, verbal and non-verbal, that teachers receive from principals in the exercise of their leadership function. Earlier work by Pashiardis (1998) suggested that the effectiveness of leaders is mainly dependent on how others view them as leaders, and how the principals themselves perceived their leadership style. Principals may have some ideas about themselves and the way they lead their schools, consequently they act and perform their duties based on these ideas and also based on their perceptions of themselves as leaders, however if their staffs perceive them in different ways, then it is almost certain that the leaders will have problems in performing their duties. If the views of the principals match the views of the staffs, things work out fine. Pashiardis (1998) therefore, concludes that it is important to find out whether the teachers' views are in congruence with those of the principals regarding principal leadership and management of the daily affairs of the schools, since all involved behave according to their own perceptions and not according to the way things really are, therefore perception is reality.

To a large extent, it would be reasonable to argue that there are many parallels between the American and Barbadian education jurisdictions. Preliminary discussions with members of the teaching fraternity seem to suggest that there is a high degree of frustration, dissatisfaction and, in some cases, cynicism within the teaching profession. According to these members of the teaching fraternity, there are many factors which have led to this state of affairs. These include: the ever increasing workload of teachers, inconsistent support from the Ministry of Education, and the emergence of a litigation conscious parent and student body.

An indication of the desire to get out of teaching in Barbadian schools can be seen in the large number of teachers who were prepared to resign to take up teaching stints in New York City schools. According to the Chief Education Officer, reported in Barbados Advocate dated Thursday May 03, 2001, the Ministry of Education in Barbados had only agreed to grant 20 teachers leave to teach in the New York schools, however more than 300 persons had applied. Significantly, statistical evidence sourced from The Barbados Ministry of Education, indicated that during the period 2001 and 2002, 45 teachers resigned from the teaching service. Whilst over the period 2001 - 2003 at least 131 persons opted for early retirement. There is a paucity of research in Barbados that speaks to whether principal leadership correlates with teacher satisfaction, or indeed what are the factors that are forcing teachers in Barbados to be desirous of exiting the service; therefore, this research paper is quite timely.

Method

Participants

In Barbados there are 23 secondary schools. To determine the schools from which the teachers and principals would be drawn, the researcher applied a purposive method of sampling to ensure a high degree of representativeness. As a result schools were chosen from the rural, urban and suburban areas as well as schools with low, medium and high levels of student academic ability (as determined by the Barbados Secondary Common Entrance Exam). After the schools were

selected a random sample methodology was used to select a representative sample of junior and senior teachers from each school. This process yielded a sample of one hundred (100) teachers and eleven (11) principals; however, only 90 of the teacher questionnaires were usable.

Of the 101 respondents in the study 60.4 percent were female and 39.6 were male. In terms of age 32.7 percent of the respondents were in the 40 - 49 age group, while 25.7 percent of respondents came from the 50 - 59 age group. In addition 82.2 percent of the respondents were appointed and 41.6 percent of the respondents were teaching for at least ten years.

In terms of qualifications and school location, 70.3 percent of the respondents were trained graduates, while 63.4 percent and 50.5 percent represented those respondents who were drawn from newer secondary schools and the rural areas respectively.

Instrumentation

The variables for leadership, and job satisfaction were measured using questionnaire items produced by Jones (1988) in a study entitled "Principal Leadership Style its Expression on Teacher Satisfaction". Cronbach's alpha index of internal consistency reliability were computed and indicated that the questionnaire items did effectively measure what they were supposed to measure. The average item score on the Cronbach's alpha was 0.94. The questionnaire was distributed to a sample of twenty teachers and two principals in the target population of the study. These persons were asked to comment on the clarity and appropriateness of the items, and to highlight any evidence of ambiguity. At the end of the exercise, some minor changes were made. The revised questionnaire was found to be highly reliable, receiving a Cronbach's alpha score of .91.

Procedure

The questionnaires were administered to a group consisting of eleven (11) principals and one hundred (100) teachers from public secondary schools in Barbados. All of the principals' questionnaires were completed; however, ten of the teacher questionnaires were not completed, and were therefore not usable. Thus the response rate for the questionnaires was 100 % and 90 % for principals and teachers respectively.

Data Analysis

Research question 1 was analysed using descriptive statistics, namely Means and Standard Deviations, research question 2 was analysed using Pearson's Product Moment Correlation, and research questions 3 and 4 were analysed using the Independent t test.

Results and discussion

Research Question 1: What are the teachers' perceptions of principals' leadership style?

Descriptive statistics were employed to determine the teachers' perceptions of principals' leadership style. As it relates to teacher perceptions the findings presented in Table 1-1, suggest that there is a low spread of scores around the mean as it relates to the variables, professional support, evaluating, and delegating. There was a moderate spread of scores around the mean as it relates to planning, communicating, and organising. While on the variable decision making, there was a greater spread of scores around the mean. Furthermore, a comparison of the means and the maximum scores on the variables indicate that the scores are relatively close which suggests that the teachers in the study scored the principals quite highly on the leadership variables.

The findings indicated that in general teachers' perceptions of principal leadership style were similar.

Table 1-1 Simple descriptive statistics: teacher perceptions of principal leadership style

<i>Variables</i>	<i>Mean</i>	<i>SD</i>
Planning	74.8	14.0
Decision Making	101	20.8
Communicating	74.2	13.6
Organizing	76.9	14.1
Professional Support	56.2	6.8
Evaluating	49.0	9.2
Delegating	41.4	6.0

These findings were consistent with the findings of Jones (1988) who also reported that teachers considered the principals to be performing above the average in all cases except delegation. The principals were assessed as performing below the mid-point on that variable. In contrast, in this study the principals were assessed as performing above the mid-point on the variable delegating. This begs the question as to whether the secondary school principals in this study were more in favour of leadership density than their counterparts in Jamaica, as evidenced by their higher scores on delegation. The apparent disparity in scores on delegation can be regarded as a function of the increasing workload of the modern day principal. It can be argued that the study by Jones was completed in 1988, an era when arguably, there were less demands on the time of the principals, while today, as was reported in the literature, Leithwood and Riehl (2003), the principal must be a virtual super leader. Hence, in the interest of effective leadership, the principal is well served by promoting greater levels of leadership density and delegation.

Evidence to support the above assertions comes from John and Taylor (1999) whose study also reported that teachers were consistent in their perceptions of principal leadership and regarded the principals' leadership as characterised by high consideration and high initiating structure. Significantly, a leader who is high in initiating structure emphasizes schedules and specific work assignments, establishes channels of communication and sees to it that the followers are working up to capacity, while the leader high in consideration listens to staff and is approachable, (Lunenberg and Orstein 1991).

Put differently, the type of leader outlined would be keen on the promotion of leadership density and delegation. The findings were also in accord with those of Persico (2001) who found that teachers were quite consistent in their positive perceptions of the level of leadership provided by their principals.

Research Question 2: Is there a significant relationship between principal leadership style and teacher satisfaction?

Teacher satisfaction showed significant correlations with planning $r = .332$ $p < 0.01$, decision making $r = .326$ $p < 0.01$, communicating $r = .325$ $p < 0.01$, organising $r = .360$ $p < 0.01$, professional support $r = .263$ $p < 0.01$, and evaluating $r = .398$ $p < 0.01$.

The results which showed that there were statistically significant correlations between the independent and dependent variables are consistent with those observed by Jones (1988). The results of the study revealed that for teachers there were significant interrelationships among the variables which measured leadership style. Delegation was found to be significantly related to job satisfaction while decision making, social and professional support and evaluation were significant correlates of morale.

Table 1-2 Summary of intercorrelations of principal leadership and teacher satisfaction

Measure	1	2	3	4	5	6	7	8
1. Planning	1							
2. D.Making	.869**							
3. Communicating	.834**	.910**						
4. Organizing	.859**	.877**	.893**					
5. P. Support	.389**	.484**	.444**	.526**				
6. Evaluating	.616**	.643**	.617**	.669**	.419**			
7. Delegating	.428**	.405**	.426**	.462**	.205**	.608**		
8. Satisfaction	.323**	.326**	.325**	.360**	.263**	.398**	.177	1

Note. Intercorrelations for teacher participants (n=90). ** Correlation is significant at the 0.01 level (2-tailed).

Again, these findings accord with those of Jones (1988) who found that teachers' perception of principals skills in planning, delegating, organising and coordinating, communicating, and social and professional support were significantly related to their job satisfaction.

Speaking to the link between satisfaction and communication, Kottkamp, Mulhern and Hoy (1987) pointed out that in an open climate, where principals are perceived as democratic managers, who maintain channels of communication with the staff, teachers would be more satisfied with their jobs as compared to schools where principals exhibit harsh and authoritative attitudes.

The nexus between decision making and job satisfaction was addressed by Imper, Neidt and Reyes (1990), who provided evidence to suggest that the greater the involvement of teachers in decision making processes, the higher the level of job satisfaction. Perie and Baker (1997) found that administrative support and leadership among other things were conditions associated with teacher satisfaction. The more favourable the working conditions were, the higher the job satisfaction scores.

Research Question 3: Is there a significant difference in male and female teachers' perception of principal leadership style?

The Student 't' test was used to determine if there was a significant difference in the scores of male and female teachers, on the principal leadership variables. The results indicated that there was a significant difference in one of the sub-scales of principal leadership style. In the area of delegation was there a significant difference in the way in which male and female teachers perceived principal leadership style. Female teachers ($M = 42.6$, $SD = 6.0$) reported significantly higher means than male teachers ($M = 39.5$, $SD = 5.5$), $t(88) = -2.449$, $< .05$, see Table 1-3 below.

Table 1-3 T Test for male and female teachers' perception of principal leadership

	Sex		t	df
	Males	Females		
Delegating	39.52 (5.5)	42.64 (6.0)	-2.449*	88

Note. $P < 0.05$. Standard Deviations appear in parenthesis below means. Males $N = 34$, Females $N = 56$

The statistically significant difference on the variable of delegation may be due to a multiplicity of reasons. On the one hand, one can argue that men tend to like to function on their own, and therefore dislike micro management. In an Irish study of teachers Johnston (1986) found differences according to gender interplay of teachers and leaders. Male teachers preferred female leaders to be facilitative and directing, while female teachers, preferred female leaders to be coordinators and controllers. Male teachers preferred male leaders to be directors and coordinators, while female teachers preferred them as facilitative and authoritative.

On the other hand, it may also be argued that women function better or prefer micro management. Thirdly, one can also advance the cultural context argument. Barbados, like most other Caribbean countries was shaped by a culture that tended to promote male domination. For example, males traditionally have been the persons who have been in leadership roles, hence it is quite plausible to argue that men, having been socialised to be in charge, may have a greater need for laissez-faire approaches from principals as this would allow them greater freedom to use their initiative. Since it was the male teachers rather than the female teachers who scored the principals lower on the issue of delegation, there are implications for principals in the area of delegation.

The fact that male teachers scored lower than their female counterparts, on the variable, delegation, is also worthy of further discussion, as it relates to distributive leadership. According to Gold, Evans, Earley, Haplin and Collarbone (2003) there is a relationship between the level of satisfaction recorded by teachers and delegation as practised by the principal. In one large secondary school which formed part of a case study of ten effective school leaders, one staff member was reported as extolling the virtues of the principal, mainly because of the fact that delegation was practised. Gold et al (2003) concluded that one way of encouraging teachers to stay in teaching was by giving them the opportunity to take on leadership roles.

Research Question 4: Is there a significant difference in the male and female teachers' level of satisfaction?

The Student t was used to determine if there was a significant difference in the level of male and female teacher satisfaction. Male teachers ($M = 3.10$, $SD = 1.1$) and female teachers ($M = 3.00$, $SD = .71$) did not differ significantly on levels of satisfaction, $t(88) = .533$, $p = n.s.$, see Table 1-4 below.

Table 1-4 T Test for male and female teachers' satisfaction

	Sex		t	df
	Males	Females		
Satisfaction	3.10 (1.1)	3.00 (.71)	.553	88

Note. Standard Deviations appear in parenthesis below means. Males $N = 34$, Females $N = 56$

This finding was in concert with that of Eldred (2010) who conducted a similar study and found that there was not a significant difference in the male and female teachers' level of job satisfaction. This finding was also significant in terms of the low mean scores for satisfaction. The low mean scores therefore indicate that satisfaction levels were extremely low.

When one considers this finding on its own, it is not surprising and would suggest that male and female teachers are impacted in similar ways by the school environment and therefore experience similar levels of satisfaction. However, when one considers the finding in light of the finding on teachers' perceptions of principal leadership, it appears quite enigmatic. In research question 1, the teachers according to the mean scores rated the principals quite highly, yet when the teachers were asked to indirectly evaluate the principal through the satisfaction variable the mean scores were quite low. The teacher satisfaction variable was measured using a five point Likert scale, with twelve items that asked them how satisfied they were with things such as the measures used to deal with misconduct, the expectations of the principal, advice given by the principal, involvement in decision making, and opportunities for training and professional development. The maximum possible score for respondents was therefore sixty (60), while the minimum was five (5). This therefore suggests that there are other variables which are impacting on teachers' perception of principal leadership style, and teacher satisfaction.

Conclusion and recommendations

The findings in this study confirmed the positive correlation between principal leadership style and teacher satisfaction. The question that needs to be answered is what can be done to engender greater levels of satisfaction among teachers? A good starting point would be the facilitation of teachers in the areas of professional development, leadership density, and involvement in decision making. At the same time, the findings also suggest that there are other intervening variables which are impacting on the level of teacher satisfaction. These findings point to the need for a further study that would examine the construct of teacher satisfaction and seek to explore some of the possible intervening variables. Indeed, one may even have to consider the extent to which out- of- school factors impact on the level of teacher satisfaction and teachers perceptions of leadership style.

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Improving Student Appreciation for Universal Design Using a Simulation-based Comparative Approach

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An introductory Human-Computer Interaction course exposes students to the guidelines, processes and models used in the creation of usable interactive software systems. These concepts revolve around the principle of user centeredness, where the user is the focal point of the software design. However, one area that tends to be overlooked is that of universal design; the process of designing user interfaces for as many users as possible. This article presents the results of an action research study in the use of a preliminary assignment to introduce 37 computer science students, which represented the entire course, to the importance of universal design. Students were provided with the opportunity to construct knowledge via a comparison exercise using software development tools developed specifically for teaching universal design. The results were analyzed using the SPSS statistical analysis tool. The major findings were that students' appreciation of universal design increased, however, greater time to complete the assignment may have led to better overall results.

Keywords: Computer Science Education, Universal Design, Human-Computer Interaction



Introduction

The ACM Special Interest Group on Computer-Human Interaction (SIGCHI) defines Human-Computer Interaction (HCI) as “a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.” (ACM SIGCHI Curricula for Human Computer Interaction).

With this in mind, an introductory HCI course offered under the discipline of Computer Science will typically focus on the fundamental design issues of user interface creation for computer software. Students are introduced to a variety of development processes, guidelines and best practices. One example is the Interaction Framework, which provides a framework for modeling the interaction between the user and the computer system (Dix, Finlay, Abowd & Beale, 2004). Students are also introduced to several rules-of-thumb that are a collation of several years of research such as the Eight Golden Rules of User Interface Design by Shneiderman & Plaisant (2005), which provide useful broad guidelines on the creation of usable user interfaces. In addition, case-studies are used to demonstrate the various HCI techniques that were employed when solving specific problems. These case studies provide reference points for

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students when tackling real-world problems (McCrickard, Chewar & Somervell, 2004; Smith, Vega & McCrickard, 2008; Carroll & Rosson 2005).

One topic that is usually briefly introduced is that of universal design or the art of designing user interfaces for as many different user types as possible. In order for students to gain experience with universal design, it is necessary to create opportunities that allow them to fully explore the concept. One approach is at the assignment level where universal design is the focus. However, one of the major hurdles is access to software tools that enable students to experiment with the design issues that can occur when creating software for non-typical users. Assignments focusing on this area would typically require the student to build the required user interface components. This can have the disadvantage of reducing what the students can achieve in the limited time period.

This paper explores the use of an assignment to explore the topic of universal design. Students were required to create user interfaces for two different user types, for the same problem. They were given the assignment, near the beginning of the semester, with the hope that such early exposure would produce a greater appreciation of the need for such design techniques. Given this proposal, the research questions were:

- *Can an intervention focused on universal design increase students' appreciation for the area?*
- *Would inclusion of an extra assignment depreciate students' appreciation for the topic of universal design?*
- *What effect would the inclusion of this assignment have on students' performance in the final major project?*

Literature Review

Universal design states that the product under consideration should be designed to be used by as many people as possible in as many situations as possible (Dix et al., 2004). In other words, during the creation of any product, the design should avoid any specific attribute that deliberately discriminates against a specific type of user.

The Seven Principles Universal Design

The seven general principles of universal design were developed at North Carolina State University in the 1990s (Story, Mueller & Mace, 2014; Dix et al., 2004). While these principles deal with design in general, they can be applied to interactive user interfaces. The seven principles are summarized below.

1. **Equitable use:** The item in question should be useful to as many people as possible without stigmatizing.
2. **Flexibility in use:** In order for a product to be available to a wide range of users, it must cater to the expected wide range of abilities and preferences.
3. **Simple and intuitive to use:** To be universal in nature, the product must be intuitive and simple to use. With respect to intuition, the user should be able to use their existing knowledge to deduce how to use the system. In the case of simplicity, achieving a specific goal should require as few steps as possible.
4. **Perceptible information:** Information must be able to be displayed in multiple ways to cater for different user preferences, needs and abilities.

5. **Tolerance for error:** The system must be able to minimize the damage caused by user error and would include the ability to undo changes.
6. **Low physical effort:** For users in general, ergonomic issues can have a dramatic effect on performance. Systems that require awkward or difficult physical maneuvers will in time cause discomfort and fatigue.
7. **Size and space for approach and use:** The location and size of the system also plays an important role. This not only applies for physical exertion but also the effort required for manipulating objects on a computer screen.

Use of Universal Design

The concept of universal design is a generic term used to describe the creation of processes and items for as wide an audience as possible by utilizing as much flexibility as possible. The area commonly associated with universal design is accessibility for the disabled and the elderly. This can be found in a variety of areas such as the design of buildings, the creation of educational objects and the development of software. Siu (2011) discusses how universal design can solve the accessibility issues of public toilets which focus on those with motor disabilities but ignore the visually impaired. Rivera-Nivar and Pomales-Garcia (2010) discuss the issues involved with developing online training modules for users of differing ages using universal design guidelines. Sayagoa and Blat (2010) show how age affects the perception and use of e-mail by older people while Becker (2004) discusses the age factor in terms of the use of the Web. Inkpen (2001) shows that the point-and-click method is easier than drag-and-drop when considering children as the user group.

In the area of education there is a growing body of work focused on creating educational assets that are universally accessible. Sapp (2009) describes an early system focused on the development of an e-learning system for students with both learning and physical disabilities. Basham and Marino (2013) discuss the use of universal design for learning techniques to make STEM (Science, Technology, Engineering and Mathematics) education accessible to students from either end of the spectrum, exceptionally gifted children to those with learning difficulties.

Lombardi and Murray (2011) discuss the creation of a survey instrument to determine the attitude of faculty towards adopting universal design principles in the creation of their educational content. For universal design for learning to be successful, faculty must be willing to adopt the principles.

Udo and Fels (2010) discuss the need for universal design in the creation of close captioning and audio descriptions. Close captioning is used to provide text representation of spoken dialogue for the hearing impaired, while audio descriptions is a second audio stream used to provide descriptions of important visual elements in the film or television show to the visually impaired. Bjork (2009) discusses the consequences of not utilizing universal design in normal product design, such as suffering a loss of competitiveness and a reduction of market share.

Given the rapid spread of powerful mobile devices, decreasing hardware costs and the increasing economic strength of physically disabled and elderly users, the area of universal design must take on a greater role within commercial software development. For example, sound, containing rich information, plays an important role in the design of web browsers for blind users (Takagi, Saito, Fukuda & Asakawa, 2007; Yesilada, Stevens, Harper, & Goble, 2007; Hochheiser & Lazar, 2010). There have also been some attempts to develop frameworks to guide the developer (Obrecovic et al., 2007).

HCI Assignments

Given the previously discussed issues, it is critical that the topic of universal design be included in the Computer Science curriculum. One method for reinforcing the universal design principles is direct experience with the issues at hand. By placing students in situations where the specific HCI issues are experienced, they are given the opportunity to construct knowledge around those experiences. Given the user centered nature of HCI, it has been argued that one of the best forms of experience is the solving of a real-world problem. As Coppit (2006) shows, not only are students exposed to the area of teamwork but it gives students the opportunity to put into practice what was learnt within the course. This approach introduces some of the complexities associated with the real-world application of theory (Whiddett, Jackson & Handy, 2000).

One of the more pressing issues is how to introduce universal design into an already crowded Computer Science curriculum. As discussed by Liffick (2005), Poor et al. (2012) and Waller, Hanson and Sloan (2009), one approach is to create entire courses or programmes that include or focus exclusively in this area. A more realistic approach is to incorporate the topic into a Human-Computer Interaction course. While this approach cannot go into the required depth, it still ensures that students are introduced to this area. Poor et al. (2012) demonstrate that greater incorporation of accessibility engineering or universal design into an HCI course can increase a student's awareness of the importance of usability.

□

Human-Computer Interaction Course

The Human-Computer Interaction (HCI) course is a level III course which began in the academic year 2008-2009 and is offered annually. The primary focus of this course is to teach students how to produce user interfaces that meet the needs and expectations of the users. One important topic of the design section of the course is universal design.

Initially, coursework consisted of a series of small tasks and a final major project. The tasks were generally made up of computer lab-based exercises exploring some of the issues discussed in class. The major project formed 20% of the overall mark. Groups of students were required to develop a major software application to solve a problem using fundamental HCI techniques taught throughout the course.

Universal Design Assignment

Before the academic year 2011-2012, all groups completed the major project but at the same time made errors in the overall design and function of the user interfaces. The errors were a result of assumptions based on societal generalizations and personal experiences. In many cases, students attempted to create user interfaces for users with physical impairments by creating user interfaces for regular users and then extending them, with minor changes to other groups. In other words, students either did not understand the concepts of universal design or did not see the need to apply it.

Consequently, it was decided to add an additional assignment to focus on universal design. It was hoped that this new approach would increase the student's awareness of the concepts of universal design. This assignment focused on the development of software for the blind and was used for two consecutive academic years, 2011-2012 and 2012-2013. It was felt that the assignment would provide students with the opportunity to explore some of the issues involved with creating user interfaces for users with varying physical disabilities.

Given the short time span of the assignment, approximately 3 weeks, the necessary software tools, code libraries and application programming interfaces (API) were supplied. The

tool provided to the students for the development of software for the blind, called the AUI (Audio User Interfaces) system, was developed internally. The AUI system is built using the internally built ADG software development kit, as shown in figure 1. It provides access to the features needed for developing audio based software such as text handling, audio handling and speech synthesis. It was developed using the Microsoft .NET framework (Microsoft .NET Framework and .NET SDKs, 2014). Students can utilize the ADG via any .NET supported programming or via the custom builtXML based scripting language.

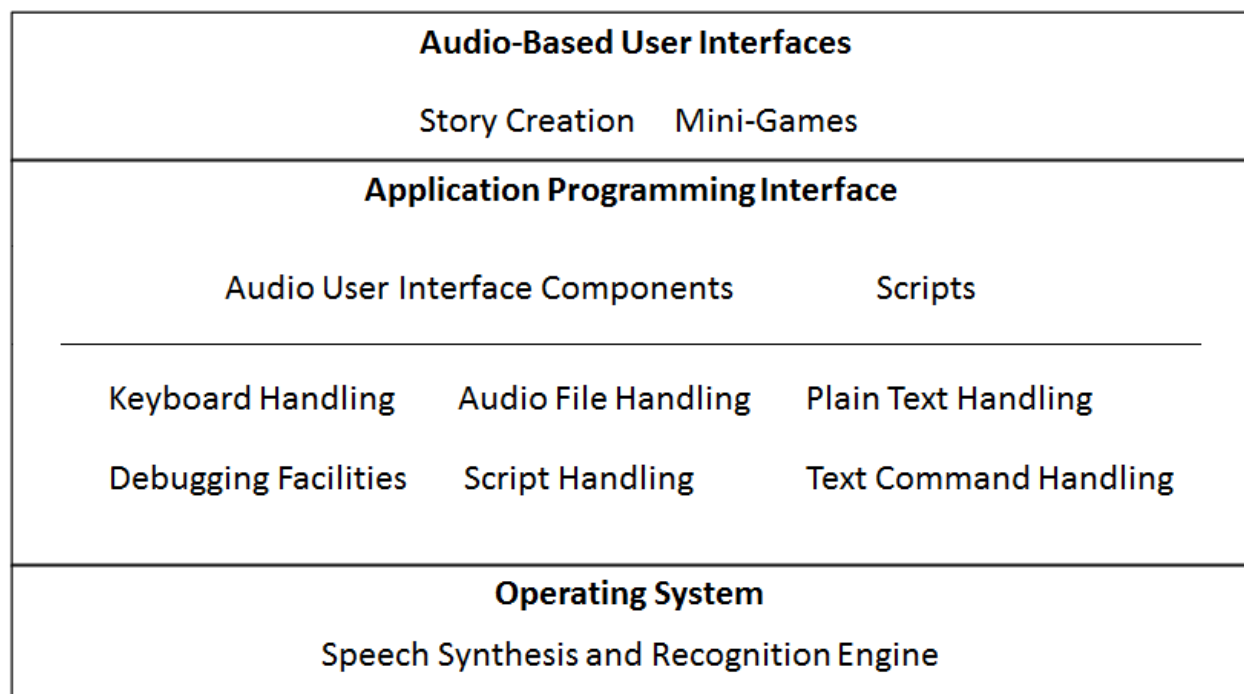


Figure 1.ADG Architecture

This was a preliminary test to determine the viability of the approach and whether or not it was beneficial. Overall, the students demonstrated a greater awareness of user centeredness and tried to apply the concepts in their final projects. However, a number of issues arose.

- The use of another programming language (in this case XML) was found to be difficult to learn in the short time given.
- The APIs allowed for a large degree of programming freedom but were found to be too complex for the short time period.
- The creation of the audio files took considerably more effort than was anticipated.

At the end of the assignment, students were asked to complete a questionnaire that looked at the student's experience with the software. One question focused on the lessons learnt, "What lessons did you learn?" For both years, the comments can be summarized as follows.

- Developing software for blind users or those with physical issues is difficult.
- Creating audio-only software is difficult.

Students did realize that creating software for the blind was a much harder task than they anticipated but the overall lessons learnt revolved around the difficulty in completing the assignment and not the overall concepts of universal design.

In spite of these difficulties, there were improvements in the final major projects and the overall performance. However, what was not clear, was how the difficulty level of the assignment affected the student's overall attitude towards universal design.

□

Current Assignment

In the academic year 2013-2014, it was decided to undertake a more formal examination of the universal design assignment approach. To address the issues with the previous attempts, a new set of software tools were developed. Also, the assignment was modified so that students were given the opportunity to compare designing user interfaces for two distinct groups, sighted and blind users, using the same data.

For the purposes of this assignment, a new software tool called GameUI was developed, which provided the data stream required for the two user groups. Figure 2 shows the output of the GameUI sample code provided to the students. In this case simple circles and numbers are utilized to represent the data stream. The GameUI system also enables the use of audio to represent the same data.

The GameUI system consists of the original AUI tools wrapped in a new simplified API, as shown in figure 3. This removed the need for XML but introduced the need for the C# programming language (Microsoft, C# Fundamentals for Absolute Beginners). The preferred programming language would have been C++ due to the students' prior experience with the language (Microsoft, C++ Language Reference). However, to use C++ for the .Net based API would have resulted in the use of too many non-standard C++ features, which the students were unaware of. Given C#'s similarity to the C++ and Java programming languages, it was also felt that students having undertaken a course in C++ and with over 80% indicating that they have completed the course in Java programming, C# would be easier to grasp (Oracle Technology Network: Java). The API was made simple enough that students did not have to learn the C# language in its entirety. They simply needed to know how to call functions via an object-based approach and with their prior programming experience, they already knew how to do this.

From a programming perspective, this system provides two sets of APIs, one for graphical user interface components and one for audio based programming. The first one allows for visuals (graphics) to be developed for sighted users while the other is for blind users. The data was generated at a rapid rate so that students could not take the easy way out and simply display/playback the data to the user. In this case, the available visual components could display data at a faster rate than the audio components. This meant that students could not simply develop the user interface for sighted users and then modify it for blind users. Instead, equal effort was required for both user interfaces.

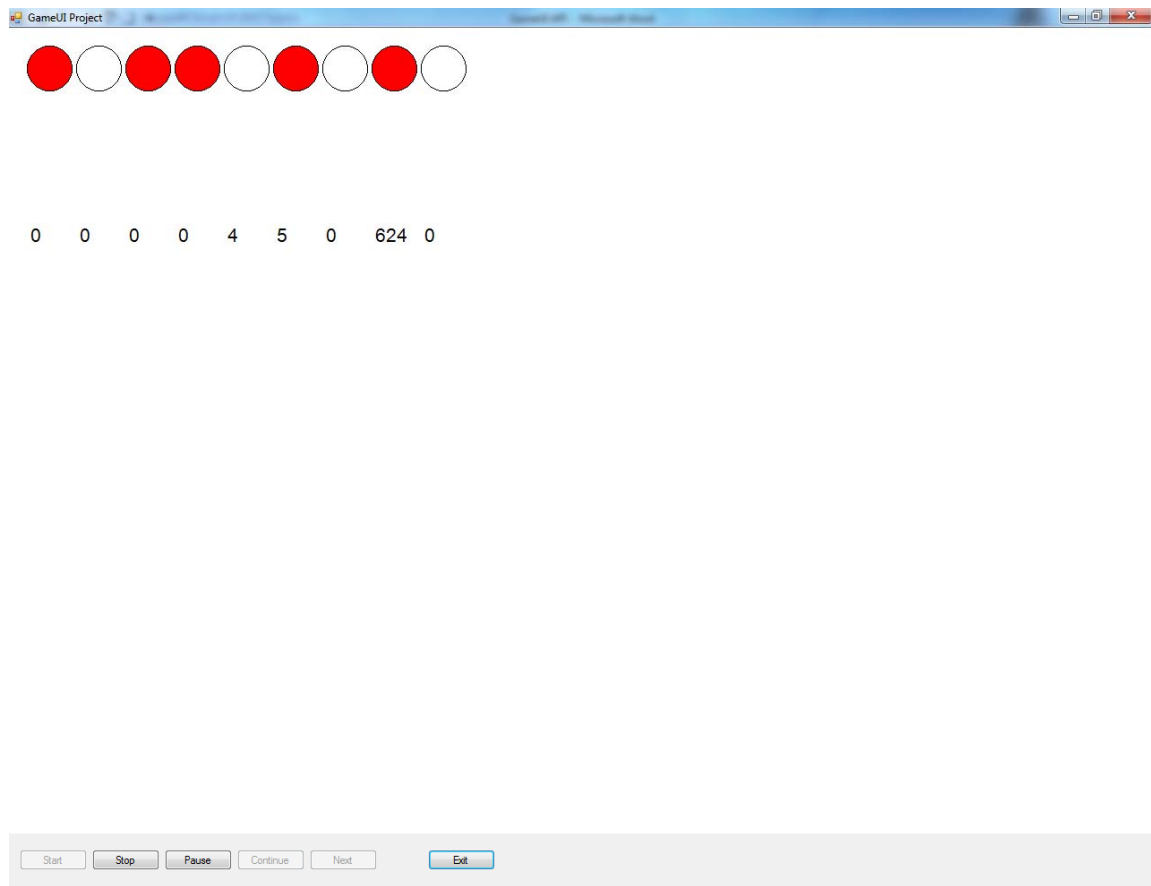


Figure 2.GameUI System

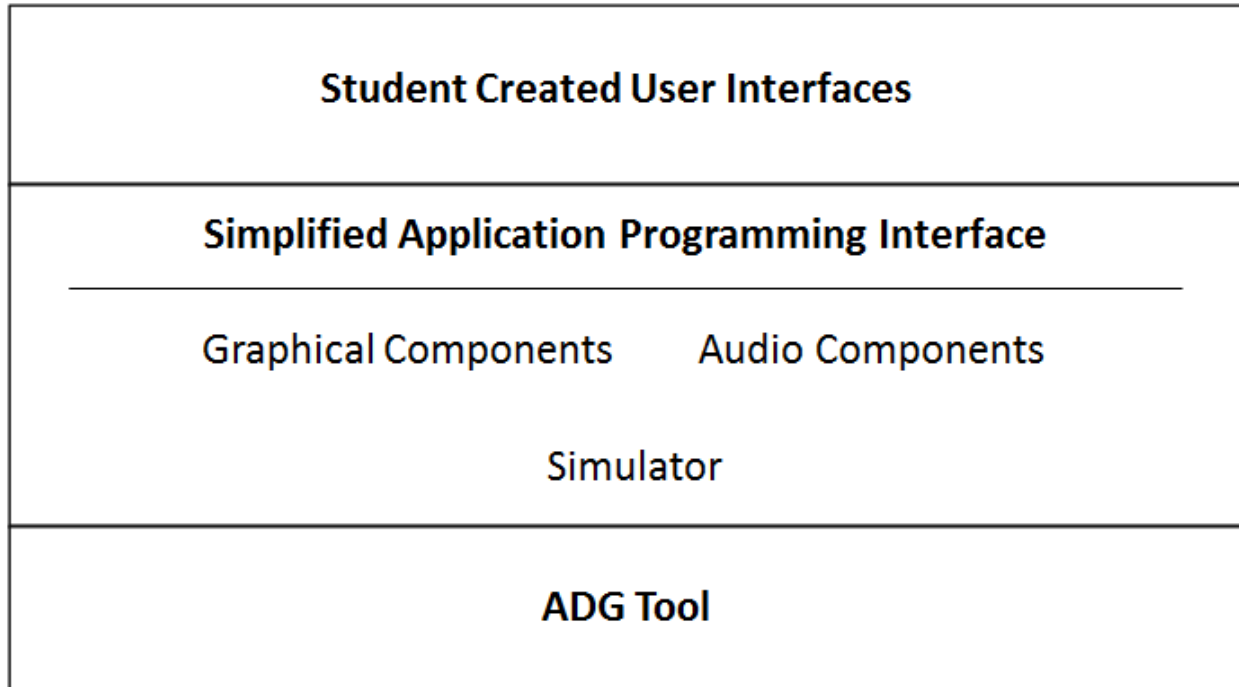


Figure 3. Architecture of GameUI System

Risks

Below are the risks and the actions taken, to reduce their effect on the usefulness of the assignment.

- Students did not have prior experience with C#. This was mitigated by the fact that all students would have been taught C++ and so the required object-oriented concepts would be known.
- The addition of another assignment may frustrate students due to the reduced time for the other assignments. Any negative effects were mitigated by keeping the required coding to a minimum.
- Given that two user interfaces were to be developed, the time needed may be too short. As the focus was on the design and not the implementation, considerably little coding would be required with most of the effort being in the creation of the graphics and the audio clips.

Methodology

The revised universal design assignment was given in semester I of the academic year 2013-2014, in the second quarter of the semester. Students were given three weeks to complete the assignment. They were divided into groups of 4-5 students each and they remained in those groups for the duration of the semester. On completion of the assignment, each group gave a 10 minute presentation outlining their solutions. Students were required to complete a questionnaire before and after the assignment i.e. pre and post questionnaires. Before the pre-questionnaire was distributed, students were given a short description of what universal design is, its primary purpose with respect to the design of user interfaces, the available design modalities and the issues that need to be considered when designing for specific types of users.

The pre-questionnaire was divided into two sections. The first section consisted of five questions covering basic demographic information and included gender, age, level of study, current major and registration status (full-time versus part-time). The next six questions were Likert based questions covering the student's attitude towards universal design.

For the post-questionnaire, the same questions existed but an additional seven Likert based questions, focusing on the usefulness of the actual GameUI software, were added. Two short answer questions focusing on the lessons learned were also included.

□

Results

The total number of students registered for the course was 37, which was divided into groups of 5 students each, giving a total of 7 groups with two groups containing 6 students each. The total number of respondents for the pre-questionnaire, or pre-test, was 28 (76%) and for the post-questionnaire, or post-test, was 29 (78%). The total number of usable completed questionnaires was 26 for the pre-test (92.9%) and 23 for the post-test (79.3%). A total of 13 males and 13 females responded for the pre-test and 14 males and 9 females for the post-test. For both groups 22 students were full-time. All students in both groups were registered in either the Computer Science or Information Technology majors and all were level III students. Table 1 shows the age ranges for both groups.

Table 1

Age ranges

Age Range	Pre-Test	Post-Test
20-25	21	18
26-29	3	4
30-39	1	1
40-49	1	0

Table 2 contains the results for the questions dealing with students' attitudes towards universal design for both the pre-test and the post-test questionnaires. Each question had 4 possible answers, strongly disagree, disagree, agree and strongly agree. Strongly disagree and disagree have been combined under the heading "Negative Responses" and likewise, strongly agree and agree have been combined under the heading "Positive Responses".

Table 2

Response to questions about attitudes

Question	Negative Responses (Disagree Combined)		Positive Responses (Agree Combined)	
	Pre-Test %	Post-Test %	Pre-Test %	Post-Test %
i. I believe that universal design should be employed by all programmers.	19.2	0	80.8	100
ii. I appreciate the need for universal design during the creation of computer software.	7.8	4.3	92.2	95.7
iii. I believe that universal design should be included in all Human-Computer Interaction courses.	15.4	0	84.6	100
iv. I am confident in my ability to use universal design techniques.	46.2	43.5	53.8	56.5
v. I believe that universal design should be required for the final major project.	46.2	30.4	53.8	69.6
vi. I believe that universal design should not be required for all software development.	73.1	87	26.9	13

As the results indicate, student attitudes towards universal design were positive before the assignment and remained positive on completion of the assignment, increasing in all cases. The most dramatic increases occurred for question (i) and (iii) where the negative responses dropped

to 0. The improved results for question (vi) support the results for (i). These indicate that students see the importance of including universal design topics in an HCI course and including it as part of the software design process.

These results indicate that the students' view of the importance of universal design was not negatively affected by the addition of the assignment. In fact, their positive view increased after the assignment.

To confirm that students truly understood the importance of universal design, the results of the two questions dealing with the lessons learnt are summarized as follows.

- i. What lessons did you learn?
 - Students note that universal design is difficult to implement especially when considering users with physical disabilities.
 - When using universal design, a lot of thought and effort must be made.
 - One common comment was that it is difficult to place yourself in the position of a blind person.
 - Also noted was the importance of maintaining focus on the needs of the user at all times i.e. the needs of the user comes first.

In summary, at the end of the universal design assignment, students understood the difficulties involved with designing software for users with varying abilities. They also began to show an awareness of why the user is central to the development of user interfaces. Finally, they realized that a lot of prior planning is needed to use universal design during the creation of user interfaces.

- ii. Where there any differences between creating a user interface for sighted users versus blind users?
 - Due to their prior experience it was easier to design the user interface for the sighted user than the blind user.
 - The use of audio requires the data to be presented differently such as the use of audio cues versus the global view that can be obtained from visuals. Student soon realized that different approaches are needed when using graphics to display summaries of data versus using audio.

Again the answers to this question demonstrate that students began to understand that designing for users with traits that differ from their own is difficult. Also, the use of programming components other than graphical components requires a different approach than what they are used to.

GameUI Project Results

As in previous years, all groups were unable to complete the entire assignment. In this case, completion was considered to be two running demonstration programs using graphics and audio respectively. Therefore the simplification of the application programming interfaces (APIs) did not produce better results in terms of completion. Students were able to complete designs for the interface for sighted users but not for the blind users. This was a result of the unfamiliarity with the creation and use of audio clips. Also, many students underestimated the time needed to create

audio clips, leaving them to the last minute. However, students were still able to present their ideas for both user interface types.

While students did not have problems using the C# programming language, many found the time to learn the new API too short. As they were able to grasp the C# quickly, it is unlikely that this issue would have been different if the language used was the familiar C++.

Major Project Results

Table 3 contains the grade results for the major project. As can be seen, there were no failures recorded for the last three years, which is the time that the universal design assignments were used. In the last two years, all major projects received an A grade. From these results, it can be seen that the introduction of this new assignment did not affect student performance for the major project. This assignment was worth 10% of the final course mark. The average was 7.94% in both the 2012-2013 and 2013-2014 academic years.

In summary, there was no improvement in the overall performance of the students for the major project. However, the high standards were maintained.

Table 3

Implementation grades for major project

Year	A	B	C	D	F
2008-2009	66.7% (4)	16.7% (1)	16.7% (1)		
2009-2010	20% (1)	40% (2)	20% (1)		20% (1)
2010-2011	20% (1)	40% (2)	20% (1)		20% (1)
2011-2012	50% (4)	25% (2)		25% (2)	
2012-2013	100% (7)				
2013-2014	100% (7)				

Overall Course Results

Table 4 shows the overall coursework marks for all of the years the HCI course has been offered. The coursework forms 40% of the overall course mark and the final examination accounts for the remaining 60%. The table shows that the total enrollment for the course has been steadily increasing. Also, the performance has increased steadily with the year 2010-2011 being the worse in terms of the number of As and 2008-2009 in terms of the number of Ds and Fs. Tables 5 and 6 show the overall final course results and demonstrates steady improvements over the years. The most significant improvements occurred in the coursework marks and can be attributed to the improvements gained in the major project.

Table 5 shows a decline in performance between the academic years 2012-2013 and 2013-2014. This is a result of more students getting above 34% in the coursework in 2012-2013 than 2013-2014. However, table 5 shows that students performed better in the final exam in 2013-2014 resulting in a near equal overall performance in both years. It should also be noted that in 2013-2014, all students passed the course (see table 6).

In summary, the introduction of the new assignment in 2013-2014 did not affect the overall performance of students when compared to the previous years.

Table 4

Overall coursework marks

Year	A	B	C	D	F	Total
2008-2009	55.6% (10)	33.3% (6)	0	5.6% (1)	5.6% (1)	18
2009-2010	81.8% (18)	13.7% (3)	4.5% (1)			22
2010-2011	42.9% (9)	52.4% (11)	4.8% (1)			21
2011-2012	89.7% (35)	7.7% (3)	2.6% (1)			39
2012-2013	100% (37)					37
2013-2014	100% (37)					37

Table 5

Coursework, final exam and total marks averages

Year	Coursework (40)	Final Exam (60)	Overall (100)
2008-2009	24.3	31.1	55.3
2009-2010	29.7	29.5	59.2
2010-2011	26	36.2	62.2
2011-2012	30.9	32.5	64.4
2012-2013	32.6	33.1	65.8
2013-2014	31.1	34.4	65.4

Table 6

Overall course grades (includes coursework and final exam)

Year	A	B	C	D	F
2008-2009	33.3% (6)	33.3% (6)	27.8% (5)	0	5.6% (1)
2009-2010	28.5% (6)	38.1% (8)	28.6% (6)	0	4.8% (1)
2010-2011	33.3% (7)	42.9% (9)	23.8% (5)	0	0
2011-2012	43.6% (17)	28.2% (11)	23.1% (9)	0	5.1% (2)
2012-2013	43.2% (16)	51.4% (19)	2.7% (1)	0	2.7% (1)
2013-2014	43.2% (16)	43.2% (16)	13.5% (5)	0	0

Universal Design Question

In the 2011-2012 and 2013-2014 final exams there was a question on universal design. In both cases, the first half of the question dealt with simple recall about what is universal design and the principles of universal design. The second half dealt with its application in specific circumstances such as for visually impaired users.

In 2011-2012, 16 out of 39 (41.03%) students attempted the question and in 2013-2014, it was 30 out of 37 (81.08%). The average mark out of a possible total of 15 was 10.75 in 2011-2012 and 11.37 in 2013-2014.

In the 2013-2014 year, students demonstrated a greater understanding of the concept of universal design. They were better able to discuss the specific software changes needed to handle as large a range of users as possible. In some cases, students were able to go beyond what was in the notes, basing some of their answers on their own experience in the course assignments.

The increase in the number of students answering the question indicates some increased measure of confidence in the topic. This shows that there is a possible correlation between the use of the new assignment and the increased confidence. There may also be a relationship between the increased positive attitude and increased willingness to answer this question.



Discussion

Utilizing the results of the previous section, the three research questions can now be considered.

1. *Can an intervention focused on universal design increase students' appreciation for the area?*

Table 2 demonstrates that students' appreciation for universal design became more positive for every question. Students demonstrated a greater awareness for the importance of universal design in both the teaching of HCI and within the commercial development of any software application. The written comments of the students also support their answers for the Likert-based questions.

2. *Would inclusion of an extra assignment depreciate students' appreciation for the topic of universal design?*

The introduction of this assignment did increase the coursework load of the students and as a result their completion rate did not improve. However, it did not affect their appreciation of the topic as shown in table 2. Also, as discussed before, more students attempted the universal design question in the final exam than in previous years. They also performed better.

3. *What effect would the inclusion of this assignment have on students' performance in the final major project?*

As the results in tables 3 to 6 show, the performance of the students did not decline. In some cases, there were improvements over the previous years, such as the improvement in the final examination and failure rates. Table 3 shows the results for the final major project and they remain unchanged from the previous year, which was the best year during the course's entire existence.

Conclusion

The results demonstrate that with the introduction of the universal design topic as the first assignment, student performance in the major project, coursework and final exam did not suffer and, improved in some cases. Providing students with the opportunity to make comparisons for the two user groups enabled them to understand the difficulties involved with designing user interfaces for a wide range of user types. This in turn demonstrated to them the importance of understanding the various universal design theory and techniques.

The small improvements between the last two years indicate that the introduction of the new universal design assignment did not affect the performance improvements achieved over the years. The written comments by the students in the last year show that students were able to grasp and maintain their understanding of the need for universal design. This was supported by the results for the questionnaire which show small improvements in students' positive attitudes towards universal design.

One area of concern is the students' inability to complete the assignments and produce functional prototypes. In the future, the assignment will be adjusted to one where the prototypes are not necessary and only the overall user interface design will be required. In this case, the GameUI tool will be for reference and testing of ideas purposes only. This fits in well with what occurred over the last three years of the course.

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Special Educator Attitudes toward Children with Communication Disorders in the Caribbean

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This paper examined the attitudes and perception of Communication Disorders in special educators in the Bahamas. An interview, observation field notes and a questionnaire comprised of open-ended responses and a rating scale captured the views, pedagogical knowledge and skills and perceptions of 17 special education teachers who educate children with special needs and communication disorders pre and post a simulated workshop. The findings revealed four emerging themes related to perceptions and previous personal experiences in which may affect their respective teaching approaches. Findings of the study also revealed that providing special educators with workshops and other professional development opportunities to learn and discuss difficulties children with special needs and communication disorders may experience, increased their teaching approaches, changed some perceptions and introduced new techniques that were later actively incorporated. The special educators of this study expressed a need for more resources to assist them in effectively educating all children with special needs and communication disorders. The special educators attributed limited resources such as professional development to their motivation or lack thereof to functionally engage and educate children with special needs and communication disorders.

Keywords: Bahamas, attitudes, perception, skills, special needs, communication disorders, professional culture, qualitative

Introduction

Special education services addressing a child's communication disorders, their learning disabilities, adequate knowledge, and resources for the development of providing appropriate special education in the Bahamas are in the emerging stages and continues to be a challenge the country faces. In 2000, The Commonwealth of the Bahamas Census of Population and Housing (2000) reported that one thousand and fifty-five children from birth to nineteen years of age are experiencing some form of disability of which affects the body and/or mind. However, only three hundred and eighty six school aged individuals were reported to have a learning disability or communication disorder that was being addressed. That is less than 3% of the disabled population reported. Secondary to the overwhelming results of under serviced children experiencing a communication disorder or learning disability, the country of the Bahamas concluded that Special Education was an important and required initiative to address as part of

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their national agenda. Less than four years ago, the Bahamas Ministry of Education determined that educators of children with special needs were missing key components needed to be appropriate and functional educators. As a result, one of the objectives set forth in the national agenda was to develop workshops, trainings, assessments and evaluations for all special educators in order to increase and support the teaching-learning process of children with special education needs (Ministry of Education , 2010).

This pilot study is an initial approach to determining what factors of personal perceptions and attitudes of 17 special educators may have contributed to the limitations of the amount of reported children with communication disorders in relation the amount of children actually experiencing a communication disorder in their school setting. Using a simulated workshop approach, interviews, questionnaires and observations to produce and assess feelings of frustration, anxiety and tension similar to that of children with special needs and communication disorders in 17 special educators; the special educators' attitudes and perceptions were identified and analyzed. The analysis of the interview responses, questionnaires and observation field notes pre and post the simulated workshop revealed that the 17 special educators had specific perceptions of what communication disorders were, attitudes and preferences of how children with disorders learned and/or should be taught, beliefs and practices the result of things they were taught, learned or heard about as they were growing up and requirements for effectively meeting the needs of special needs students. It is important to note however that secondary to these responses being based on just 17 special educators in one school setting, the findings should be considered exploratory and exposed to widespread verification of the outcomes.

Background

Societal perceptions and attitudes are said to be directed by one's education and knowledge. When there is no appropriate exposure and education to disabilities, it is expected that the individual will have a narrow understanding of the difficulties the child with special needs may present (Esmail, Darry, Walter, & Knupp, 2010). One of the largest barriers to appropriate special education for children with disabilities including communication disorders, are societal misconceptions (Garvar & Schmelkin, 1989). As a result, teachers have been noted to have preconceived ideas of what is appropriate for students with disabilities and what their abilities are, leading to ineffective teaching techniques and exclusion of the child from academic activities (United Nations Youth , 2014). In the Caribbean, the capacity of an individual's disability produces different perceptions and approaches to teaching. An individual with only a physical disability may be better accepted and understood within their community and educational system than an individual with a mental/psychological or developmental disability (such as autism, intellectual disabilities, and/or down's syndrome) (Thomas, 2001). As a result, for over fifty years, children with developmental and learning disabilities have been marginalized and excluded altogether from basic educational opportunities such as special education services (Lavia, 2007). In some Caribbean countries, special education exists within a "culture of silence". In the years preceding the 1960's, there existed no formal education system for children with developmental, learning, and physical disabilities at all in the Caribbean. Prior to the last few years in which awareness and acceptance has slowly increased, individuals within the Caribbean society, including educators, often viewed children with disabilities as a burden to their society, excluding them from educational activities and employment opportunities (Armstrong , Armstrong , Lynch , & Severin, 2005). This implies that most individuals from a Caribbean cultural group often carry over their beliefs, concepts, and practices to their

professional lives (California Endowment, 2003). Some of these individuals view children with mental/psychological and/or developmental disabilities as “unruly, stubborn and lazy children who are not trying hard enough to prevent the behaviors and disability/disabilities they may present with” (Thomas, 2001). The combination of these perceptions, beliefs, limited intervention and limited appropriately trained special educators may be the result of a lack of awareness and sensitization to what a learning disability or communication disorder is. In addition, it may also result in a limitation in the special educator’s knowledge of how to functionally address a learning disability and communication disorder, and why children with diagnosed learning disabilities and communication disorders present with secondary behaviors such as violence, tantrums, and attention deficit disorders. The implementation of the simulation workshop to be evaluated here is the result of attempting to explore possible causes of these limitations.

Purpose

This study is designed to provide some understanding of the attitudes of 17 special education teachers in the Bahamas who educate children with special needs and communication disorders. Further, the study aimed to explore the teaching practices and perceptual culture of communication disorders in the classrooms of the 17 special educators, and to discuss recommendations of what topics and areas of knowledge should be addressed during teacher trainings, workshops and professional developments.

The study included 17 special educators identified as primary classroom teachers, teacher assistants’ and one to one specialists, providing a variety of educators represented in the sample. These teachers were selected from a primary through vocation private school in Abaco, Bahamas. All the participants work with children diagnosed with varying special needs and communication disorders ranging from Autism, Down’s syndrome and Cerebral Palsy to learning disabilities such as dyslexia, specific language impairments, and attention deficits. Participants ranged in age from 18-56 years old with educational backgrounds of high school diploma only to some Master’s level courses taken. Selection of participants involved ensuring all participants were in contact with at least one child classified as having a communication disorder secondary to comorbid conditions such as Autism, Down’s syndrome, Intellectual Disabilities etc., 80% of their work day. Participants were also required to be recognized as a naturalized citizen or a natural born citizen of the Bahamas during the time of the study. Citizenship status was verified via documentation of work permits or country approved identification. Participants for this study were not randomly selected. The sample population was selected secondary to purposeful sampling strategy, convenience sampling (Hardon, Hodgkin, & Fresle, 2004). Access and approval to the participants resulted in the use of convenience sampling secondary to an existing collaboration of the schools support of this study and the site being preapproved by the Government of the Bahamas. Convenience sample due to the Government of the Bahamas allowing the authors to conduct research in the country under a Non-Immigrant Visa. Additionally, all participants included in the study met the selection criteria and possessed certain attributes consistent with the purposes of this study, resulting in this form of purposeful sampling.

Methodology

Due to resource and limited access to more educational settings, the study was conducted in one educational setting in Abaco, Bahamas with 17 special educators. Following the concept of Richard Lavoie's "How Difficult Can this Be? The F.A.T. City Workshop" project (Lavoie, 1989), and the extensive experience and knowledge of the researchers about communication disorders and special needs, 17 special educators (SE) were engaged in an 180 minute simulation workshop and administered an interview and questionnaire (before and after the workshop). The selection criteria for selecting these specific 17 special educators included the following.

Information of the proposed research study was disseminated to the school's principal with copy's of the study's materials and consent forms for all potential participants. The principal was then asked to recommend 15-20 SEs who spent 80% of their work day educating students with communication disorders and special needs. It was a requirement that the SEs that were selected would have to be willing to complete the workshop in its entirety, be observed while working in the classroom, openly and honestly discuss feeling and experiences of communication disorders and special needs, and answer all the questions presented on the questionnaire. The principal was able to identify 17 SEs who meet the criteria set forth.

The 17 selected SEs were informed that the study consisted of two phases, 1) the observation without intervention and initial interview-questionnaire phase and 2) the F.A.T. with Communication Disorders Simulation workshop and final questionnaire phase. The SEs were not informed of what the researcher would be observing to reduce the possibility of a Hawthorne effect or reactivity (Landsberger, 1958). In phase one, the researcher interviewed, provided with a questionnaire and observed each SE within their respective classrooms to collect data on their teaching approaches, classroom techniques and knowledge and perception of communication disorders.

To begin with, each SE was randomly interviewed in a one to one setting within an empty classroom in the school. During the interviews, the researcher documented the participant's responses on an interview sheet as well as audio recorded via the Voice Record Pro app on the Apple iPad device. Each SE was asked the following 20 interview questions:

1. How long have you been working with children with communication and learning disorders?
2. What's your job role as a teaching assistant?
3. How did you get into this field?
4. Over the years what type of disorders have you been exposed to or worked with?
5. What type of resources do you use to assist you in educating the children?
6. In your own words describe what a learning disability is or looks like to you.
7. What do you think a communication disorder is?
8. Would you consider a child that can't say words and are unintelligible.... (Ex. They mean to say snake but they say take), would you consider that to be a communication disorder?
9. Here in this school what kind of goals do you have for the children you work with?
I am going to tell you a scenario, and you tell me what you feel about it, if you agree or disagree or if you don't really have a take on it.
10. A) What is your opinion on a child who cannot talk or has a severe communication disorder?
B) What do you feel has caused that for the child to have a communication disorder?

11. Agree or disagree, a communication disorder sometimes happens because the parent like the mom or the dad is paying for something that they did.
12. Do you believe that a child with a communication disorder will never be able to talk?
13. How do you feel about children with disabilities or communication disorders being in the classroom with typically developing children?
14. Do you feel that your activities or programs that you do with the kids are limited because they can't talk?
15. What are the biggest limitations to your teaching?
16. Do you think that the children you work with are less intelligent than typically developing children?
17. Agree or disagree a family with a child with a disability or communication disorder should home school them or keep them at home.
18. Okay, give me your outtake or opinion. How do you feel about a child with a communication disability or LD providing value to the society? Do you think they give value to the society or can a benefit later on in life?
Do you believe your classroom is set up to provide your children with the most opportunities to be able to communicate? If not, what do you think can be done better to help the classroom?
19. When a child with a disability acts out negatively are they purposely being disruptive and should they be reprimanded?
20. What are some of the reasons they may be acting out?

The researcher prompted the SE to expand on any questions that were answered with one word or considered to be a limited response by asking them to "tell me more". Some of the interview questions were derived from research discussing Caribbean society's attitudes and myths about disabilities (Charlton, 2000). After the SE completed the interview, they were supplied with a questionnaire and asked to answer each question as honestly as possible.

On the following day after all interviews were completed, the researcher conducted observations without intervention. To ensure naturalistic observations, visits to each SE's class was randomized. Using an observation checklist, the researcher observed the SEs teaching during two different lessons. The lesson observations each lasted for a maximum time of 60 minutes per SE. All sessions were audio taped and field notes were taken by the researcher and listed in the comments section of the checklist. The researcher later transcribed the interview and observation recordings and they were checked for accuracy. The lessons for the observations observed included: Language Arts, Math, Writing, Spelling, Circle Time, and Vocational Arts. The observation checklist was adapted from components of the Loudoun County Public Schools Classroom Observation Checklist (2009). Table 1 presents the educator approaches and skills checklist created for this study.

Table 1. Educator approaches and skills checklist

Skills and Approaches	Comments
- Multi-modal approach (visual, auditory, kinesthetic, tactile) - Students seated with little distractions present (eliminate all unnecessary materials) - Allows Student time to process data, respond, and complete a task. - Allow time before changing from one activity to the next. - Reduce the amount of work presented at one time (breaks assignments down). - Modified expectations based on student's needs. - Provides a model of what the end product/assignment looks like. - Provides written and verbal directions with visuals to assist the child. - Sequences steps to a task that has more than two steps. - Explains the learning expectations of the lesson before beginning the lesson. - The educator makes sure they have the student's attention before starting a task. - Assignments and tasks are modified based on ability and need (limits the number of items presented). - Provides a quiet setting for test taking. - Divides large tests into small sections. - Allows sufficient time as needed to complete class assignments or tests. - Grade Spelling separately from Content on tests. - Modifies rules that discriminate against those with special needs. - System code developed to let students know when their behavior is not appropriate.	
	Effective Not Effective
- Provides a designated safe place for the student to use when exhibiting inappropriate behaviors. - Code of conduct developed and reviewed with the students frequently and it is visible.	
	Code of conduct appropriate
- Provides a behavior Intervention Plan that is realistic and easily applied. - Provides immediate feedback and reinforcements to the child as needed. - Changes % of work required for passing.	

Table 2 presents the educator perceptions and attitudes questionnaire created and used for this study.

Table 2. Educator Perceptions and Attitudes Questionnaire

7)

Set One: <i>In your own words, please describe and write each answer to the questions listed to the best of your ability.</i> - What is your job title? - How long have you been working with children with communication and learning disabilities? - What are the job roles and responsibilities associated with your title? - How often during your work week do you interact with children with learning disabilities? - During your work week, how often do you interact with children with severe communication skills/abilities? - What types of disorders have you been exposed to during your career as an educator? - What resources do you have to assist you in educating children with communication and learning disabilities? - In your own words, describe what having a learning disability means and looks like to you: - In your own words, describe what having a communication disorder means and looks like to you: - What goals and educational lessons do you address when working with children with limited to severe communication and/or learning disabilities:
Set Two <i>For each statement, please rate the likeliness of the event occurring. Please choose only one option for each statement and one that best fits your opinion/view point.</i> Response Answers: A) Strongly Agree B) Agree C) N/A D) Disagree E) Strongly Disagree

1. A child who cannot talk or who has a severe communication disorder occurs because they are paying for something bad their parent or relative has done.
2. A child who has a disability that affects their learning occurs because of evil spirits.
3. A child with a communication disorder will never be able to talk.
4. A child who can't talk probably have a mental disability.
5. Children with communication disorders should not be in classrooms with typically "normal" developing children.
6. Children with communication disorders will exhibit negative behaviors frequently.
7. My communication opportunities and interaction with children who have communication and/or learning disabilities is very limited because they can't talk back.
8. Children with communication and/or learning disabilities can become independent with their living and learning skills.
9. All lessons and activities I teach in the class do not need to be modified to meet the specific needs of children with communication disabilities and/or learning disabilities.
10. Children with communication disabilities/ learning disabilities are always provided with other modes to help them communicate (i.e. sign language, assistive devices, pictures)
11. Children with communication disabilities should go to a doctor for help with their speech.
12. Children with communication disabilities/learning disabilities are being punished for sins their parents or relatives have committed.
13. Children with communication disabilities are likely to be less intelligent than children who can speak.
14. Children with communication disabilities could learn to speak if they tried harder.
15. The family should keep a child with special needs or communication disabilities at home

Set Three

Answer True or False to the following statements

1. Children with communication disabilities should not be included in classrooms with typically developing "normal" children.
2. Children with communication disabilities do not need to learn the same curriculum as typically developing "normal" children.
3. Children with communication disabilities do not structured classes and planned lessons.
4. Children with communication disabilities can become a burden to teachers and the school.
5. Children with communication disabilities provide little value in society.
6. Children with communication disabilities should be allowed sufficient time to express/communicate.
7. The classroom lessons are set-up to provide the child(ren) with communication disabilities opportunities to communicate.
8. Each child's goals and expectations in class are specific to their needs and abilities.
9. Schools should accommodate all children regardless of physical, mental, or communication disabilities.
10. Children with communication disabilities should not receive "special" treatment and should get the same treatment as typically developing "normal" children.
11. When a child with communication disabilities acts out negatively, they are purposely being disruptive and should be reprimanded.
12. Children with communication disabilities are better off being home-schooled.
13. Children with communication disabilities are better off being placed in a facility for children with special needs.
14. Children with communication and learning disabilities should be isolated from typically developing "normal" kids.
15. Children with communication and learning disabilities should not be included into regular education classrooms because they will disrupt the "normal" kids learning experience.
16. I chose to work with children with communication and learning disabilities.

17. I have experience working with children with communication and learning disabilities.
18. If I could choose my professional placement, I would choose to work with special needs children.
19. I don't feel qualified to work with children with communication and learning disabilities.
20. I am unsure of how to work with and address the needs of communication and learning disabilities.
21. I am not always sure of what to work on or how to teach the children with communication and learning disabilities.

During phase two of the study, SEs were required to attend one Saturday workshop that was 3 hours (9:45 AM – 12:45 PM) in duration with a thirty minute lunch break provided. All 17 SEs participated in the F.A.T. with Communication Disorders workshop in which 8 specific category areas were addressed. The researcher supplied each of the 17 SEs with a F.A.T. with Communication Disorders handbook and notified them that audio and video recording would occur for the duration of the 180 minute workshop. With the researcher acting as the facilitator of the workshop, all 17 SEs engaged in simulations related to the following eight categories:

1. **Frustration, Anxiety and Tension** – A scrambled text passage to demonstrate that what an educator perceives to be easy to read, may be difficult for the child to decode if and when there are language and cognition deficits present.
2. **Perception** – A black and white picture that when arranged and viewed from different angles may depict different animals and objects. This picture was used to demonstrate that perception is not solely based on the concrete image but also on the experience, exposure and perception of the person viewing it alone.
3. **Attention** – Demonstrated the Gestalt affect with a picture showing the participants that in some children, their brain may perceive and attend to whole objects and not individual parts therefore affecting the message they receive and recall no matter the channel of delivery (oral, visual, physical).
4. **Decoding & Encoding** – Two passages provided to the participants. One passage was presented in a foreign language to the participants and the other was filled with various non-sense words. The participants were asked to read the passages and then answer questions related to the passage demonstrating that when processing and comprehension factors are impaired, this may be how the child receives the information and affects their ability to communicate appropriately and/or academically succeed.
5. **Communication Disorders including turn taking skills, vocabulary development, non-verbal communication, higher order thinking skills and following directions** - There were various simulations included in this category all of which demonstrated some of the difficulties and frustration a child with varying communication disorders may go through on a daily basis within the educational setting.

After each simulation, the SEs were provided with the opportunity to ask questions and express their feelings towards the simulation. In addition, the researcher provided a summation and moral to the simulation, discussed what disorders and difficulties each simulation represented and provided tips and techniques the participant could utilize to assist students with special needs and communication disorders within the classroom. At the completion of Second Phase, the SEs were asked to complete the questionnaire again as honestly as possible.

Instruments

The observation checklist was adapted from components of the Loudoun County Public Schools Classroom Observation Checklist (2009). The Loudoun County Public Schools Classroom Observation Checklist and checklists like it have been used for many years in the education sector to evaluate the quality of an educator's approach and delivery to teaching. The ultimate reason for observing an educator's implementation strategy is to determine whether there is disconnect between their approach and the intention of the lesson (Wragg, 1999). Observations have the ability to provide insight into a teacher's instructional methods and interaction with students of which may impact a child's ability to learn or the extent of what they learn (Essays, 2013).

The questionnaire items were derived from research discussing Caribbean society's attitudes and myths about disabilities (Charlton, 2000). Questions on the questionnaire included close and open ended questions, true/ false questions and a rating scale. The questionnaire also provided the participant the opportunity to elaborate on questions of which their desired answer did not fit into the represented categories. The questionnaire contained 46 questions. Some questions were the same yet reworded to address the same information, by approaching it in a different way (supporting the validity of the questionnaire).

The F.A.T. with Communication Disorders Workshop was adapted from the “How Difficult Can This Be? F.A.T. City Workshop” created by Richard D. Lavoie (1990). Richard Lavoie’s workshop was designed to simulate the classroom experience through the experiences of a child with learning disabilities. The original workshop specifically addressed experiences related to emoting feelings of frustration, anxiety and tension in the participants. Like the workshop adapted for this study, the original workshop discussed strategies for effectively working with children with learning disabilities. The workshop adapted for this study was designed to explore the following areas: 1) Experiencing Frustration, Anxiety, and Tension, 2) Language Processing Disorders, 3) Emotional regulation, 4) Comprehension, 5) Visual Perception and the effect of visual perception on communication, 6) Oral Expression, 7) Auditory Capabilities, and 8) Fairness. In addition, the SEs each received a F.A.T with Communication Disorders Workshop Handbook. The Handbook included simulated activities for all eight of the areas listed above.

Research materials also included an iPad device equipped with the Voice Record Pro app and a Sony handheld digital camera.

Analysis Procedure

All the data obtained was collected through use of interviews, questionnaires, and the observation field notes. The responses to the questions presented on the questionnaire and interviews were audio-recorded and along with the observation field notes, transcribed. Once transcribed, each transcription was checked for accuracy and then coded for analyzing. The coding frame utilized to analyze data from these three sources were grounded in codes generated directly from the SE’s responses during the interviews and questionnaire. A qualitative analysis of the codes developed generated several emerging themes that were grouped into three major categories: knowledge, attitudes, and skill set. From the interview questions, the researcher also isolated questions 6 and 7 and analyzed the responses for accurate, partially accurate, and inaccurate responses. These responses were coded for further analyzing as (2)-accurate, (1) – partially accurate and (0)-inaccurate.

Data analysis

The data obtained was analyzed and coded utilizing a qualitative data analysis method of line by line open coding. Through the use of this coding procedure, the researcher was able to develop concepts/codes, define the concepts and create themes based on similarities of the defined concepts. During the line by line open coding process, the researcher analyzed each question response on the transcribed interviews seeking patterns in the data. Recognized recurring patterns and emerging themes in the data as it was being analyzed guided the researcher to consistently create categories and subcategories until the data was saturated. Once the data was saturated and all subcategories were identified, the researcher combined and classified them under emerging categories/themes. Themes that were identified as recurring were then documented, operationally defined, and categorized as either a primary theme or secondary theme. Primary themes were operationally defined based on their characteristics and the content of the statements included from the SEs responses during the interviews and questionnaires. Each secondary theme (subset) was categorized under a primary theme in which the characteristics of that secondary theme closely fit the definition of the primary theme. Each primary theme was finally identified as, 1- Attitudes, 2- Skill Set and 3- Knowledge.

Furthermore, the coded responses of Questions 6 and 7 from the interview were analyzed and categorized into two categories, (6) learning disability definition and (7) communication disorders definition. The researcher then compared the means of each accurate, partially accurate and inaccurate response for each category.

Findings

The analysis of the questionnaire responses to questions 6 and 7 from the SEs reflected that there was limited to no knowledge of what a communication disorder and learning disability was. Question 6 – What is a learning disability?, yielded one accurate (6%) response, and an even distribution of 8 partially accurate (47%) and 8 inaccurate responses (47%). From the results of question 7- what is a communication disorder, one SE accurately defined the question (10%), and the remaining 16 SEs were partially accurate (90%) in their definition of a communication disorder. No SEs provided an inaccurate response to this question. Overall, between the two categories, SEs were able to define communication disorders partially accurate (90%) more times than they were able to define learning disabilities (47%) accurate. The SEs' ability to accurately define these two questions may be secondary to their educational levels and prior knowledge of the terms. For example, four of the SEs identified that they had a high school education level with no prior training in special education, and seven of the SEs identified themselves as college graduates. Three of the seven college graduate SEs reported having prior training in either education or special education. The remaining SEs identified themselves as either having attended a technical school (1), or some college (5) yet no prior training in either special education or education.

Three significant themes/categories were identified through an open coding process. The three significant themes/categories that emerged from the data analysis are: 1) Knowledge, 2) Attitudes & Beliefs and 3) Skill Set. Further analysis of the open coding data presented four subsets, cultural beliefs, values, educational practices and cultural definitions. The first category, "Knowledge" reflects the individual knowledge the SEs possessed in relation to working with children with special needs and communication disorders. The second category, "Attitudes and Beliefs" reflects the perceptions, belief and feelings the SEs internally possessed in relation to their views and opinions of what causes communication disorders and learning disabilities, how to address communication disorders and learning disabilities, and the causes of communication disorders and learning disabilities. The third category, "Skill Set" represents the skills and approaches the SEs implement within their respective classrooms when educating children with special needs and communication disorders. This includes the presentation of class lectures for students, how students are being graded and the expectations of how a student should perform academically.

The first theme to emerge from analysis of the interview and observation data was discussions of the SEs' knowledge as it relates to communication disorders and learning disabilities.

"A communication disorder is when a person cannot communicate what is going on around them and has that ability to really deal with what is going on around them." (Participant 11, One to One specialist)

"A learning disability is somebody that is um, kind of low. Um, they have a hard time with lots of things like speech and like tactile stuff." (Participant 9, Teacher)

Although all of the SEs were verified to spend a minimum of 80% of their work day with children with communication disorders, none of them were able to accurately define or identify what a communication disorder was. Overall, 90% of the responses were partially correct and demonstrated a limitation to their knowledge about the topic. One SEs was able to provide an accurate response which may have been attributed to as she reports in addition to a college degree and training in special education, shadowing a speech-language pathologist within the year the study was conducted and being told the definition of the term at that time. They reported providing responses based on estimations secondary to their current experience with the learning disabled/communication disorders population. Although for some, the current position as a special educator was their first exposure to many disorders.

"We need more training and opportunities to go to continuing education classes so we can know this stuff." (Participant 5, Teacher's Aide)

"Over the years what type of disorders have you been exposed to or worked with? Some ADHD, um and I think Down's Syndrome" (Participant 2, Teacher)

The SEs' limited knowledge of communication disorders and learning disabilities may have also been impacted by their cultural beliefs. Although majority of the responses revealed they knew something about communication disorders and learning disabilities, the presence of beliefs and attitudes grounded in myths, and passed down through the culture continued to manifest in their responses. For example, when the researcher inquired of what causes a communication disorder, the responses included statements such as:

"Most of it is hereditary like passed down from parents, something that the parent has done, also human nature ... we call it sin...Imperfection if you want to use that." (Participant 7, Teacher)

"I grew up hearing people say that you would pay for what wrong you did or your children would pay." (Participant 1, Teacher's Aide)

Even though, the SEs had some exposure to communication disorders and learning disabilities and over 50% of them possessed some college or a college degree, their responses were consistently presented with some level of beliefs or attitudes of myths. Although some of the SEs were reluctant to express their beliefs and attitudes, the emerging categories analyzed revealed multiple occurrences of responses infused with cultural beliefs. Overall, the SEs felt as though they needed more information and training on learning disabilities and communication disorders.

Furthermore, analysis of the coded responses from the observations and interview data revealed a second category, attitudes and belief. Subsets from this category revealed the SEs' outlook on values as it relates to special needs and communication disorders, attitudes and opinions of children with special needs and communication disorders worth in society and perceptions and expectations of children with special needs and communication disorders.

"Children with communication disorders can learn to speak if they try harder." (Participant 3, Teacher)

“Yes my students can get a job, if it is like farming or something using their hands.” (Participant 4, Teacher)

Furthermore, the data collected from the interview and observation transcripts reveal that majority of the SEs’ attitudes and beliefs provided low expectations for the students they educate regardless of their position, education level and past experiences with the population. The transcribed responses suggest that the SEs’ teaching approaches may be impacted by their exposure to knowledge and awareness, and the skills used when educating children special needs and communication disorders. Resulting in the final category, skill set. More specifically, the special educators’ expressed a change in their understanding of what a communication and learning disorder is and how to educate this population after the implementation of the F.A.T with Communication Disorders workshop. In addition, all the SEs expressed a desire to have more and recognized their limitations or what they were lacking in terms of their educational approach/skills.

“It made me really think. I mean I know I am guilty of doing some of the things you discussed... I know some of them {techniques} but I have forgotten...to be honest with you some of this stuff I have done and dropped because we can’t keep up with it depending on how many kinds we have...we just don’t stop and do those things but I know we need to do some of those things... we rely on basic simple things we can do quick. But I would like to {have} more strategies to do that. So I would like to build that in more so that...I would like to do that, I would like to have more.” (Participant 15, Teacher)

“It helped a lot it’s good to see how students are when we are in their shoes to see what they are thinking. That what I thought I was doing to input was not helping, it really helped sometimes you don’t see what they are going through but by putting our self in they shoe you can understand and really sympathize.” (Participant 13, Teacher’s Aide)

“... we need more resources to help in the classroom.”(Participant 17, Teacher)

Ultimately, the final theme reveals that the SEs are aware of their limitations and seeking opportunities to learn more and enhance their knowledge and skills to be able to better educate children with special needs and communication disorders.

However, the SEs expressed major concerns, predominantly in the area of skill set.

These concerns included:

1. The special educators feel unqualified to teach the students with special needs and communication disorders in their classrooms
2. There is a limited amount of resources available to effectively implement appropriate academic lessons and intervention to the students with special needs and communication disorders
3. Opportunities for professional development, training and workshops addressing special needs and communication disorders are scarce on the island

4. Access to professional development, training and workshops offered off-island is challenging secondary to limited funds resulting in inadequately prepared special educators

On the other hand, the SEs expressed positive feedback in reference to the F.A.T. with Communication Disorders workshop. They expressed satisfaction in the implementation of the workshop, empathy towards what children with special needs and communication disorders experience as a result of the workshop's simulations and an increase in knowledge of what communication disorders and learning disabilities are and strategies to address these difficulties in students.

In conclusion, it may be safe to imply that the special educators made a paradigm shift in their knowledge, attitudes and skills after participation in the workshop despite the short period of time the simulation workshop was implemented. It is also fair to say that the special educators have demonstrated an adjustment in their educational approaches in a manner conducive to the needs of the students with special needs and communication disorders in comparison to the special education approaches used in the past in the Bahamas (Ministry of Education , 2010). This demonstrates a positive impact and shift in light of the current special education reform over the last few years (Armstrong , Armstrong , Lynch , & Severin, 2005).

Table 3. Observations and Interview Emerging Themes Sample

Themes	Examples
1. Knowledge: • Cultural Definitions (How the participants define communication disorders) • Cultural Theories (Religious, Traditions, Spiritual)	• "A communication disorder is when a person cannot communicate what is going on around them and has that ability to really deal with what is going on around them". • "What do you think causes a communication disorder?" • "Most of it is hereditary like passed down from parents, something that the parent has done, also human nature ... we call it sin...Imperfection if you want to use that."
2. Attitudes- Values, worldviews of SPED children, worth in society, stereotypes/expectations	• "Children with communication disorders can learn to speak if they try harder." • "Do you think your students will be able to get a job?" • "Yes, if it is like farming or something using their hands."
3. Skill Set – Educational Practices (service delivery, lessons taught, approaches including tone of voice, patience etc.)	• "What type of educational lessons do you implement in your class?" • "Reading and math with the more functional kids and like colors and shapes with the kids that take more time." • "Do you believe your classroom is set up to provide your students with the most opportunities to be able to communicate?" • "No, we need more resources to help in the classroom."

Discussion

This study explored the knowledge, attitudes and skill set of special educators who work with student with special needs with communication disorders. Three main themes manifested throughout the analysis and have been categorized as: 1) Knowledge

2) Attitudes and Beliefs and 3) Skill Set. The concerns, perceptions and knowledge that resulted from these categories were also discussed. The findings of this study assist in developing a

preliminary explanation and decision on how to enhance awareness, knowledge and skills of special educators in the Bahamas.

The core concern of the special educators in relation to addressing this need is limited resources and lack of training and professional development opportunities. These findings are consistent with the Bahamas Ministry of Special Education 10 year plan (Ministry of Education , 2010), which discusses the objective to develop workshops, trainings, assessments and evaluations for all special educators in order to increase and support the teaching-learning process of children with special education needs. The findings of this study are also consistent with the Bahamas' Ministry of Education's determination that educators of children with special needs were missing key components needed to be appropriate and functional educators. These limitations have proved to be affecting not only approaches to appropriate education for children with special needs; but also towards increasing the skill set and knowledge of the special educator.

The 17 SEs who participated in this study discussed and/or demonstrated their recognition of the limitations they faced; and would like to seek and be offered opportunities to remove barriers to increased pedagogical knowledge. Access to these opportunities mean continued workshops and trainings that address strategies and current knowledge related to special education and communication disorders for these educators. In addition, this study reveals that limited resources and opportunities for professional development may impact the attitudes and perceptions of special educators in the Bahamas. This study supports findings that historical trends in the process of educating individuals with special needs can influence the manner and content in which teachers were trained (Fisher, Sax, & Pumpian, 1999; Fisher, Sax, Rodifer, & Pumpian, 1999); therefore influencing that teacher's approach to educating, engaging and interacting with children with special needs and communication disorders.

Secondly, the analysis of the observations and interview responses pre and post the simulated workshop revealed that in over 70% of the participants, prior to the simulation workshop, demonstrated ingrained beliefs about children with disabilities secondary to their association of disabilities with acts of punishment, as a result of something an ancestor or parent has negatively done, and/or a sign that the disability was God's will of misfortune (Thomas, 2009). It can be deduced that in some instances, the presence of previously ingrained beliefs about disabilities may have unfavorably impacted educators' educational approaches or expectations for children with special needs and communication disorders in the Bahamas.

The implementation of the simulated F.A.T with Communication Disorders workshop lend to an increase and change in the participants' approaches and perceptions to communication disorders. The results of this study demonstrate that when the participants' were totally immersed in situations similar to what their students with communication disorders experienced, they were able to later empathize and better comprehend the effects of the disability and how to address it. This finding demonstrates that Special Education teachers should be continuously acquiring knowledge through pre-service and inservice opportunities. This is necessary because special educators are expected to be able to implement collaborative problem solving skills, possess leadership skills, and demonstrate the ability to modify and enhance learning opportunities for their students. Not only is special education critical for all students with special needs and communication disorders, but, effective professional development for special educators is necessary in order to improve and increase functional communication of these students. Ultimately, improvements in the inservice training preparation for future and current special educators in the Bahamas can lead to an increase and change in perceptions and

educational innovations for children with special needs and communication disorders (Fisher, Frey, & Thousand, 2003). To this effect, trainings should also include simulated workshops such as the one implemented in this research study as much as possible.

Overall, this study reveals that focusing on knowledge, awareness, and pedagogical skills is likely to produce a paradigm shift in enhancing the skill set, knowledge, and approach toward educating children with special needs and communication disorders in the Bahamas.

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